UNCLASSIFIED

OFFICE OF THE SECRETARY OF DEFENSE

FY 1994 BUDGET ESTIMATES

JUSTIFICATION OF ESTIMATES SUBMITTED TO CONGRESS

APRIL 1993

RESEARCH, DEVELOPMENT TEST AND EVALUATION
DEFENSE WIDE

DEVELOPMENT TEST AND EVALUATION, DEFENSE

DIRECTOR OF OPERATIONAL TEST AND EVALUATION DEFENSE

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Note: NSA, DIA, DSPO, WHE (Classified Programs C3I), and U.S. Special Operations Command (Advanced Special Operatons R&D) Descriptive Summaries are of a higher classification and will be provided under separate cover.

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FY 1994 BUDGET ESTIMATES

DESCRIPTIVE SUMMARIES

DEFENSE MAPPING AGENCY

APRIL 1993

DEFENSE MAPPING AGENCY
FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: 0305139B Budget Activity: Intelligence and Communications #5

PE Title: DMA Mapping, Charting, and Geodesy (MC&G) Production System Improvement

A. (U) RESOURCES ($ in Thousands)

Project Number and Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
(U) New MC&G Products (formerly Project 200, Product Definition and Production Implementation)	[7,703]	[7,930]	29,446	Cont	Cont
(U) New MC&G Processes (formerly Project 300, Product Independent Production Improvements)	[24,243]	[40,558]	33,051	Cont	Cont
(U) New MC&G Concepts (formerly Project 100, Source Collection Optimization and Project 400, MC&G Standardization)	[4,654]	[4,592]	3,837	Cont	Cont
(U) 700 Digital Production System(DPS)	189,921	0	0	0	2,006,324
(U) 100 Source Collection Optimization	1,371	1,614	0	0	N/A
(U) 200 Product Definition and Production Implementation	7,703	7,930	0	0	N/A
(U) 300 Product Independent Production Improvements	24,243	40,558	0	0	N/A
(U) 400 MC&G Standardization	3,283	2,978	0	0	N/A
(U) TOTAL PROGRAM ELEMENT 0305139B	226,521	53,080	66,334	Cont	Cont

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program element includes all RDT&E costs associated with improving the Defense Mapping Agency production system and any related MC&G development activities that foster new DMA products; introduce, improve or adapt DMA operational processes to enhance interfaces or functionality; and use new technology in the development of concepts that would enhance processes and products. This PE also reflects the costs associated with the completion of the Digital Production System (DPS). DPS was the development, acquisition, and installation of a capability to produce MC&G products using digital source materials.

(U) COMPARISON WITH FY 1992/1993 DESCRIPTIVE SUMMARY: Change in the RDT&E program has been necessitated by the completion of DPS. In prior years, DPS was the major thrust of DMA's RDT&E program and reported as a separate project. After meeting the Final Operating Capability (FOC) milestone in November 1992, DPS has become the primary DMA production system. The RDT&E program has been simplified to concentrate resources on three types of projects: 1) New MC&G Products, 2) New MC&G Processes, and 3) New MC&G Concepts. The memo entries [] in section A. above are for comparison. Cross-referencing between the previous and current project structure is as follows:

Previous	Current
100 Source Collection Optimization	New MC&G Concepts
200 Product Definition/Production Implementation	New MC&G Products
300 Product Independent Production Improvement	New MC&G Processes
400 MC&G Standardization	New MC&G Concepts

DEFENSE MAPPING AGENCY
FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: 0305139B Budget Activity: Intelligence and Communications #5

PE Title: DMA Mapping, Charting, and Geodesy (MC&G) Production System Improvement

A. (U) RESOURCES ($ in Thousands)

Project Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
(U) NEW MC&G PRODUCTS	[7,703]	[7,930]	29,446	Cont	Cont

B. (U) BRIEF DESCRIPTION OF PROJECT: As a Combat Support Agency, DMA is responsible for the research, development, and production of new mapping, charting, and geodetic products to meet evolving customer requirements. Key product initiatives currently include: development of rapidly producible interim and substitute products for crisis support; development of digital products to support planned and fielded operational, mission planning, and C3I systems; development of a suite of digital products designed to support the analytical functions of Military Geographic Information Systems currently being integrated into Electronic Battlefield architectures; and development of hydrographic and bathymetric products in support of the Defense Hydrographic Initiative.

C. (U) JUSTIFICATION FOR PROJECTS IN FY 1994:

(U) FY 1992 ACCOMPLISHMENTS: Continued development of intermediate and large scale products in Vector Product Format (VPF), including prototypes of the Digital Nautical Chart and Digital Joint Operations Graphic; Continued prototyping and data collection for Tactical Terrain Data (TTD); Continued development of Raster Product Format (RPF) and Text Product Format; Completed prototype for Digital Gazetteer; Continued development of Digital Point Point Positioning Data Base (DPPDB).

(U) FY 1993 PLANS: Continue DPPDB development; Continue additional prototypes of DMA products in VPF and RPF; Continue efforts to convert hardcopy products to digital format; Continue development and implementation of new vector and raster products; Perform requirements analysis for Digital Products Data Base; Commence design of Master Sea Floor Digital Data Base (MSDDB).

(U) FY 1994 Program: Continue Vector Products development to define and prototype multi-resolution data layers; Continue design of the MSDDB; deliver the DPPDB production line; Initiate design of Digital Products Database for the archival, transformation, packaging and transmission of MC&G datasets; Perform requirements analysis for image based products.

(U) WORK PERFORMED BY: SAIC; TASC; Intergraph; ESRI; other competitive and sole source contracts.

(U) OTHER APPROPRIATION FUNDS:

	FY 1992	FY 1993	FY 1994
PDA	[0]	[3,200]	5,850

(U) COMPARISON WITH FY 1992 DESCRIPTIVE SUMMARY:

SCHEDULE CHANGES: Integration of new vector products into the DPS accelerated to FY 1992; development of image based products, exclusive of DPPDB, delayed until FY 1994; and implementation of DPPDB delayed until FY 1994.

COST CHANGES: This Project contains funding previously reflected in Project 200, Product Definition and Product Implementation.

DEFENSE MAPPING AGENCY
FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: 0305139B Budget Activity: Intelligence and Communications #5

PE Title: DMA Mapping, Charting, and Geodesy (MC&G) Production System Improvement

A. (U) RESOURCES ($ in Thousands)

Project Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
(U) NEW MC&G PROCESSES	[24,243]	[40,558]	33,051	Cont	Cont

B.(U) BRIEF DESCRIPTION OF PROJECT: As a Combat Support Agency, DMA is responsible for the establishing and maintaining the production processes required to support Service and Command MC&G requirements. Key initiatives within this project include development of capabilities to process, integrate and archive hydrographic and bathymetric source; production line integration of alternate image source and native hardcopy materials to alleviate source shortfalls, increase crisis response capabilities, and reduce collection costs; automation enhancements to increase throughput and decrease production time; and improvement to cataloging and distribution systems.

C. (U) JUSTIFICATION FOR PROJECTS IN FY 1994:

(U) FY 1992 ACCOMPLISHMENTS: Initiated development of the Hydrographic Source Assessment System (HYSAS) and the DoD Digital Bathymetric Library; Initiated integration of Defense Hydrographic Initiative support systems in the Digital Production System (DPS); Completed operations concept for MC&G Mainframe Upgrade; Developed Segment Specific and Full Production Training Capability for DPS.

(U) FY 1993 PLANS: Begin development of the Catalog System improvements to accommodate new media and digital products and interface to the production management function of the Digital Production System; Initiate development of Development Test Facility (DTF) interfaces; Continue development of the DoD Digital Bathymetric Library and HYSAS; Continue integration of DHI into DPS, including the Automated Notice to Mariners and CNO Special Chart interfaces; Continue development of comprehensive System Test capabilities and fully integrated System Engineering Tools; Commence Operability Interface Development; Continue development to interface Terrain Feature Analysis System (TFAS).

(U) FY 1994 Program: Complete Catalog improvements and system transition; Continue Operability Interface development; Begin HYSAS implementation; Continue upgrade of Source Assessment interfaces; Develop processes for integration of Alternate Source materials into production line; Provide the DTF capability to develop and test Data Service and Production Management system modifications; Implement Catalog System improvements for new media and digital products; Develop capability to handle Large Data Set limitations; Develop wideband interfaces.

(U) WORK PERFORMED BY: Intergraph; General Dynamics; E-Systems; General Electric; Hughes; DBA; SAIC; TASC; other competitive and sole source contracts.

(U) OTHER APPROPRIATION FUNDS:

	FY 1992	FY 1993	FY 1994
PDA	[4,587]	[10,680]	30,700

(U) COMPARISON WITH FY 1992 DESCRIPTIVE SUMMARY:

TECHNICAL CHANGES: Modifications to Production System have been added in FY 1993 and FY 1994 to address integration and performance issues that have been identified during the FY 1992 production ramp-up.

SCHEDULE CHANGES: Contract award for Catalog System delayed until FY 1993 and implementation delayed until FY 1994.

COST CHANGES: This Project contains funding previously reflected in Project 300, Product Independent Production Improvements.

DEFENSE MAPPING AGENCY
FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: 0305139B Budget Activity: Intelligence and Communications #5

PE Title: DMA Mapping, Charting, and Geodesy(MC&G) Production System Improvement

A. (U) RESOURCES ($ in Thousands)

Project Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
(U) NEW MC&G CONCEPTS	[4,654]	[4,592]	3,837	Cont	Cont

B. (U) BRIEF DESCRIPTION OF PROJECT: As the DoD lead for MC&G, DMA is responsible for advancing the state of the art in MC&G production and exploitation technology; addressing the MC&G issues embedded in DoD Science and Technology thrust areas identified by OSD/DDRE; and participation in national and international MC&G standards initiatives. Concepts initiatives in support of this mission include ongoing investigations of technologies for Geographic Information Systems, multi-sensor fusion, electronic data dissemination, media, and printing; sensor modeling; and development of standards for digital geographic data to reduce aggregate DoD data production and integration costs and maximize interoperabilty.

C. (U) JUSTIFICATION FOR PROJECTS IN FY 1994:

(U) FY 1992 ACCOMPLISHMENTS: Completed prototype development of improved digital sounder for bathymetric data collection; Completed GPS Block II data processing implementation; Continued studies and analyses of alternate source for production of MC&G products; Continued studies and analyses in support of new collection systems; Completed production, distribution and MILSTD formalization of Digital Chart of the World; Continued development of standardized MC&G Utility Software; Completed MILSTD formalization of Vector Product Format.

(U) FY 1993 PLANS: Provide support and analysis for studies associated with advanced Air Force aircraft inertial navigation systems by developing concepts and methods for production of gravity products to support these systems; Continue implementation of gravimetric data processing and storage design; Continue efforts to research and evaluate alternate source data such as multispectral imagery (MSI) to support DMA products; Continue standardization effort in data definition for vector and raster products; Continue to support other agencies through interoperability agreements.

(U) FY 1994 Program: Continue technology studies; Continue studies of the design, integration, and exploitation of new sensors and imagery; Continue MC&G Utility Software development and implementation; Continue support to national and international standards organizations.

(U) WORK PERFORMED BY: Service Laboratories, government research laboratories, competitive and sole source contractors

(U) OTHER APPROPRIATION FUNDS:

	FY 1992	FY 1993	FY 1994
PDA	[689]	[1,000]	760

(U) COMPARISON WITH FY 1992 DESCRIPTIVE SUMMARY:

COST CHANGES: This project contains funding previously reflected in Projects 100, Source Collection Optimization and Project 400, MC&G Standardization.

DEFENSE MAPPING AGENCY
FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: 0305139B Budget Activity: Intelligence and Communications #5

PE Title: DMA Mapping, Charting, and Geodesy(MC&G) Production System Improvement

A. (U) RESOURCES ($ in Thousands)

PROJECT NUMBER AND TITLE	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
(U) 700 DIGITAL PRODUCTION SYSTEM (DPS)	189,921	0	0	0	2,006,324

B. (U) BRIEF DESCRIPTION OF PROJECT: DPS was an Office of the Secretary of Defense (OSD) mandated, congressionally endorsed, effort to attain an all-digital production capability for DMA using available source material. This capability consists of three fully equipped, interdependent production centers, generating MC&G products. The completed DPS gives DMA the flexibility to adapt its production line to future changes in acquisition and collection of source materials. Compared to previous capabilities, the DPS is expected to increase DMA's production capability to support current and new weapon systems, tactical operations, and improve responsiveness through a decrease in product generation time. The five major segments of DPS are:

(U) Source Preparation Segment - assesses, evaluates, and integrates all source materials for production programs.
(U) Data Extraction Segment - provides for the extraction of terrain elevation and feature data from available sources.
(U) Product Generation System - supports the generation and revision of MC&G products by capturing and integrating data from various sources.
(U) Data Services Segment - responsible for the centralized management and transfer of source materials and all digital data.
(U) Production Management Segment - provides resource allocation, production monitoring and quality assurance support.

C. (U) JUSTIFICATION FOR PROJECTS IN FY 1994:

(U) FY 1992 ACCOMPLISHMENTS: Testing and debugging of the segment unique software has occurred with the deliveries of the remaining software for DPS. Intercenter production capabilities were demonstrated with Full Operating Capability (FOC) in November 1992.

(U) FY 1993 PLANS: N/A

(U) FY 1994 PLANS: N/A

(U) WORK PERFORMED BY:

(U) Source Preparation Segment - E-Systems, Garland TX.
(U) Data Extraction Segment - General Dynamics Corporation, San Diego CA.
(U) Product Generation Segment - Intergraph, Huntsville AL.
(U) Data Services Segment - Hughes Aircraft Corporation, El Segundo CA.
(U) Production Management Segment - General Electric, Valley Forge PA.

(U) OTHER APPROPRIATION FUNDS:

	FY 1992	FY 1993	FY 1994
PDA	7,234	0	0

DEFENSE MAPPING AGENCY
FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: 0305159B Budget Activity: Intelligence and Communications #5

PE Title: Defense Reconnaissance Support Activities

A. (U) RESOURCES ($ in Thousands)

Project Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
(U) Defense Reconnaissance Support Program	6,248	6,127	11,320	Cont	Cont
(U) TOTAL PROGRAM ELEMENT 0305159B	6,248	6,127	11,320	Cont	Cont

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program evaluates developing or planned advanced systems for potential MC&G data exploitation. Developments address data extraction algorithms and operational scenarios. Additional activities include test and evaluation to ensure source material support of MC&G product requirements.

C. (U) JUSTIFICATION FOR PROJECTS IN FY 1994:

(U) FY 1992 ACCOMPLISHMENTS: Test, demonstrations, and training were conducted to support the DMA source collection activities. Utility studies continued for non-conventional source exploitation. Initiated accuracy improvement studies. Initiated a source management study. Delivered prototype software for exploitation of alternate source data on soft copy. Provided operations engineering support. Continued work on alternate source exploitation studies. Completed upgrades for existing quality control source assessment. These efforts are described in the Congressional Justification Book for Tactical Intelligence and Related Activities (TIARA).

(U) FY 1993 Plans: Continue operations and enhancements to existing quality control source assessment. Continue work on primary source improvement activities. These efforts are described in the TIARA.

(U) FY 1994 Program: Continue studies of the design, integration, and exploitation of new sensors and imagery. Begin the development of modifications to DMA's production system which would allow the exploitation of the LANDSAT 7 based High Resolution Multispectral Stereo Instrument (HRMSI) sensor. These efforts are described in the TIARA.

(U) Work Performed by: Private contractors and government research laboratories.

(U) Other Appropriation Funds:

	FY 1992	FY 1993	FY 1994
PDA (Other Capital Equipment)	2,333	2,418	4,500
O&M	6,764	7,137	7,931

DEFENSE MAPPING AGENCY
FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: 0901600B Budget Activity: Intelligence and Communications #5

PE Title: Contract Administration/Audit

A. (U) RESOURCES ($ in Thousands)

Project Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
(U) Contract Administration/Audit	0	0	1,357	Cont	Cont
(U) TOTAL PROGRAM ELEMENT 0901600B	0	0	1,357	Cont	Cont

B. (U) BRIEF DESCRIPTION OF ELEMENT: The FY 1994 budget reflects the portion of the Department's estimate as result of contract awards made in this appropriation. This represents a change from the way the budget was presented last year and reflects a Congressional and Departmental initiative to move toward mission budgeting which calls for an improved method of budgeting and justifying resources. The visibility of total cost related to contract awards and administrative requirements is improved in this presentation because support service funding for related contracts is included in this appropriation.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS: These funds will be used to finance contract services that are performed in support of programs budgeted in this appropriation.

(U) WORK PERFORMED BY: Defense Contract Management Command (DCMC)
Defense Contract Audit Agency (DCAA)

STRATEGIC DEFENSE INITIATIVE ORGANIZATION

FY 1994 BUDGET ESTIMATES

APRIL 1993

THIS DOCUMENT CONTAINS PPBS DATA

Releasable To: Contractor Personnel With A PPBS Non-disclosure Agreement On File With PO, SDIO.
Not Releasable To: Other Contractor Personnel.
In Accordance With: DoD Directive 7045, May 6, 1992

DEPARTMENT OF DEFENSE
STRATEGIC DEFENSE INITIATIVE ORGANIZATION
WASHINGTON, DC 20301-7100

MAR 24 1993

MEMORANDUM FOR SECRETARY OF DEFENSE

SUBJECT: Strategic Defense Initiative Organization FY94 President's Budget (PB) Submission - INFORMATION MEMORANDUM

I am pleased to submit, for the FY94 President's Budget (PB), the SDIO FY94 program. SDIO's submission was developed in compliance with PBD 756. The PB reflects your priorities, which are consistent with basic tenets of the Missile Defense Act of 1991 as revised by the FY93 National Defense Authorization Act. We will emphasize Theater Missile Defense (TMD) and initiate a major thrust in maritime missile defense development. However, the effect of reduced actual FY93 funding and FY94 budget request levels has been to force delays in development of a National Missile Defense (NMD) capability to protect the United States from limited ballistic missile attacks.

Additionally, we have zeroed the Space-Based Interceptor (SBI) program element and transferred a severely curtailed Brilliant Pebbles (BP) effort as a technology base activity to a new Follow-On Technologies program element (PE), merging the SBI and Other Follow-On PEs. Additional reductions were made to other supporting technology programs, including a key segment of the Nation's directed energy activities.

We have judiciously planned and used available resources to move toward Theater Missile Defense (TMD) and NMD deployments within time frames endorsed by Congress. This planning includes an attempt to maintain all options for initial NMD deployment. Our FY94 funding shifts resources to TMD from the Strategic Missile Defense area and within the strategic arena from follow-on and BP to near-term acquisition and technology programs supporting the Limited Defense System (LDS). Any reductions in FY93 funding, beyond those already offered up, or reductions in the FY94 budget would seriously jeopardize our efforts to keep these essential deployments on track.

We believe that the ongoing Strategy Review, from which final decisions on SDIO outyear funding and TMD/NMD deployments will be derived, will consider fundamental ballistic missile defense policy issues. Basic policy to provide protection to forward deployed forces, friends and allies, and to the United States against limited attacks is reflected in your priorities and the Missile Defense Act. We look forward to working with the OSD staff in building an outyears budget (FY95-99) to ensure the resources are in place to continue the important progress we have achieved to date in meeting those objectives. We believe the SDIO FY94 PB emphasizes funding for programs which strive to put in place a highly effective ballistic missile defense program, which is so essential to protect the American people.

Malcolm R. O'Neill

MALCOLM R. O'NEILL
Major General, USA
Director (Acting)

SDIO

FY 1994

BUDGET ESTIMATES

PROGRAM

SUMMARY

Summary Program Description

Program Overview:

Following the specific guidance provided by the SECDEF, the SDIO FY94 budget provides for continuation of efforts to provide for advanced theater missile defenses and retains options for the deployment of the initial National Missile Defense (NMD) site, providing for a ground-based defense of the United States. SDIO will provide for an early capability for Theater Missile Defense as a contingency deployment of Dem/Val hardware through the User Operational Evaluation System (UOES) concept. The Secretary's Strategy Review will provide further direction in ensuring ballistic missile defenses are carried out as a top national priority, consistent with prudent management of cost, schedule, performance, and technical risk factors.

While we are still working on defining the long range program, this FY94 budget maintains the basic priorities laid out by the Secretary of Defense. Funding for theater defense, both a Department and Congressional priority, has been substantially increased in FY94 to accommodate a fully coordinated Navy TMD program worked out jointly between the SDIO and the Navy and strongly encouraged by Congressional actions during deliberations on the FY93 budget. Air-Based Theater Defensive systems also could provide the capability for rapid insertion of large area missile defense capabilities. Therefore, SDIO is working with the Air Force to establish a joint program for such an air-based theater capability.

We have lowered the priority for early contingency capability for the programs supporting the defense of the United States, based on both Congressional and SECDEF priorities. In realigning the National Missile Defense (NMD) program to reflect the funding levels provided, we had to slow the pace substantially. The core acquisition program now leads to an initial site capability no earlier than 2004.

Funding for Follow-on Technologies, Small Business Innovative Research (SBIR), and Research and Support has been substantially reduced to a level of effort. This provides for a Brilliant Pebbles (BP) technology demonstration program which continues technology development, but curtails acquisition efforts at this time. Historically, SDIO had two follow-on program elements (PEs), the Space-Based Interceptor (SBI) PE, and the Other Follow-on PE for far-term follow-on projects, which have been combined into a new Follow-On Technology PE. The decision to reduce and convert Brilliant Pebbles into an advanced technology development program has resulted in movement of BP and supporting technologies to the new Follow-On Technology PE. The Follow-on Technology, Small Business Innovative Research, and Research and Support PEs will focus on only the most important technologies supporting advanced capabilities that might be required to respond to future threat evolution.

Theater Missile Defense

In response to the SECDEF priorities, the Missile Defense Act (MDA), and FY93 Congressional direction, we are developing Theater Missile Defense (TMD) systems to protect U.S. forces deployed overseas, and our friends and allies. The TMD program has been expanded in the past year to emphasize the transition from research and development to acquisition of TMD systems. SDIO plans first to improve PATRIOT and then to move as quickly as possible to develop advanced, rapidly relocatable, supportable, ground-based wide-area theater missile defenses that could be deployed in the mid-1990s in a contingency regional conflict such as Desert Shield/Desert Storm. Additional maritime, air, space, and ground-based sensors and defensive weapons are also under consideration.

Initial TMD efforts are underway to upgrade the PATRIOT system, and to continue development of the ERINT interceptor to compare the potential advantage of the ERINT interceptor with an enhanced PATRIOT. Additional efforts are being made to improve existing launch detection capabilities, and utilize the Brilliant Eyes space-based sensor capabilities; to add the initial elements of an upper-tier, wide-area defense system, THAAD (Theater High Altitude Area Defense) and TMD-GBR (Theater Missile Defense - Ground Based Radar); to upgrade Marine Corps radar systems and data networks for TMD in concert with Marine Corps funded upgrades to the HAWK missile system; to upgrade the Navy AEGIS/SPY-1 Radar, providing a limited-area defense capability to the fleet, ports, and amphibious objective areas; and to improve the battle management and command, control and communications that support these elements. With the increased early emphasis on Naval capability as agreed to with the Navy, urged by the Congress, and funded in this FY94 budget, we are exploring options for earlier contingency capability for wide-area defense from ship-based platforms. SDIO is also evaluating operational and technical issues, as well as options, for a Boost Phase Intercept (BPI) tier in the TMD architecture. A BPI layer offers options which are attractive against certain classes of threat, to include reducing collateral damage in friendly territory and providing "thinning" to enhance effectiveness and survivability of terminal defense assets, especially in the event of saturation attacks. The TMD program involves all four Services and several U.S. allies in the development of technology and the selection of systems to provide an anti-missile defense.

Limited Defense System

We have further modified the program to reflect a lower priority placed on the defense of the United States. The LDS consists of a Command and Control Element (C2E), Ground-Based Interceptors (GBI), a Ground-Based Radar (GBR), Brilliant Eyes (BE), and will take advantage of data from existing early warning sensors. SDIO has had to stretch its low to moderate risk acquisition program, which should now lead to initial site deployment in 2004. Whenever the initial site is activated, the plan is to build on it, as required, and/or allowed by International Treaties, by adding additional sensors and additional interceptor sites to improve the coverage and defense effectiveness.

Another key feature of our strategy is to maintain a robust technology program to reduce risk in our development activities and to hedge against future uncertainties. Many key development activities will greatly benefit from the infusion of technological innovation through the competitive process of acquiring even the initial site. Also, these technology activities will provide the basis for rapid response to future circumstances through technological insertion and/or pre-planned product improvements (P3I). The LDS architecture for the defense of the United States as set forth in the MDA ultimately could include multiple ground-based interceptor sites supported by both ground-based radars and space-based electro-optical sensors.

Space-Based Interceptors

Although the MDA directed that space-based interceptors such as Brilliant Pebbles (BP) not be included in the initial plan for deploying the Limited Defense System, it established a separate Space-based Interceptor Program Element, including BP and supporting technologies, which had as its primary objective, "the conduct of research on space-based interceptors to provide an overlay for ground-based interceptors." At the significantly reduced level of funding for FY94, a decision was made to restructure the SBI programs into a technology demonstration effort, and move them to the new Follow-On Technology program element.

Follow-on Technology

The Follow-on Technology Program Element is a newly combined PE, taking projects from SBI, as discussed above, and combining them with projects from the Other Follow-On PE. This PE supports two categories of activities. The first category supports directed energy systems development. These weapons provide significant added capabilities for countering potential future threats which may very well increase in both number and sophistication. SDIO is responsible for over 90% of the nation's directed energy -- laser and particle beam -- research and development efforts. Systems exploiting directed energy technologies are realistic, achievable and affordable. The former Soviet Union has made huge investments in these technologies, and in many cases they are preeminent. FY93 Congressional language has resulted in two far-term follow-on directed energy programs, including the Free Electron Laser and the Airborne Laser, to be transferred from SDIO to the Services.

The second category is other Advanced Technologies, such as very advanced interceptors, sensors, materials, and power technologies. This has included hypervelocity projectile technologies, unconventional discrimination approaches, and advanced power programs including the evaluation of the TOPAZ Thermionic Reactor. As mentioned above, the Brilliant Pebbles program and supporting technologies have now been moved to this PE. All of these activities could pay major dividends -- some during our planned deployment activities. Because of the necessary budget reductions these activities have been reduced to supporting only a few of the highest payoff technology areas.

Research and Support

The Research and Support Program Element has typically contained three categories of activities: "Research," "General Test and Evaluation," and "Support" for activities in one or more of the other program elements. In order to maintain essential activities supporting the priority TMD and LDS activities and to live within Congressionally-imposed ceilings on the funding within this program element, essentially all of the Test and Evaluation (T&E) and simulation activities have been divided, sometimes reduced, and moved to the program elements they directly support. Some of the support activities have also been moved.

Research activities in the Research and Support Program Element are primarily associated with Innovative Science and Technology (IS&T). This PE also includes our technical work done to integrate all threat and countermeasures work conducted in support of system development activities.

Under our Support activities, we supply the basic management support to SDIO and our agents to accomplish the SDI program. These functions form a vital part of assuring our overall program viability. Here we pay for salaries, capital equipment, and basic management support within SDIO and within the executing services and agencies.

Small Business Innovative Research (SBIR)

Following specific guidance established by the OSD Comptroller, the statutory Small Business Innovative Research programs have now been combined into a separate program element. These SBIR programs were formerly funded within the Research & Support PE.

SUMMARY

The FY94 President's Budget submission reflects funding required to maintain the basic program options while recognizing evolving Administration and Congressional priorities. It provides for development and deployment of improvements to current systems with ATBM capability. The SDIO budget continues production of upgraded PATRIOT and ensures SDIO is able to provide a contingency capability to field advanced, highly effective point and area TMD systems. It institutes new cooperative TMD programs with the Navy and Air Force. The budget lays out a program where the NMD, required for defense of the United States, is stretched out by at least a year. It reduces to a technology demonstration program, within the Follow-On Technology PE, the R&D efforts to provide an option for space-based kinetic energy interceptors.

Within the program, SDIO has continued to emphasize the priority of building upon the Missile Defense Act of 1991 for developing and deploying defenses against limited ballistic missile attacks for the American people, our forces abroad and our friends and allies. The funding outlined in this FY94 President's Budget is essential to meet these objectives.

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APPROPRIATION

SUMMARY

APPROPRIATION SUMMARY

A. RESOURCES: ($ In Thousands)

Project Number and Title:	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	Total Program
RDT&E				
PE 0603216C (TMD-6.3)	785,380	1,027,257	1,636,304	Continuing
PE 0604225C (TMD-6.4)	11,500	0	50,410	Continuing
PE 0603215C (LDS-6.3)	1,481,984	1,674,354	1,195,459	Continuing
PE 0604226C (LDS-6.4)	0	0	0	Continuing
PE 0603214C (SBI)	433,897	220,000	0	Continuing
PE 0603217C (FOT)	528,374	299,764	354,187	Continuing
PE 0602790C (SBIR/STTR)	0	0	42,552	Continuing
PE 0603218C (R&S)	665,762	423,425	358,223	Continuing
TOTAL RDT&E	3,906,897	3,644,800	3,637,135	
PROCUREMENT				
PE 0208060C (TMD)	24,875	75,200	120,719	Continuing
TOTAL PROCURMENT	24,875	75,200	120,719	
MILCON				
PE 0603215C (LDS)	0	5,400	30	Continuing
PE 0603218C (R&S)	5,100	0	2,697	Continuing
TOTAL MILCON	5,100	5,400	2,727	
TOTAL	3,936,872	3,725,400	3,760,581	

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PE SUMMARY

Program Element: 0603216C
PE Title: Theater Missile Defenses

Budget Activity: 04
Tactical Programs

A. RESOURCES: ($ In Thousands)

Project Number and Title:	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	Total Program
1105 Discrimination	1,000	0	0	Transferred
1106 Sens Stud & Exp	3,000	5,670	654	Continuing
1109 TMD Discrimination	11,465	11,360	1,328	Continuing
1206 Advanced TMD Weapons	20,274	6,100	5,958	Continuing
1210 Navy Exo	0	30,000	93,835	Continuing
1501 Survivability	4,400	3,120	3,047	Continuing
1502 Leth & Tgt Hard	17,660	28,020	35,064	Continuing
2102 BE	0	0	112,518	Continuing
2104 GBR	42,000	111,895	234,111	Continuing
2106 ACTS	32,130	70,138	45,386	Continuing
2203 E2I	13,770	0	0	Completed
2207 Patriot	123,550	94,470	80,684	Continuing
2208 ERINT	160,000	116,918	97,671	Continuing
2209 ACES	60,000	57,776	56,424	Continuing
2210 THAAD	75,000	273,000	484,270	Continuing
2212 Corps SAM	23,000	23,000	31,998	Continuing
2213 Navy/Marine Corps TMD	0	67,000	159,203	Continuing
3204 Countermeasures Integ	4,860	0	0	Continuing
3205 TMD Spec Studies	74,463	28,504	31,436	Continuing
3207 System Analysis	0	1,000	977	Continuing
3208 Integ & Balancing	6,803	4,600	4,395	Continuing
3210 Counterforce	3,935	2,570	3,906	Continuing
3211 C4I & Ops Anal	14,642	8,800	12,697	Continuing
3212 Passive Defense	1,000	0	0	Continuing
3213 Active Defense	6,000	200	9,767	Continuing
3301 Data Center	0	20	3,711	Continuing
3304 Targets	29,900	39,780	64,062	Continuing
3305 Theater Test Bed	55,637	40,952	38,296	Continuing
3310 T&E Facilities	0	1,000	9,962	Continuing
3311 Mobile Test Assets	0	290	0	Continuing
3313 Test Ranges	0	750	14,944	Continuing
4000 Operational Support	891	322	0	Continuing
TOTAL	785,380	1,027,255	1,636,304	

Program Element: 0603216C
PE Title: Theater Missile Defenses

Budget Activity: 04
Tactical Programs

B. BRIEF DESCRIPTION OF ELEMENT:

Includes manpower authorizations and the associated costs specifically identified and measurable to the following:

Programs, projects, and activities (including those formerly associated with the Tactical Missile Defense Initiative) that have as primary objectives either of the following:

- o The development of deployable and rapidly relocatable advanced theater missile defenses capable of defending forward-deployed and expeditionary elements of the Armed Forces of the United States, to be carried out with the objective of selecting and deploying more capable theater missile defense systems by the mid-1990s.

- o Cooperation with friendly and allied nations in the development of theater defenses against tactical or theater ballistic missiles.

C. MAJOR PROGRAM ELEMENT CHANGES:

Project funding has been shown under the Program Element to which each project was assigned in each year. Some of these Program Elements have subsequently been redefined due to program and organizational restructuring. Such project funding changes include the following:

- * Funding for Targets, National Test Bed, T&E Facilities/Launch, Test Ranges and Test Assets has been moved from Program Element 0603218C to this Program Element to more properly align the project funding with the intended application of the project.

- * A portion of the Brilliant Eyes project is now funded under this Program Element to reflect the projected Theater Missile Defense applications of the project.

PE SUMMARY

Program Element: 0604225C
PE Title: Theater Missile Defenses

Budget Activity: 04
Tactical Programs

A. RESOURCES: ($ In Thousands)

Project Number and Title:	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	Total Program
2207 Patriot	11,500	0	48,457	Continuing
3211 C4I & Ops Anal	0	0	1,953	Continuing
TOTAL	11,500	0	50,410	

B. BRIEF DESCRIPTION OF ELEMENT:

Includes manpower authorizations and the associated costs specifically identified and measurable to the following:

Programs, projects, and activities (including those formerly associated with the Tactical Missile Defense Initiative) that are in engineering and manufacturing development that have as primary objectives either of the following:

- The development of deployable and rapidly relocatable advanced theater missile defenses capable of defending forward-deployed and expeditionary elements of the Armed Forces of the United States, to be carried out with the objective of selecting and deploying more capable theater missile defense systems by the mid-1990s.

- Cooperation with friendly and allied nations in the development of theater defenses against tactical or theater ballistic missiles.

Program Element: 0208060C
PE Title: Theater Missile Defenses

Budget Activity: 01
Major Equipment

A. RESOURCES: ($ in Thousands)

Project Number and Title:	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	Total Program
2207 Patriot	24,875	75,200	120,719	Continuing
TOTAL	24,875	75,200	120,719	

B. BRIEF DESCRIPTION OF ELEMENT:

Includes manpower authorizations and the associated costs specifically identified and measurable to the following:

Procurement for programs, projects, and activities (including those formerly associated with the Tactical Missile Defense Initiative) that have as primary objectives either of the following:

- The development of deployable and rapidly relocatable advanced theater missile defenses capable of defending forward-deployed and expeditionary elements of the Armed Forces of the United States, to be carried out with the objective of selecting and deploying more capable theater missile defense systems by the mid-1990s.

- Cooperation with friendly and allied nations in the development of theater defenses against tactical or theater ballistic missiles.

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FY1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: 0603216C
PE Title: Theater Missile Defenses

Project Number: 1105
Budget Activity: 04
Tactical Programs
April 1993

A. RESOURCES: ($ in Thousands)
Project Title: Discrimination

Program Name:	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	Total Program
TMD DEM/VAL	1,000	0	0	Transferred

B. BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

Funding under this Program Element provided for analyses and simulation in support of TMD discrimination. There is no funding from TMD for FY 93 and FY 94.

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

- Developed initial TMD capability in SSGM (third world missiles and terrain/cloud backgrounds).

Program Plan to Completion: This is not a continuing program.

D. WORK PERFORMED BY:

Major Contractors:
- Naval Research Laboratory

E. COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. TECHNICAL CHANGES: None
2. SCHEDULE CHANGES: None
3. COST CHANGES: There is no funding from TMD for FY 93 and FY 94.

F. PROGRAM DOCUMENTATION:

G. RELATED ACTIVITIES:

- 1106, "Midcourse Space Experiment", "Visible/Ultraviolet Experiment", and IBSS PE No. 0603214C and 0603215C.

There is no unnecessary duplication of effort within SDIO or the DoD

H. OTHER APPROPRIATION FUNDS:

1. PROCUREMENT: None
2. MILITARY CONSTRUCTION: None FY94

I. INTERNATIONAL COOPERATIVE AGREEMENTS: Yes

J. MILESTONE SCHEDULE:

FY1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: 0603216C
PE Title: Theater Missile Defenses

Project Number: 1106
Budget Activity: 04
Tactical Programs
April 1993

A. RESOURCES: ($ in Thousands)
Project Title: Sensor Studies and Experiments

Program Name:	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	Total Program
TMD DEM/VAL	3,000	5,670	654	Continuing

B. BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

This project conducts space and suborbital "tech-demo" experiments to integrate and assess newly developed sensor technologies in a realistic an operational environment as possible before they are transferred to the TMD systems elements. Data collected and IR focal planes and discrimination algorithms developed in this project is critical to the design of all surveillance and weapon sensors and sensor processing algorithms in the Theater Defense System.

Advanced electro-optical sensor technologies being developed include visible, ultraviolet, and infrared radiation hardened charge-coupled device (CCD) imagers, step-stare sensor signal processing algorithms, and processor architectures to support evolving TMD surveillance and interceptor elements. Methodologies and techniques for performing track correlation and multisensor discrimination are also included. Progress will be verified by designing, building, and field testing sensors and by performing end-to-end simulations. Sensors will be demonstrated on the MSX experiment, ground-based telescopes and aircraft platforms, as well as Brilliant Eyes dem/val flights.

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

- Completed development of radiation-resistant visible CCD detection system.
- Assessed the ability of visible sensors to perform midcourse discrimination in conjunction with LWIR sensors.
- Platinum Silicide focal plane array technology transferred to THAAD.
- Step-stare sensor signal processing algorithms developed for Brilliant Eyes program.
- Fabricate radiation hardened, low noise ultraviolet CCD.
- Fabricate radiation hardened visible focal plane arrays for Brilliant Eyes.

Program Plan to Completion: This is a continuing program.

D. WORK PERFORMED BY:
- SDIO

Major Contractors:
- MIT Lincoln Laboratory

E. COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

Program Element: 0603216C
PE Title: Theater Missile Defenses

Project Number: 1106
Budget Activity: 04
Tactical Programs
April 1993

1. TECHNICAL CHANGES: None
2. SCHEDULE CHANGES: Initiation of termination.
3. COST CHANGES: At the present funding level, the program can only be terminated.

F. PROGRAM DOCUMENTATION: None

G. RELATED ACTIVITIES:

- There is no unnecessary duplication of effort within SDIO or the DoD.

H. OTHER APPROPRIATION FUNDS: None

I. INTERNATIONAL COOPERATIVE AGREEMENTS: None

J. MILESTONE SCHEDULE:

- Platinum Silicide focal plane completed
- Large area Visible focal plane technology developed
- Program termination

FY1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: 0603216C
PE Title: Theater Missile Defenses

Project Number: 1109
Budget Activity: 04
Tactical Programs
April 1993

A. RESOURCES: ($ in Thousands)
Project Title: TMD Discrimination

Program Name:	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	Total Program
TMD DEM/VAL	11,465	11,360	1,328	Continuing

B. BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

This multi-year program consists of a sequence of flight tests planned to address critical system level discrimination issues for theater missile defense. The objective of the program is to collect critical sensor data on potential countermeasures such that the TMD system discrimination performance against these threats can be assessed. The threats considered for these flights are tank fragmentation, jamming, chaff, reduced cross-section, RV modifications, and decoys.

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

- Began mission planning and sounding rocket and warhead hardware procurement activities for flight to be conducted. Conducted experiment designs for first two campaigns, including telemetry requirements, tank breakup and fragmentation designs, RV and separation system designs, crude MaRV deployment system designs, and flight planning and integration.
- Conduct one experimental flight campaign. Conduct data analysis and report results of first campaign. Begin mission planning for future campaigns.
- Data reduction from flight tests.

Program Plan to Completion: This is a continuing program.

D. WORK PERFORMED BY:

Major Contractors: To be determined

E. COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. TECHNICAL CHANGES: None.
2. SCHEDULE CHANGES: None. One campaign will be conducted in 2Q/FY93.
3. COST CHANGES: None.

Program Element: 0603216C
PE Title: Theater Missile Defenses

Project Number: 1109
Budget Activity: 04
Tactical Programs
April 1993

F. PROGRAM DOCUMENTATION:

G. RELATED ACTIVITIES:

- This program is coordinated among DoD and other SDIO agencies to preclude duplication of effort and take advantage of jointly conducted experiments and tests wherever practical. Related SDIO program elements include:

o	1105 Discrimination	PE No. 0603214C
o	3206 Countermeasures	PE No. 0603218C

H. OTHER APPROPRIATION FUNDS: None

I. INTERNATIONAL COOPERATIVE AGREEMENTS: None

J. MILESTONE SCHEDULE:

- First Flight Campaign (2 sounding rockets)
- Final Data Report for Campaign 1
- Second Flight Campaign (2 sounding rockets)

Program Element: 0603216C
PE Title: Theater Missile Defenses

Project Number: 1206
Budget Activity: 04
Tactical Programs
March 1993

A. Resources: ($ in Thousands)
Project Title: Advanced TMD Weapons

Program Name:	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	Total Program
TMD DEM/VAL	20,274	6,100	5,958	Continuing

B. BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

The Electro Thermal Chemical (ETC) Launcher technology project is exploring the feasibility of using a combination of electrical and chemical energy sources to produce hypervelocities. This work is underway at the Soreq Nuclear Research Center (SNRC) under the provisions of the Memorandum of Understanding between the U.S. Government and the Government of Israel, dated 6 May 1986. The approach taken by the Propulsion Physics Laboratory at SNRC combines electrothermal technology and conventional ballistics technology in a conventional gun in a mode that will result in high projectile velocities and relatively small amounts of electrical energies. This combination promises an acceleration process that will enable the achievement of velocities above the conventional ballistics limit, and a cost effective system that does not require huge quantities of electrical energy. The ultimate goal is to produce an ETC Launcher which will be able to launch 5-7 kg guided projectiles at 2.0-3.0 km/s to meet TMD requirements.

Phase I of the program investigated the ignition of chemical propellants using high temperature plasma injectors. Initial tests using a 60mm ETC gun demonstrated the launch of a 1 kg mass at 2.0 km/s. Scaling techniques were used to test this ETC approach in a 105mm gun which accomplished the goal of launching a 1.5 kg projectile to 2.5 km/s. The 60mm and 105mm tests demonstrated a 15.6% and 9% improvement over conventional ballistics, respectively.

The follow-on program's goal is to launch weapon size projectiles (5-7 kg) at velocities (2.0-3.0 km/s) applicable for TMD. To keep the barrel length reasonably short, a 35% improvement of the ETC process over conventional ballistics is required. To reach required muzzle energies, it may be necessary to scale-up the barrel diameter from 105mm to 120-155mm. A series of field experiments is also planned. The purpose is to bring the gun system technologies (D-2 like projectile, Soreq ETC Launcher, fire control) out of the laboratory and into the field. The first series of integrated field experiments (beginning in 4QFY93) will demonstrate the ability to launch a D2-like aeroshell from an ETC Launcher with transportable power and fire control tracking of the projectile. The test series will culminate in FY95-96 with the launch of a command guided D2 interceptor from the Soreq 105mm ETC Launcher for the hit-to-kill intercept of a maneuvering target.

Additional subtasks include strategic and theater missile defense integration studies to analyze the threat and to develop appropriate TMD missions and flow-down requirements to major hypervelocity electric

launcher weapon subsystems. The results will be used to guide development and demonstration planning, fire control conceptual design and development, and critical technical issue resolution appropriate for hit-to-kill, gun-launched, hypervelocity projectiles.

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

- o Soreq 60mm launcher fired 1 kg at 2.0 km/sec
- o Soreq 105mm launcher fired 1.5 kg at 2.5 km/sec
- o Soreq ETC Launchers demonstrated up to 25.6% increase in muzzle energy over optimized conventional launcher
- o Began Hypervelocity Launcher (HVL) TMD system study
- o Downselected fire control concepts - began development of interferometric fire control radar system
- o Fire 4-5 kg at 1.8-2.0 km/sec from Soreq 105mm ETC Launcher
- o Increase ETC plasma injector performance to 3 megajoules at 1.5 gigawatts.
- o Launch D2-like aeroshell from Soreq 105mm launcher on the range with fire control tracking of the projectile
- o Complete HVL TMD system study
- o Fire 4-6 kg at 2.0-2.5 km/sec from Soreq 105mm ETC Launcher
- o Increase ETC plasma injector performance to 5 megajoules at 2-3 gigawatts
- o Launch D2-like projectile from Soreq 105mm launcher on the range with fire control tracking of a maneuvering projectile

Program to Completion: This is a continuing program.

D. WORK PERFORMED BY:

- o Soreq Nuclear Research Center
- o Technology Applications
- o Georgia Tech Research Institute
- o BDM
- o GE Aerospace

E. COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. TECHNICAL CHANGES: None
2. SCHEDULE CHANGES: None
3. COST CHANGES: None

F. PROGRAM DOCUMENTATION:

G. RELATED ACTIVITIES:

o	1212 D2 Hypervelocity Interceptor	PE No. 0603217C
o	2212 Corps SAM	PE No. 0603216C
o	2209 ACES	PE No. 0603216C

There is no unnecessary duplication of effort within SDIO or the DoD.

H. OTHER APPROPRIATION FUNDS: None

Program Element: 0603216C
PE Title: Theater Missile Defenses

Project Number: 1206
Budget Activity: 04
Tactical Programs
March 1993

I. INTERNATIONAL COOPERATIVE AGREEMENTS: Yes

J. MILESTONE SCHEDULE:

- Begin first series of field experiments
- Begin second series of field experiments
- Begin third series of field experiments

FY1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: 0603216C
PE Title: Theater Missile Defenses

Project Number: 1210
Budget Activity: 04
Tactical Programs
April 1993

A. RESOURCES: ($ in Thousands)
Project Title: LEAP Tech Demo Program

Program Name:	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	Total Program
TMD DEM/VAL	0	30,000	93,835	Continuing

B. BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

Funding provides for the development, independent government testing, and experimental integration of state-of-the-art component technology to provide risk reduction for systems that could be deployed prior to the beginning of the twenty-first century. The project includes further development of Lightweight Exo-Atmospheric Projectiles (LEAP) and their technologies, and planning for transition of the LEAP technologies into the Theater Missile Defense Program. Funding under this program provides for continued LEAP flight testing at White Sands Missile Range, the Atlantic Fleet Weapons Training Facility, and Wallops Flight Facility. Funding under this program also provides for development of advanced LEAP integrated technologies, and advanced LEAP test planning for potential weapon system applications, including SRAM/LEAP and PATRIOT/LEAP compatibility testing.

Funding under this program further provides for the planning and testing which could provide a low-cost, low-risk, demonstrated technology insertion option, based on LEAP interceptor technologies, for existing STANDARD missile systems. This could provide a comprehensive demonstration of technology in support of developing an effective, near-term exoatmospheric sea-based Theater Missile Defense capability. The program will perform a series of suborbital flight tests of Navy STANDARD missiles with increasingly challenging mission scenarios which will validate the capability of LEAP technologies to perform exoatmospheric intercepts of Theater Missile type targets. A step-by-step approach will be used to demonstrate all the necessary elements of a sea-based TMD system: exointerceptors, boosters, sustainers, kick stages, shipboard launch systems, fire control systems, and satellite cueing capability. The program will culminate in a series of realistic, fully integrated high-speed intercepts at sea. In order to minimize cost, reduce risk, and enable early demonstration, maximum use will be made of existing hardware, test facilities, test infrastructures, and procedures. Early tests will be performed using deployed extended range missile systems (Terrier) in Phase I, with a potential to transition to STANDARD missile BLK IV with the AEGIS weapons system in Phase II.

Program Element: 0603216C
PE Title: Theater Missile Defenses

Project Number: 1210
Budget Activity: 04
Tactical Programs
April 1993

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

- Developed detailed flight test plans and mission scenarios.
- Initiated kick stage motor development and flight qualification program. Static fired first and second reduced diameter LEAP kick stage configuration successfully.
- Successfully performed 1 Terrier missile suborbital kinematic and controllability flight test demonstration of exoatmospheric capability.
- Demonstrated fire control upgrades for exoatmospheric flight.
- Continued detailed design and test efforts for second flight test (FTV 2) and STANDARD missile configuration B (adds full-up LEAP and kickstage) for flights FTVs 3-5.
- Perform first full-up static and hover tests of solid divert propelled projectiles.
- Continue Phase I of LEAP technology demonstrations using Terrier missiles.
- Measure total SM2 ER interceptor system accuracy including new ASAS third stage.
- Perform 1 Terrier missile flight test demonstrating modified removable shroud, improved ship system fire control mods, and measurement of missile flight environments (FTV-2).
- Deliver flight test kick stage motors for FY94 tests.
- Deliver support equipment and flight test projectiles for shipboard and ground-based flight test demonstrations.
- Conduct 1km/sec intercepts of warm body targets at WSMR (LEAP 3, 2B).
- Develop detailed flight test plans and mission scenarios for proposed SRAM/LEAP technology integration demonstrations.
- Performed early feasibility demonstration of SRAM for Air Launched LEAP demonstrations using both the B-1B and B-52 aircraft.
- Perform 1 Terrier missile flight test demonstrating mechanical integration and ejection capability with modified LEAP interceptor and ASAS kick stage (FTV-3).
- Flight test solid divert propelled LEAP interceptor.
- Perform complete mission rehearsal test for interceptor of TMD type target from shipboard launch platform.
- Demonstrate means of passing target information to ship firing platform.

Program Element: 0603216C
PE Title: Theater Missile Defenses

Project Number: 1210
Budget Activity: 04
Tactical Programs
April 1993

- Demonstrate operational effectiveness of advanced LEAP technologies including enhanced solid and liquid propulsion and improved guidance algorithms.
- Provide projectiles and midcourse interceptor components for series of flight tests using STANDARD missile elements.
- Demonstrate ASAS/LEAP integration with STANDARD missile and third stage separation capability.
- Demonstrate advanced KKVs in the 6-20 KG weight class.
- Test planning for SRAM/LEAP and PATRIOT/LEAP integrated technology demonstrations.

Program Plan to Completion: This is a continuing program.

D. WORK PERFORMED BY:

In-House:
- Naval Air Warfare Center, Weapons Department
- AF Phillips Laboratory
- Naval Surface Warfare Center
- Naval Surface Warfare Center
- Johns Hopkins University, Applied Physics Lab
- STANDARD Missile Program Office
- Terrier Program Office
- AEGIS Program Office
- Navy Strategic Systems Programs Office
- US Army Space and Strategic Defense Command (USASSDC)

Contractor:
- Hughes Missile Systems Company
- Boeing Aircraft Company
- Rocketdyne Div. Rockwell International
- ANSER Corp.
- Thiokol Corp.
- Hughes Missile Systems Company
- Raytheon Corp.

E. COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. TECHNICAL CHANGES: Added compatibility demonstrations with Short Range Attack Missile and PATRIOT. Added FTV-6 (second source demo)
2. SCHEDULE CHANGES: None.
3. COST CHANGES: Program reduced by 55%. This has resulted in the following schedule changes: FTV-3 and -4 slipped 9 months. FTV-5 slipped 12 months. Solid divert technology program delayed 1 year. Cooperative engagements constrained and delayed six months.

F. PROGRAM DOCUMENTATION:

Program Element: 0603216C
PE Title: Theater Missile Defenses

Project Number: 1210
Budget Activity: 04
Tactical Programs
April 1993

G. RELATED ACTIVITIES:

o	1202 EXO Integration Technology	PE No. 0603215C
o	1504 Materials and Structures Technology	PE No. 0603218C
o	2201, 2202, 2203, and 2205, 1202, 1211 Miniaturized Integration Technology and Validation Facilities Support	PE No. 0603216C/ PE No. 0603215C/ PE No. 0603214C
o	2213 Naval and Marine Corps TMD	PE No. 0603216C

There is no unnecessary duplication of effort within SDIO or the DoD.

H. OTHER APPROPRIATION FUNDS: None

I. INTERNATIONAL COOPERATIVE AGREEMENTS: None

J. MILESTONE SCHEDULE:

- Conducted kinematic and controllability flight test #1
- Conduct kinematic and controllability flight test #2
- Conduct FTV #3
- Conduct FTV #4 mission (target handover)
- Perform high-speed intercept of TMD target (Flight 5) at WFF
- Perform High Alt Block IV/AEGIS controllability test
- Perform missile engagements of independent TMD targets (close range)
- Perform missile engagements of independent TMD targets (long range)
- Complete Wide Area Defense capability advanced technology demonstrations and preparations for other follow-on activities as necessary
- Perform second source demo

FY1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: 0603216C
PE Title: Theater Missile Defenses

Project Number: 1501
Budget Activity: 04
Tactical Programs
April 1993

A. RESOURCES: ($ in Thousands)
Project Title: Survivability Engineering & Demonstration Project

Program Name:	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	Total Program
TMD DEM/VAL	4,400	3,120	3,047	Continuing

B. BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

Develops and demonstrates survivability enhancement options (SEOs) to ensure that TMD elements can perform their mission in all expected environments. Approaches include: technology for assessment of Survivability Enhancement Options (SEOs) before and during EMD; studies/analyses to define issue resolution approaches; appropriate tests and demonstrations; and SEO development for design, P3I, and for operational adjuncts (including war reserve modes). SEOs will be available for incorporation into TMD elements during EMD. Demonstrations will provide necessary risk reduction evidence to support milestone decisions.

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

- o Demonstrated emerging radio frequency (RF) mitigation components, agile frequency filters, and distributed initial electronic design guidelines for interceptor sensors.
- o Demonstrated radar face armor for TMD radar. Conducted ballistic and RF transmission tests.
- o Provided hostile environment and response models for test beds.
- o Completed Anti-Radiation Missile (ARM) countermeasures assessment.
- o Initiated ARM Countermeasures Evaluator (ACE) test bed development.
- o Establish initial Electromagnetic Environmental Effects (E3) criteria for all TMD ground elements.
- o Complete ACE test bed development.
- o Complete checkout of ACE with GBR Ground Test Facility and evaluate effectiveness of SEOs against foreign anti-radiation missiles using Hardware-in-the-Loop (HWIL) experiments.
- o Demonstrate utility of signature modification, decoys, and EW countermeasures against smart weapons and provide initial counter-measures guidelines.

Program Element: 0603216C
PE Title: Theater Missile Defenses

Project Number: 1501
Budget Activity: 04
Tactical Programs
April 1993

- o Develop TMD GBR RF propagation path emulator and conduct Integrated Effects Test for Survivability (INETS) Operation in Nuclear Environment (OPINE) demonstrations of utility of SEOs.
- o Develop low observables current technology design guidelines for THAAD, TMD-GBR. and CORPS SAM.
- o Perform tests/demonstrations for state-of-the-art technology assessments of chemical and ballistic hardening.
- o Provide survivability experts to the concurrent engineering process and assist TMD prime contractors with SEO design implementation and hardened parts selection.

Program Plan to Completion: This is a continuing program.

D. WORK PERFORMED BY:

- o U.S. Army Space and Strategic Defense Command
- o Defense Nuclear Agency
- o U.S. Army Research Laboratories - Survivability, Lethality Analysis Directorate (SLAD), Chemical Biological Defense Agency (CBDA), Belvoir Research Development Engineering Center (BRDEC)
- o TACOM Research, Development and Engineering Center

E. COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. TECHNICAL CHANGES: Program revised because of schedules and funding.
2. SCHEDULE CHANGES: Work delayed by funding constraints.
3. COST CHANGES: With a 30% reduction in funding, this project has had severe technical and schedule changes. Technical changes include: significant reduction in verification testing of hardening concepts and technologies including elimination of all participation in the next underground nuclear effects test, elimination of significant portions of the RF hardening and camouflage, concealment and deception technologies programs and significant reduction in nuclear and conventional hardening efforts. Schedule changes include: most efforts delayed 1-2 fiscal years, potential serious disconnects with survivability technology transition to element developers for candidate TMD systems, inefficient coupling of survivability risk mitigation and P3I, reduced support to TMD elements' design and development programs.

F. PROGRAM DOCUMENTATION:

G. RELATED ACTIVITIES:

- o Defense Nuclear Agency PE No. 0602715H

The DNA generic research and development program supports efforts to provide the technology base for the nuclear survivability of all U.S. weapons systems. It supports UGETs, high fidelity calculation of nuclear environments, and system hardness validation methodologies. Technology programs are

coordinated with SDIO and a memorandum of understanding executed to preclude duplication of effort and provide best leverage of DNA generic efforts.

H. OTHER APPROPRIATION FUNDS: None

I. INTERNATIONAL COOPERATIVE AGREEMENTS: Yes

J. MILESTONE SCHEDULE:

- Complete ARM countermeasures assessment
- Develop GBR emulator and track file corruption design
- Complete initial TMD interceptor Survivability Design Guidelines for THAAD UOES - Conventional, Reconnaissance, and Chemical Threats
- Complete TMD GBR Survivability Guidelines input for UOES CDR
- Begin GBR ARM countermeasures testing
- Develop initial low observables technology assessment for Upper Tier Theater Missile Defense and CORPS SAM

FY1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: 0603216C
PE Title: Theater Missile Defenses

Project Number: 1502
Budget Activity: 04
Tactical Programs
April 1993

A. RESOURCES: ($ in Thousands)
Project Title: Lethality and Target Hardening

Program Name:	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	Total Program
TMD DEM/VAL	17,660	28,020	35,064	Continuing

B. BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

The Lethality of TMD weapons is a measure of TMD systems effectiveness in fulfilling defense mission requirements. The Lethality and Target Hardening program is developing a necessary and sufficient understanding of physical principles involved in defensive weapon/target interaction, target response and kill modes, and impact signatures for discrimination and damage assessment.

The TMD lethality task specifically addresses kill criteria for TMD interceptors against theater threats. Theater threats include conventional, chemical, biological, and nuclear warheads. Common, validated lethality criteria for a high confidence kill against any/all threat warheads is required. These lethality criteria are developed in coordination with TMD interceptor development. Lethality of the interceptors will be validated in cooperation with interceptor demonstration/validation flight test and evaluation.

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

- Conducted 4 full-scale sled track lethality phenomenology tests of ERINT hit-to-kill interceptors against simulated chemical submunition warhead threats.
- Initiated 16" gun technology program to address full scale lethality issues for hit-to-kill interceptors hitting simulated chemical and biological submunition warhead targets.
- Initiated Israeli TMD warhead evaluation program on parametric variation against chemical submunitions.
- Initiated subscale test program of THAAD against chemical and biological submunition warheads.
- Continue TMD interceptor hit-to-kill and warhead lethality sled track tests.
- Conduct bulk chemical (simulated) flight experiment in preparation for planned FY 1993 TMD interceptor tests.
- Patriot Multi-Mode and ERINT intercept flight tests of the simulated chemical target vehicle. Lethality program provides threat warhead and kill effectiveness diagnostics.
- Initiate full scale ground submunition test series of THAAD against chemical submunition and biological warheads on sled track.
- Continue 16" gun driver technology program in support of hit-to-kill TMD lethality criteria development.
- Provide Baseline Lethality Criteria document for theater missile requirements definition and systems performance evaluations.

Program Element: 0603216C
PE Title: Theater Missile Defenses

Project Number: 1502
Budget Activity: 04
Tactical Programs
April 1993

- o Continue participation Patriot Multi-Mode intercept flight test of the simulated chemical target vehicle. Lethality program provides threat warhead and kill effectiveness diagnostics.
- o Continue Patriot Multi-mode and ERINT lethality flight test support.
- o Complete scale test program of THAAD against chemical and biological warheads.
- o Initiate lethality support of THAAD flight test series.
- o Complete subscale tests of fragments against TMD nuclear threat warhead.
- o Initiate lethality criteria validation tests on TMD nuclear threat warhead.
- o Complete defensive lethality criteria testing of current biological threat agents (simulants).
- o Continue Israeli TMD warhead evaluation program on parametric variation against chemical submunitions.
- o Complete test series to quantify chemical submunition kill mechanisms and demise parameters.

Program Plan to Completion: This is a continuing program.

D. WORK PERFORMED BY:

In-house:
- o Defense Nuclear Agency
- o U.S. Air Force's Wright Labs
- o U.S. Army Space and Strategic Defense Command

Major Contractors:
- o Kaman Sciences Corp.
- o Science Applications International Corp.
- o Teledyne Brown Engineering
- o Batelle Memorial Institute
- o General Research Corp.

E. COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. TECHNICAL CHANGES: All Lethality Technology directly supporting Space Based Interceptor and Other Follow-On Program Elements ceases due to lack of funding.

2. SCHEDULE CHANGES: None
3. COST CHANGES: None

F. PROGRAM DOCUMENTATION:

G. RELATED ACTIVITIES: None

H. OTHER APPROPRIATION FUNDS: None

I. INTERNATIONAL COOPERATIVE AGREEMENTS: None

Program Element: 0603216C
PE Title: Theater Missile Defenses

Project Number: 1502
Budget Activity: 04
Tactical Programs
April 1993

J. MILESTONE SCHEDULE:

- o Simulated bulk chemical target flight test
- o Baseline TMD lethality criteria for all threats
- o Sled track HTK lethality tests
- o 16 inch gun HTK test capability
- o THAAD lethality modeling
- o ERINT lethality flight test
- o Support Multi-Mode Patriot intercept
- o Full scale sled and gun lethality tests
- o TMD lethality criteria update
- o TMD lethality flight test support
- o Continue full scale TMD-HTK sled/gun tests
- o Continue TMD lethality flight test support
- o Complete full scale TMD-HTK sled/gun tests

FY1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: 0603216C
PE Title: Theater Missile Defense

Project Number: 2102
Budget Activity: 04
Tactical Programs
April 1993

A. RESOURCES: ($ in Thousands)
Project Title: Space-Based Sensor (Brilliant Eyes)

Program Name:	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	Total Program
TMD DEM/VAL	0	0	112,518	Continuing

B. BRIEF DESCRIPTION OF MISSION REQUIREMENTS AND SYSTEM CAPABILITIES:

The Brilliant Eyes (BE) element is a distributed space based surveillance satellite system that is designed to support both strategic and theater ballistic missile defense needs. A constellation of BE satellites provides global (below-the-horizon and above-the-horizon) access of ballistic missiles in their boost, post-boost, and midcourse phases in response to directed tasking from the command and control element.

BE satellites carry a suite of passive sensors including short-, medium-, and long-wavelength infrared and visible sensors. These sensors acquire and track longer range ballistic missiles in the boost phase and continue to track and discriminate the reentry vehicles from debris and penetration aids throughout the midcourse flight of the missiles. The satellites are in low earth orbits which afford relatively short ranges to the missiles compared to early warning geosynchronous satellites and above-the-horizon (ATH) viewing in the midcourse phase of the missiles trajectory. These shorter ranges and ATH viewing allow the BE sensors to track missiles below-the-horizon and above-the-horizon and provide more accurate trajectory estimates throughout the missile's trajectory than the early warning systems. The BE constellation can be sized to provide access to theaters of interest. BE can either be cued by an early warning sensor such as DSP or FEWS or can be actively monitoring small areas of interest in anticipation of missile launches.

BE can provide surveillance and track data to support overall command and control, active defense, passive defense and attack operations. BE can provide TMD with continuous tracking of ballistic missiles in flight to support situation awareness, apportionment and support the optimum allocation of defense assets. BE provides data to allow interceptors commits beyond radar range, thereby extending the defending footprints of the interceptor. BE can cue radars (ground based or ship based) to acquire the reentry vehicles and increase their detection range by focusing their energy. BE can provide data that can be converted into accurate reentry vehicle impact point and time predictions enabling defensive measures to be taken and precise and timely launch point estimates, in theaters of interest, to enable prompt counterstikes against missile launchers.

The major programmatic and technical objectives being addressed by this program include: (1) validation of LWIR and Advanced LWIR functional performance in the post-boost and midcourse phases measured against known threat representative targets; (2) demonstrate critical space vehicle system capabilities such as real-time interoperability with other sensors,

interceptors, and C3 functions, extendibility of theater battle space, platform stability/ephemeris accuracy, and distributed hardware and software processing using known threat representative targets; (3) demonstrate noncritical space vehicle system capabilities by conducting analysis based upon validated end-to-end simulations; (4) substantiate affordability by validating cost models based on fabrication of critical technology components; (5) demonstrate cost effective supportability by validating maintenance and support concepts that integrate product development practices and procedures; (6) develop System Test Plans, by the contractor, that meet the System Testability Criteria; (7) demonstrate producibility of critical technologies utilizing engineering models and simulations of critical components; (8) demonstrate that the operational BE System Design satisfies the following Critical Operational Issues (COIs): operational performance, command, control, and communication, suitability, interoperability and positive control.

The test program for BE includes computer simulations, ground demonstrations, and flight demonstrations to collect data and demonstrate the technical maturity of the BE program for a Milestone II decision in late 1990s. Technology maturity can support an early 2000s BE deployment.

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

- o Completed BE Dem/Val Step 01 contracts.
- o Completed integration of Proof of Principle experiments and conducted ground tests to provide early demonstration of critical BE functions.
- o Initiated development of 10 Kelvin sorption cryocooler components.
- o Completed design of a three stage, 10 Kelvin sorption cryocooler brassboard system for spaceflight experiment.
- o Awarded two BE Dem/Val Step 02 prime contracts to: (1) Complete BE operational space and ground system designs through System Design Review (SDR); (2) conduct ground demonstrations of key technologies and producibility; and (3) launching and testing BE Flight Demonstration System satellites.
- o Demonstrate focal plane arrays, processors, and 60 GHz communication components functionality and key components at natural environments radiation levels.
- o Initiated long life testing of 65 Kelvin mechanical cryocooler.
- o Continue 10 Kelvin sorption cryocooler development and begin brassboard fabrication and assembly.
- o Deliver BE experiments to SPAS III experiment integrator.
- o AEDC 7V & 10V Sensor Test Capabilities Critical Design Reviews.
- o 7V Sensor Test Chamber IOC.
- o Complete BE Flight Demonstration Satellite System Design Review and initiate detailed design.
- o Begin BE operational system design following NMD Operational Requirements Document validation and Acquisition Program Baseline approval.
- o Complete BE Flight Demonstration System Satellite Preliminary Design Review (PDR).

- Purchase flight pacing hardware items for BE Flight Demonstration System satellites.
- Demonstrate initial digital End-to-end Real-time Simulation (ETERTS) in support of Flight Demonstration System design.
- Continue BE operational system design.

Program Plan To Completion: This is a continuing program.

D. WORK PERFORMED BY:

Major Contractors:
- Rockwell International, Space Systems Division
- TRW, Inc./Hughes Aircraft

Developing Organization:
- Air Force Space and Missile Systems Center/MGS

E. COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY

1. TECHNICAL CHANGES: None
2. SCHEDULE CHANGES: Stated below
3. COST CHANGES: Due to reductions in the SDIO FY94 budget the BE Dem/Val flights have been delayed one year from FY97 to FY98 and initial support to TMD has been delayed to the early 2000s.

F. PROGRAM DOCUMENTATION:

G. RELATED ACTIVITIES:

o 1101	Passive Sensors	PE No. 0603215C
o 1104	Signal Processing	PE No. 0603215C
o 1105	Discrimination	PE No. 0603215C
o 1106	Sensor Studies & Experiments	PE No. 0603215C
o 1405	Communication Engineering	PE No. 0603215C
o 1501	Survivability Tech	PE No. 0603215C
o 3102	Engineering & Integration	PE No. 0603215C
o 3307	Airborne Surveillance Test Bed	PE No. 0603215C
o 3308	System Simulation Level II	PE No. 0603215C

There is no unnecessary duplication of effort within SDIO or the DoD.

H. OTHER APPROPRIATION FUNDS: None

I. INTERNATIONAL COOPERATIVE AGREEMENTS: None

J. MILESTONE SCHEDULE:

- BE Step 02 Contract Awards
- 7V/10V Chamber Critical Design Review
- BE Flight Demonstration System Design Review
- 7V Chamber Initial Operational Capability

Program Element: 0603216C
PE Title: Theater Missile Defense

Project Number: 2102
Budget Activity: 04
Tactical Programs
April 1993

- o Flight Demonstration ABM Treaty Compliance Review
- o BE Formal Requirements Review
- o BE Flight Demonstration Preliminary Design Review
- o Execute contract option for Satellite fabrication

FY1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: 0603216C
PE Title: Theater Missile Defenses

Project Number: 2104
Budget Activity: 04
Tactical Programs
April 1993

A. RESOURCES: ($ in thousands)
Project Title: Ground-based Radar

Program Name:	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	Total Program
TMD DEM/VAL	42,000	111,895	234,111	Continuing

B. BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

TMD-GBR is the theater radar supporting the Upper Tier Theater Missile Defense System (UTTMDS). NMD-GBR is the strategic radar of the initial deployment complying with the National Missile Defense Act of 1991 and eventually the radar for the full Global Protection Against Limited Strikes System (GPALS) deployment. Both radars are similarly designed sharing co-development, co-production, and life-cycle cost savings. The NMD-GBR will have a bigger antenna and require a larger power supply than the TMD-GBR. These two systems are being procured as the strategic and theater members of the SDIO "Family of Radars."

The TMD-GBR meets an immediate requirement for a more capable wide area defense radar providing surveillance and fire control support to the Theater High Altitude Area Defense (THAAD) missile system in the UTTMDS architecture and cuing support to the lower tier. The TMD-GBR utilizes current GBR ballistic missile radar technology. Required functions include threat attack early warning, threat type classification, interceptor fire control, sensor/cuing, launch/impact point estimation, threat classification against theater/tactical ballistic missiles and kill assessment. In addition to providing fire control support for THAAD and cuing support to the lower tier, the TMD-GBR will also have residual capability against air breathing threats. The TMD-GBR Dem/Val radar will be tested at the White Sands Missile Range (WSMR).

Family of Radars Design Concept

The design and fabrication of the TMD-GBR and the NMD-GBR will be based upon the family of modular X-Band radars concept derived from the GBR-X radar program conducted 1986-1991. The transmitter (power) and aperture are sized to the radar tactical range requirements. The radar antenna for the TMD-GBR Dem/Val radars will use solid state transceiver modules and the NMD-GBR Dem/Val radars will use traveling wave tubes with ferrite phase shifters. Significant commonality exists between the TMD-GBR Dem/Val radars and the NMD-GBR Dem/Val radar in the areas of the radar receivers, signal processors, data processors, recorder subsystems, beam steering generation, and software. Issues concerning higher power rated solid state transceiver modules needed for EMD will be resolved by a parallel Solid State Demonstration Array contractual effort.

Program Element: 0603216C
PE Title: Theater Missile Defenses

Project Number: 2104
Budget Activity: 04
Tactical Programs
April 1993

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

- o Family of Radars Dem/Val contract awarded.
- o TMD-GBR MS I (UTTMDS) Defense Acquisition Board completed.
- o Dem/Val engineering and development initiated.
- o Solid State Demonstration Array contract awarded.
- o Complete requirements definition and Preliminary Design Reviews for TMD-GBR Dem/Val and UOE radars.
- o Accomplish TMD-GBR Dem/Val Critical Design Review.
- o Release first increment of TMD-GBR software for test.
- o Conduct TMD-GBR OPINE and Electronic Countermeasures (ECM) / Electronic Counter-Countermeasures (ECCM) performance analysis.
- o Commence radar fabrication for the TMD-GBR Dem/Val radar.
- o Complete negotiations for TMD-GBR test facility and test plans for WSMR Functional Test Validation (FTV).
- o Continue Solid State Demonstration Array technology contract.
- o Continue TMD-GBR Dem/Val test radar fabrication and in-plant testing.
- o Complete TMD-GBR User Operational Evaluation System (UOES) design, conduct CDR, and begin fabrication.
- o Continue Solid State Demonstration Array technology contract.

Program Plan To Completion: These are continuing programs.

D. WORK PERFORMED BY:

- o U.S. Army PEO GPALS
- o U.S. Army Space and Strategic Defense Command
- o U.S. Army Missile Command, Redstone Arsenal
- o Family of Radars Dem/Val contract

E. COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. TECHNICAL CHANGES: 17 SEP 92, GBR contract award. TMD-GBR Dem/Val radar was changed from a 6 square meter antenna to a 4.6 square meter antenna and TMD-GBR UOE radar was changed from a 12 square meter antenna to a 9.2 square meter antenna.
2. SCHEDULE CHANGES: The TMD-GBR Dem/Val and TMD-GBR UOES delivery schedules were adjusted to reduce risk and align to the contract award date.
3. COST CHANGES: TMD FY92/FY93 funding was reduced by $2.0 M/$10.0 M due to budget reprogramming. FY94 funding of $43.8M for the Solid State Demonstration Array project was transferred from Limited Defense Systems to Theater Missile Defense to directly support risk reduction for TMD-GBR EMD and Production.

F. PROGRAM DOCUMENTATION:

G. RELATED ACTIVITIES:

Program Element: 0603216C
PE Title: Theater Missile Defenses

Project Number: 2104
Budget Activity: 04
Tactical Programs
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o	2104	NMD-GBR	PE No. 0603215C
o	2210	THAAD	PE No. 0603216C
o	1102	Large Radar Technology	PE No. 0603215C
o	1105	Discrimination Technology	PE No. 0603216C
o	3304	Targets	PE No. 0603216C
o	4101	Program Operational Support	PE No. 0603218C
o	1501	System Survivability	PE No. 0603216C

There is no unnecessary duplication of effort within SDIO or the DoD.

H. OTHER APPROPRIATION FUNDS: None

I. INTERNATIONAL COOPERATIVE AGREEMENTS: None

J. MILESTONE SCHEDULE:

- o GBR Solicitation Package to Industry
- o UTTMDS MS I (TMD-GBR) Defense Acquisition Board
- o Family of Radars Contract Award
- o TMD-GBR Dem/Val Critical Design Review
- o TMD-GBR UOE Critical Design Review
- o TMD/GBR Dem/Val delivered to WSMR
- o TMD-GBR UOES delivered to WSMR (Two Systems)

FY1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: 0603216C
PE Title: Theater Missile Defenses

Project Number: 2106
Budget Activity: 04
Tactical Programs
April 1993

A. RESOURCES: ($ in Thousands)
Project Title: Advanced Contingency Theater Sensor

Program Name:	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	Total Program
TMD DEM/VAL	32,130	70,138	45,386	Continuing

B. BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

The purpose of this project is to demonstrate near-term TMD sensor upgrades and technologies with application to Theater Missile Defense (TMD). These demonstrations provide near-term sensor alternatives that address critical TMD sensor needs. These improvements are accomplished through block upgrades of existing sensor systems and/or the introduction of new technologies.

This project includes the TMD Experiments Program (previously project number 1205) which consists of: the Tactical Surveillance Demonstration (TSD) Upgrade; Passive Surveillance System (PSS) III; and PATRIOT cueing and discrimination. Additional sensor development includes tactical processing and application of space sensor data in the Talon Shield and Radiant Ivory projects, TMD upgrades to the Marine Corps TPS-59 air surveillance radar, and airborne sensor technology development and demonstration.

All RAPTOR/TALON activities are moved from this PE to PE 0603217C (Project Title: KE Boost Phase Intercept).

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

- Completed initial field tests of Aerojet TSD at WSMR.
- Analyzed TSD results and initiate field deployment upgrades.
- Completed initial field tests of IBM PSS II at WSMR.
- Analyzed PSS II results and initiated field deployment upgrades.
- Completed Westinghouse EMT tests and submitted final report.
- Initiated conceptual design of RAPTOR/TALON concept.
- Began evaluation of additional technologies for TMD sensor experiments.
- Awarded TPS-59 upgrade contract to General Electric Corporation.
- Demonstrated TSD, Radiant Ivory, and Talon Shield systems.
- Evaluated airborne sensor technology and requirements.
- Built RAPTOR "Demonstrator" aircraft.
- Complete MESAR thinned array demonstration.
- Initiate field-deployable TSD system tests.
- Initiate field-deployable PSS system tests.
- Demonstrate PATRIOT cueing at White Sands Missile Range.
- Complete PATRIOT discrimination effort.
- Continue TPS-59 upgrade development.
- Conduct PSS/TMD architecture analysis.
- Conduct PSS technical assessment.
- Continue tactical prototype PSS III system development work.

Program Element: 0603216C
PE Title: Theater Missile Defenses

Project Number: 2106
Budget Activity: 04
Tactical Programs
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- o Field test ship-based space sensor data processing.
- o Complete RAPTOR "Demonstrator" design mods, initiate flight tests.
- o Continue technology demonstration experiments.
- o Complete Talon Shield developmental tests.
- o Continue Radiant Ivory field tests.
- o Initiate AN/TPS-59 modification developmental tests.
- o Transfer RAPTOR/TALON project to Follow-on Technologies program element (PE: 0603217C).
- o Continue PSS III development work.
- o Achieve TSD upgrade initial capability.
- o Initiate Airborne sensor technology development.

Program Plan To Completion: This is a continuing program.

D. WORK PERFORMED BY:

- o Raytheon
- o Aerojet
- o IBM
- o Westinghouse Electric
- o General Electric
- o Various US/Allied contractors and Government laboratories will be selected to participate in TMD experiments.

E. COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. TECHNICAL CHANGES: None
2. SCHEDULE CHANGES: None
3. COST CHANGES: None

F. PROGRAM DOCUMENTATION:

G. RELATED ACTIVITIES:

o	1106	Sensor Studies and Experiments	PE No. 0603216C
o	1109	TMD Discrimination	PE No. 0603216C
o	1501	Survivability	PE No. 0603216C
o	1502	Lethality	PE No. 0603216C
o	2104	Ground-Based Radar	PE No. 0603216C
o	2207	PATRIOT	PE No. 0603216C
o	2208	ERINT	PE No. 0603216C
o	2210	THAAD	PE No. 0603216C
o	2212	Corps SAM	PE No. 0603216C
o	2300	Command Center Element	PE No. 0604220C
o	3205	TMD Special Studies	PE No. 0603216C
o	3208	TMD Integration and Balancing	PE No. 0603216C
o	3210	Counterforce	PE No. 0603216C
o	3211	C4I	PE No. 0603216C
o	3212	Passive Defense	PE No. 0603216C
o	3213	Active Defense	PE No. 0603216C
o	3305	Theater Test Bed	PE No. 0603216C

Program Element: 0603216C
PE Title: Theater Missile Defenses

Project Number: 2106
Budget Activity: 04
Tactical Programs
April 1993

There is no unnecessary duplication of effort within SDIO or the DoD.

H. OTHER APPROPRIATION FUNDS: None

I. INTERNATIONAL COOPERATIVE AGREEMENTS: None

J. MILESTONE SCHEDULE:

- o TSD demonstration
- o PSS demonstration
- o RAPTOR design effort initiated
- o EMT final report completed
- o TSD field deployment upgrades initiated
- o PSS field prototype system work initiated
- o Ship-based space sensor processing system test
- o MESAR thinned array test
- o Field-deployable TSD tests
- o Conduct PSS II tests
- o Ship-based space sensor processing demonstration
- o Initiate Talon Shield developmental tests
- o PATRIOT cueing demonstration
- o RAPTOR flight test
- o PATRIOT discrimination final report
- o Initiate airborne sensor development
- o Continue Radiant Ivory field test
- o PATRIOT cueing final report
- o Complete AN/TPS-59 upgrade developmental tests
- o Initiate Talon Shield operational tests
- o Complete AN/TPS-59 upgrade operational tests
- o Complete PSS II developmental tests
- o TSD upgrade initial operational capability
- o Complete AN/TPS-59 modifications

FY1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: 0603216C
PE Title: Theater Missile Defenses

Project Number: 2203
Budget Activity: 04
Tactical Programs
April 1993

A. RESOURCES: ($ in Thousands)
Project Title: HEDI (High Endoatmospheric Defense Interceptor)

Program Name:	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	Total Program
TMD DEM/VAL	13,770	0	0	Completed

B. BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

The Theater Missile Defenses program element funded a portion of the Kinetic Energy Kill Vehicle Integrated Technology Experiment (KITE)-2a flight test, as the data collected in this test is beneficial to TMD interceptor efforts, particularly to Arrow, Theater High Altitude Area Defense (THAAD) and Navy far-term interceptor designs.

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

- Built KITE-2a hardware.
- Conducted successful KITE-2a test against an air-dropped flare target to test the seeker acquisition and tracking functions. This flight also tested the optical window and the cooling subsystem under actual flight conditions to verify performance predictions.
- Completed KITE-2a mission results documentation.
- Performed ground tests and additional environmental tests to maintain option for follow-on KITE-3 test.
- Completed detailed mission planning for KITE-3.
- This program is unfunded in FY93. Endo interceptor research will continue under SDIO Technology.

Program Plan to Completion: This program was completed in FY92.

D. WORK PERFORMED BY:

- McDonnell Douglas Space Systems Corp (Prime), KITE System Integration, Kill Vehicle Airframe and Air Vehicle Integration
- Hughes Aircraft Company (Sub), KITE Kill Vehicle Seeker, Integration and Avionics
- Aerojet Tech Systems Company (Sub), KITE Propulsion Controls, Forebody and Window Cooling

E. COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. TECHNICAL CHANGES: None
2. SCHEDULE CHANGES: None
3. COST CHANGES: None

F. PROGRAM DOCUMENTATION:

G. RELATED ACTIVITIES:

- 2202 GBI

PE No. 0603215C

Program Element: 0603216C
PE Title: Theater Missile Defenses

Project Number: 2203
Budget Activity: 04
Tactical Programs
April 1993

- o 3304 Test and Evaluation Resources — PE No. 0603215C
- o 2210 THAAD — PE No. 0603216C
- o 1209 Endo Technology — PE No. 0603215C

There is no unnecessary duplication of effort within SDIO or the DoD.

H. OTHER APPROPRIATION FUNDS: None

I. INTERNATIONAL COOPERATIVE AGREEMENTS: None

J. MILESTONE SCHEDULE:

- o WSMR KITE Flight 1
- o WSMR KITE Flight 2a

Program Element: 0603216C
PE Title: Theater Missile Defenses

Project Number: 2208
Budget Activity: 04
Tactical Programs
March 1993

A. RESOURCES: ($ in Thousands)
Project Title: Extended Range Interceptor (ERINT)

Program Name:	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	Total Program
TMD DEM/VAL	160,000	*116,918	97,671	Continuing

(These figures do not include target monies (Project 3304); Reference Section G, Related Activities, for those amounts.)

B. BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES

The purpose of this project is to fund both the Demonstration/ Validation and Engineering and Manufacturing Development of the Extended Range Interceptor (ERINT-1) Technology Program. This technology program is being considered as a potential adjunct to several systems in the theater segment of the Global Protection Against Limited Strikes (GPALS) system, particularly PATRIOT.

The ERINT-1 will demonstrate a small, agile, hit-to-kill missile that will provide an asset defense against incoming maneuvering and non-maneuvering TBMs. A secondary objective of the Program is to provide defense against the air-breathing threat. The missile combines several state-of-the-art technologies, including an on-board active millimeter wave seeker that provides endgame guidance, advanced flight control technologies for agility in terminal maneuvers, lethality enhancement technologies, and a lightweight composite case solid rocket motor. The ERINT has been designed to integrate easily with existing air and missile defense capabilities such as Patriot, and is a technology capable of integration into the Navy AEGIS weapon system.

The ERINT Program will complete a series of eight flight tests. Results from these tests, from accompanying simulation and other analyses, and from ongoing acquisition planning, analysis, and trade studies being performed by US Army organizations will be used to establish the ERINT acquisition strategy. On the basis of ERINT test results, high fidelity simulations, and cost and operational effectiveness studies, the U.S. Army and SDIO will determine the future acquisition strategy. These flight tests will also gather critically needed lethality data required to validate the hit-to-kill concept and establish "common kill" criteria against a variety of maneuvering and non-maneuvering TBM threats (chemical and biological, both bulk and submunition).

Program Element: 0603216C
PE Title: Theater Missile Defenses

Project Number: 2208
Budget Activity: 04
Tactical Programs
March 1993

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

- o Developed and demonstrated an ERINT pre-prototype missile and launch control system.
- o Demonstrated the integration of a number of unique technologies including a composite rocket motor casing, and a combination of aerodynamic and impulse control.
- o Demonstrate the hit-to-kill capability of the ERINT low endo-atmospheric interceptor against surrogate threat tactical ballistic missile.
- o Continue the development of the ERINT Technology Program with flight tests against ballistic and air-breathing targets.
- o Establish ERINT Acquisition Strategy.
- o Demonstrate hit-to-kill capability of ERINT against submunition and bulk chemical targets.
- o Support the PAC-3 Informed Missile Decision process.
- o Complete Patriot/ERINT Integration Program.
- o Demonstrate hit-to-kill capability of ERINT against maneuvering targets.
- o Complete the Flight Test Program
- o Complete Producibility Engineering and Planning (PEP) and Manufacturing Plan.
- o Continue Logistics planning/LSA/LSAR/training and technical manual support.

Program to Completion: This is a continuing program.

D. WORK PERFORMED BY:

- o Loral Vought Systems Corporation
- o Rockwell International
- o Atlantic Research Corp.
- o AEG
- o SEP

E. COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY

1. TECHNICAL CHANGES: None

2. SCHEDULE CHANGES The guided test flights are all scheduled during FY93 and FY94 dependent on the final delivery of flight test hardware.

3. COST CHANGES: 6.3 dollars increased in FY94 to $97.671M; 6.4 dollars have been zeroed.*

(* These monies are budgeted within the PATRIOT program (Project 2207) under Advanced Interceptor - ERINT Procurement. This supports the strategy of integrating ERINT into the PATRIOT system as a missile upgrade and/or adjunct.)

F. PROGRAM DOCUMENTATION:

Program Element: 0603216C
PE Title: Theater Missile Defenses

Project Number: 2208
Budget Activity: 04
Tactical Programs
March 1993

G. RELATED ACTIVITIES:

o	1502	Lethality and Target Hardening	PE No. 0603216C
o	2207	PATRIOT, Advanced Interceptor	PE No. 0208060C
o	2210	THAAD	PE No. 0603216C
o	2212	Corps SAM	PE No. 0603216C
o	3304	Targets (PATRIOT/ERINT FY93: $18.082M)	PE No. 0603216C
o	3305	Theater Test Bed	PE No. 0603216C
o	3310	Data Centers	PE No. 0603216C

There is no unnecessary duplication of effort within SDIO or the DoD.

H. OTHER APPROPRIATION FUNDS: None

I. INTERNATIONAL COOPERATIVE AGREEMENTS: Yes

J. MILESTONE SCHEDULE:

- o Conduct ERINT-1 guidance section analyses
- o Deliver radar for first ERINT missile guided flight test
- o Start ERINT controlled flight tests
- o Start ERINT intercept flight tests
- o PAC-3 Informed Decision
- o Conclude flight test program
- o Complete Patriot/ERINT Integration Program

Program Element: 0603216C
PE Title: Theater Missile Defenses

Project Number: 2209
Budget Activity: 04
Tactical Programs
March 1993

A. RESOURCES: ($ in Thousands)
Project Title: Arrow Continuation Experiments (ACES)

Program Name:	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	Total Program
TMD DEM/VAL	60,000	57,776	56,424	Continuing

B. BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

The ACES Program is a US-Israeli initiative designed to provide Israel with a basis for an informed EMD decision for an area tactical ballistic missile defense capability. This Program is a follow-on demonstration phase for Arrow interceptor development. Critical lethality tests will be conducted in the initial phase of this program using the Arrow-1 missile developed during the Arrow program. An Arrow-2 missile will be designed and tested for an increased engagement envelope. If successful, the Arrow-2 will satisfy the Israeli requirement for an interceptor for population defense and will support US technology base requirements for new advanced anti-tactical ballistic missile technologies that could be incorporated into the GPALS layered defense system.

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

- o Conducted ACES Preliminary Design Review.
- o Signed contract with Israel Aircraft Industries (IAI).
- o Designed ACES experimental program.
- o Designed Arrow-2 scaled-down interceptor.
- o Completed final flight test of Arrow Program.
- o Conduct Arrow-2 Critical Design Review.
- o Conduct ACES lethality test flight program using Arrow-1 missiles.
- o Complete first ACES interceptor flight test.
- o Conduct three Arrow-2 missile flight tests.

Program to Completion: This is a continuing program.

D. WORK PERFORMED BY:

- o Israel Aircraft Industries

E. COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY

1. TECHNICAL CHANGES: None
2. SCHEDULE CHANGES: None
3. COST CHANGES: None

F. PROGRAM DOCUMENTATION:

- o ACES Manufacturing/Engineering design drawings and various program review documents.

Program Element: 0603216C
PE Title: Theater Missile Defenses

Project Number: 2209
Budget Activity: 04
Tactical Programs
March 1993

G. RELATED ACTIVITIES:

o	1206	Advanced TMD Weapons	PE No. 0603216C
o	1502	Lethality and Target Hardening	PE No. 0603216C
o	2104	GBR	PE No. 0603216C
o	2106	Advanced Theater Sensors	PE No. 0603216C
o	2207	Patriot	PE No. 0603216C
o	2210	THAAD	PE No. 0603216C
o	3205	TMD Studies	PE No. 0603216C
o	3305	Theater Test Bed	PE No. 0603216C

There is no unnecessary duplication of effort within SDIO or the DoD.

H. OTHER APPROPRIATION FUNDS: None

I. INTERNATIONAL COOPERATIVE AGREEMENTS: Yes

J. MILESTONE SCHEDULE:

- o Arrow-2 Critical Design Review
- o Flight Tests Initiated
- o Complete structures production
- o Complete avionics systems productions
- o Complete system integration
- o Contract end

FY1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: 0603216C
PE Title: Theater Missile Defenses

Project Number: 2213
Budget Activity: 04
Tactical Programs
April 1993

A. RESOURCES: ($ in Millions)
Project Title: Naval & Marine Corps TMD

Program Name:	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	Total Program
TMD DEM/VAL	0	*67,000	159,203	Continuing

(* These figures do not include Navy LEAP monies (Project 1210); Reference Section G, Related Activities, for those amounts.)

B. BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

The Theater Ballistic Missile (TBM) threat is present and growing in terms of both weapon proliferation and sophistication. Sea-based assets can provide a significant contribution to Theater Ballistic Missile Defense objectives. Development of a Sea-based Theater Ballistic Missile Defense capability takes advantage of the attributes of naval forces including overseas presence, mobility, flexibility, and sustainability in order to provide protection to debarkation ports, coastal airfields, amphibious objective areas, allied forces ashore, population centers and other high value sites. Additionally, in many cases, sea-based assets will provide the only means to establish an initial TBM defense for the insertion of additional land-based TBMD assets and other expeditionary forces in an opposed environment. The Naval and Marine Corps TMD program is dependent upon receipt of the requested funding.

Attributes of a Naval TMD capability supported by the requested funding include:

- Modifications to the AEGIS Weapon System to provide automatic TBMD attack warning, surveillance, and engagement support, and cuing to forces ashore.
- Initiation of modifications to the Navy Standard Missile (SM-2 Block IV) with the IOC of a TBMD capable Standard Missile (SM-2 Block IV A) in FY1999.
- Initiation of BMC3 architecture development to ensure that long range THAAD or LEAP type weapons can be successfully targeted from sea using a variety of shipboard, space and airborne sensors netted in such a fashion to provide the accuracy and timeliness required to achieve intercepts.
- Appropriate mods and upgrades for rapid exchange of information among theater sensor systems, air defense command centers, and weapons engagement units.
- A goal of fielding a User Operational Evaluation System (UOES) consisting of the SM-2 Block IV A and the AEGIS/SPY mods in FY 97 if required to counter an existing threat.
- Support for the option to use a more robust interceptor such as the Army developed THAAD or Navy SM-2 Block IV variant employing a Lightweight Exo-atmospheric Projectile (LEAP) in a maritime role, should the results of the LEAP Flight Tests (PMA 1210) yield a viable interceptor.

Program Element: 0603216C
PE Title: Theater Missile Defenses

Project Number: 2213
Budget Activity: 04
Tactical Programs
April 1993

- Study of requirements to modify existing elements/systems to address TBM threat and Sea Based role for ATBM capability in multi-mission and theater environment.

Attributes of a Marine Corps TMD capability supported by existing funding include:

- AN/TPS-59 radar data interface to the HAWK missile system Battery Command Post (BCP) via an Air Defense Communications Platform (ADCP). The funding line builds toward providing TPS radar data to other theater users as well as configuring HAWK to accept cueing from other sensors.

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

- The Naval TBMD Program Office has developed a near term program plan which initiates concept definition and will provide a detailed program plan.
- In house studies for concept definition began at several labs.
- Evaluation of necessary SPY radar modifications and definition of necessary SM-2 Block IV changes began following Congressional committee concurrence with Navy TBMD new start.
- Marine Corps Systems Command has arranged for ADCP work to be accomplished by Naval Electronics System Command; BCP modifications will be accomplished by Army Missile Command.
- Prepare for and proceed to Milestone 0 for sea-based TBMD.
- Complete the Concept Evaluation leading to the definition of the Naval TBMD program.
- Continue SPY radar modification design and evaluation.
- Conduct critical tracking experiments using the SPY radar and AEGIS Weapon system in order to obtain data required for a better understanding of system TBMD capabilities and necessary modifications.
- Deliver preliminary SPY radar tracking software mods to support ballistic missile tracking data collection at sea.
- Conduct AEGIS tracking experiments in conjunction with TBMD Threat Countermeasures Mitigation Program.
- Demonstrate Patriot acceptance of remote SPY radar data.
- Commence the definition of AEGIS modifications, including BMC3 changes, that are required to provide the capability against TBM threats.
- Participate in SDIO space based, airborne and land based cueing experiments.
- Continue definition of SM-2 Block IV modifications required to provide TBM interceptor capability. Conduct risk mitigation efforts and finalize development plans.
- Participate in the THAAD Dem/Val effort with the objective or preserving the option to use THAAD in a sea-based application.
- Initiate Cost and Operational Effectiveness Analysis (COEA) to evaluate upper tier active defense alternatives from AEGIS cruisers and destroyers.

Program Element: 0603216C
PE Title: Theater Missile Defenses

Project Number: 2213
Budget Activity: 04
Tactical Programs
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- Participate in LEAP Flight Tests funded by PMA 1210 in order to identify where near term work could speed the integration of LEAP into the Navy TBMD architecture should a future decision be made to deploy LEAP at sea. Continue the LEAP Phase I Firing Tests by using Block II Standard Missiles (Terrier variant) to minimize testing costs.
- ADCP and BCP research and development and design will continue for the Marine Corps.
- Continue design of SPY radar and AEGIS Weapon Control System modifications.
- Continue AEGIS tracking experiments in conjunction with TBMD Threat Countermeasures Mitigation Program.
- Continue design of Naval BMC3 architecture.
- Continue development/design of SM-2 Block IV modifications to provide for capability to intercept TBM threats.
- Demonstrate automated acceptance of long range (off ship) cue and SPY radar acquisition.
- Complete concept definition of BMC^3 changes required in the AEGIS Weapon System.
- Initiate design of Naval BMC3 required to support TBMD.
- Continue support for the THAAD Dem/Val effort.
- Continue LEAP Phase I firing tests at sea from Terrier ships.
- Commence the LEAP ATD using Standard Missile 2 Block IV as launch vehicle from an AEGIS ship.
- Complete upper tier active defense COEA and prepare for Milestone I for sea-based TBMD.
- Demonstrate Patriot cueing on remote AEGIS/SPY tracks.
- Prepare for Milestone IV for AEGIS/SM-2 Block IV A TBMD underlay capability.
- Marine ADCP will go through Dem/Val; the BCP will go to a Milestone IV decision and enter modification.

Program Plan to Completion: This is a continuing program.

D. WORK PERFORMED BY:

In House:

- For Naval TMD, work will be managed by the Naval Theater Ballistic Defense Program office and performed by various Naval Laboratories. The Naval Surface Warfare Center; Naval Air Warfare Center; and Naval Command and Control Oceanographic Systems Center will all contribute to the program.
- For the Marine Corps, ADCP work will be performed by Naval Electronics Systems Command and at Naval Weapons Center. BCP modification will be performed by Army Missile Command.

Major Contractors:

- Specific participants have not yet been identified and no contracts have been awarded.
- Concept definition has been tasked to the Applied Physics Laboratory of Johns Hopkins University (APL/JHU).

Program Element: 0603216C
PE Title: Theater Missile Defenses

Project Number: 2213
Budget Activity: 04
Tactical Programs
April 1993

E. COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. TECHNICAL CHANGES: The program has been increased in scope to include the option for testing a LEAP interceptor, together with necessary sensor and BMC3 development.
2. SCHEDULE CHANGES: Funding has been included to initiate SM-2 Block IV TBMD Mods and achieve an AEGIS/SPY and SM-2 Block IV A TBMD IOC. Based on the requested FY 95 funding level, UOES of one ship and 35 missiles is programmed. A LEAP ATD employing SM-2 Block IV launch vehicles is funded.
3. COST CHANGES: The projected program costs have increased significantly since the last budget submission due to a new consensus to seek a greater sea-based TBMD role. The Lightweight Exoatmospheric Projectile (LEAP) technology development has been accelerated and expanded to include additional testing of LEAP vehicles aboard SM-2 Block IV missiles.

F. PROGRAM DOCUMENTATION:

G. RELATED ACTIVITIES:

o	1106	Sensor Studies and Experiments	PE No. 0603216C
o	1109	TMD Discrimination	PE No. 0603216C
o	1210	Navy LEAP (FY93:$30.0M)	PE Nos. 0603215C/16C/17C
o	1202	MSTI Tracking Satellite	PE No. 0603217C
o	1206	Theater Interceptor	PE No. 0603216C
o	1209	Endo LEAP	PE No. 0603217C
o	1501	Survivability	PE No. 0603216C
o	1208	Discriminating Interceptor	PE No. 0603217C
o	1502	Lethality and Survivability	PE No. 0603216C
o	2104	Ground Based Radar	PE No. 0603216C
o	2106	Advanced Theater Sensors	PE No. 0603216C
o	2207	Patriot	PE No. 0603216C
o	2208	ERINT	PE No. 0603216C
o	2209	ACES	PE No. 0603216C
o	2210	THAAD	PE No. 0603216C
o	2212	Corps SAM	PE No. 0603216C
o	3203	Threat Development	PE No. 0603216C
o	3208	TMD Integration and Balancing	PE No. 0603216C
o	3210	Attack Operations/Counterforce	PE No. 0603216C
o	3211	C^{4}I & Operational Analysis	PE No. 0603216C
o	3212	Passive Defense	PE No. 0603216C
o	3213	Active Defense	PE No. 0603216C
o	3305	Theater Test Bed	PE No. 0603216C

There is no unnecessary duplication of effort within SDIO or the DoD.

H. OTHER APPROPRIATION FUNDS:

o C1120 Air Defense Missile Systems Project 0206623M

I. INTERNATIONAL COOPERATIVE AGREEMENTS: None

Program Element: 0603216C
PE Title: Theater Missile Defenses

Project Number: 2213
Budget Activity: 04
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J. MILESTONE SCHEDULE:

- o AEGIS TBM Tracking Experiment
- o AEGIS TBM Tracking Experiment
- o LEAP ATD Begins
- o AEGIS Cueing Experiment
- o BCP Milestone IV
- o ADCP Milestone III
- o LEAP Phase II Concludes
- o AEGIS/SPY and SM-2 Block IV A UOES
- o SM-2 BLK IV A Flight Tests
- o AEGIS/SPY MOD IOC
- o SM-2 BLK IV A IOC

Program Element: 0603216C
PE Title: Theater Missile Defenses

Project Number: 3204
Budget Activity: 04
Tactical Programs
April 1993

A. RESOURCES: ($ in Thousands)
Project Title: Countermeasures Integration

Program Name:	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	Total Program
TMD DEM/VAL	4,860	0	0	Continuing

B. BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

The mission of the SDI Countermeasure Integration (CMI) Program is to stress GPALS architectures and elements to ensure that deployed ballistic missile defense systems are robust to potential countermeasures which are within the means of anticipated adversaries. Included in this mission is a twofold responsibility. First, the CMI program supports the SDI threat development process by stimulating the examination and assessment of all credible counters to future deployed systems. Secondly, the CMI program provides the GPALS system designer with advance warning necessary for building preplanned improvements and program hedges into the design.

The SDIO CMI Program carries out its mission by pursuing the following objectives: identify potential countermeasures; determine credibility through analyses and tests; characterize credible countermeasures by providing designs and performance parameters; inform intelligence and system threat developers of potential countermeasures; and inform GPALS system designers with advance warning of potential countermeasures. These last two objectives represent the cardinal goals of the program. The support provided by the CMI Program to the threat development process and its outcome is the chief means by which the program achieves its mission of ensuring the robustness of future deployed systems. Making vulnerability and susceptibility information available to the system designers provides a mechanism by which the designers can build robustness into their designs during early stages of the system development process. The ability to improve the robustness of the design in its formative stages provides a cost-effective means of ensuring a flexible high performance design. Timely screening of countermeasures also allows the system designer to focus on the critical countermeasures and safely ignore countermeasures which ultimately prove to be technically, politically, militarily or economically infeasible.

The CMI Program uses three primary resource groups to execute the process of countermeasure identification, analysis, verification and assessment. These three resource groups are the Red Teams, laboratories, and strategic analysis groups. Red teams are formed and tasked to identify and analyze potential countermeasures to a GPALS architecture or element. The laboratories and the contractor are responsible for verification of the technical feasibility of potential countermeasures. The strategic analysis groups provide assessments of the reality of potential countermeasures within the total context of the adversary's environment. Through this framework, the CMI program is able to access an

array of countermeasure evaluation resources from government agencies, national laboratories, and contractors.

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

- o Two Red/Blue Exchanges addressing the TMD architecture were completed by the SDI Red Team.
- o Two Countermeasure Position Papers were published on significant countermeasures.
- o Conducted a countermeasure experiment at the Surveillance Test Bed on fragmented boosters.
- o Executed the Countermeasures Demonstration Experiment (CDX) flight test of electro-optic chaff, multiple inflatable reentry vehicle replicas for midcourse, and exo- and endoatmospheric pyrotechnic flare concepts.
- o Completed Phase I and Phase II of Project HYDRA.
- o Performed assessments and designs of potential countermeasures for Theater Ballistic Missiles.
- o Provided support to a Defense Science Board Task Force for a review of the SDIO countermeasure programs.
- o Conduct TMD Red Panel of TMD Boost Phase Intercept Study.
- o Conduct TMD Red/Blue Exchange of low-endoatmospheric systems.
- o Conduct STB experiments of selected countermeasures to TMD-GBR and TMD optical sensor.
- o Publish Countermeasure Position Papers on selected potential countermeasures to support STAR update and system engineering.
- o Complete analysis of selected TMD countermeasure concepts to support development of threat specifications.
- o Complete design and fabrication of TMD countermeasure test targets for TCMP flight tests.
- o Complete Project HYDRA design by U.K. within SCORE.
- o Provide senior-level oversight of Red/Blue Exchanges.
- o Conduct studies on foreign country propensity for specific classes of TMD countermeasures.
- o Begin implementation of DSB Task Force recommendations.

Program Plan to Completion: This is a continuing program.

D. WORK PERFORMED BY:

- o Science Applications International Corporation - (prime contractor)
- o System Planning Corporation - (prime contractor)
- o MIT/LL
- o Sandia National Laboratories
- o Ballistic Missile Organization
- o US Army Strategic Defense Command
- o USAF Phillips Laboratory

E. COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. TECHNICAL CHANGES: None

Program Element: 0603216C
PE Title: Theater Missile Defenses

Project Number: 3204
Budget Activity: 04
Tactical Programs
April 1993

2. SCHEDULE CHANGES: None
3. COST CHANGES: None

F. PROGRAM DOCUMENTATION:

G. RELATED ACTIVITIES:

- The countermeasure and threat projects involve organizations of the Army, Air Force, and Department of Energy (DOE). Activities are defined in Program Management Agreements (PMAs) for the Services, Federally Funded Research and Development Centers, DOE, and the prime contractors. TMD elements benefit from this work through improvements to system robustness.
- Coordination is accomplished through daily monitoring of activities and a weekly technical interchange and direction meeting with prime contractor management.
- There is no unnecessary duplication of effort within SDIO and DOE.

H. OTHER APPROPRIATION FUNDS: None.

I. INTERNATIONAL COOPERATIVE AGREEMENTS: Yes

J. MILESTONE SCHEDULE:

- Conclude low-endoatmospheric Red/Blue Exchange
- Complete STB experiment for TMD-GBR
- Begin TMD Round 4 Red-Blue Exchange

FY1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: 0603216C
PE Title: Theater Missile Defenses

Project Number: 3205
Budget Activity: 04
Tactical Programs
March 1993

A. RESOURCES: ($ in Thousands)
Project Title: Theater Missile Defense (TMD) Special Studies

Program Name:	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	Total Program
TMD DEM/VAL	74,463	28,504	31,436	Continuing

B. BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

The purpose of this project is to produce workable solutions to the critical issues within Theater Missile Defense. The priorities are based upon input from theater Commanders-in-Chief (CINCs), allies, and the US Services. The research and development tasks contained in this program are centrally managed and directed by SDIO, in close cooperation with the Executing Agents.

The objective is to define technical and other systematic approaches to operational requirements critical to an integrated TMD complex of systems. The project spans both Allied and the four Uniformed Services interests and concerns. Within the program are: European, Asian, and Pacific Rim Theater architecture studies; two Artificial Intelligence software projects for Command and Control and Discrimination; support of Israeli TMD studies and analysis, and analysis and experiments to examine issues regarding scientific, engineering, technologic, environmental, test & evaluation, cost, and logistics.

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

- Determined effectiveness of the European Ballistic Missile Defense architectural sets, against GPALS and Nth world threats, using improved tracking C^3I algorithms; conducted trade studies.
- Assessed impact of Northeast Asian Ballistic Missile Defense on regional stability; conduct trade studies to determine critical elements of architectures and create technology, cost and policy roadmaps; demonstrate via simulation architectures to Allies.
- Completed initial end-to-end AI-based BM threat discrimination demonstrator; took delivery of tailored AI-based Data Fusion demonstrator; conduct excursions with rules on SDIO testbeds.
- Supported additional Israeli defense analysis and lethality studies.
- Conducted conceptual evaluation study to determined best elements to perform ATBM from Vertical Launch afloat platform.
- Initiated USMC AN/TPS-59 capabilities upgrade and C^2 for HAWK via contract award; continued digital launcher adaptation.
- Initiated U.S. Air Force studies and development programs to address FY95/96 Battlefield TMD C^3I and sensor requirements.
- Initiate Northeast Asia country specific architectural definitions working in partnership with governments and U.S. Military customers.
- Refine and add additional features to end-to-end AI-based BM threat discrimination demonstrator; add situational assessment and mobile target locator to extend AI-based Data Fusion demonstrator into C2

demonstrator; conduct excursions and experiments with rule sets on SDIO testbeds.

- o Support collaborative European ATBM system analysis.
- o Support Israeli ATBM systems engineering analysis of TBM defense architecture.
- o USN-specific plans now addressed in Project Number 2213.
- o USMC-specific plans now addressed in Project Numbers 2106 and 2213.
- o USAF-specific plans now addressed in Project Numbers 2106, 3210, and 3211.
- o Perform selected TMD engineering, scientific, technologic, environmental, test and evaluation, cost and logistics analysis and trade studies.
- o Complete TMD Programmatic Environmental Impact Assessment.
- o Conduct EUCOM and PACOM TMD exercise to assess interface/operational requirements issues.
- o Continue Pacific Rim/European/Asian specific architectural definitions and systems analysis work in partnership with those governments and U.S. military customers.
- o Support Israeli ATBM systems engineering analysis of TBM defense architecture exponents.
- o Continue development of an end-to-end AI-based BM threat discrimination demonstrator.
- o Continue development of AI-based fusion and situation assessment demonstrator.
- o Perform selected TMD scientific, engineering, technologic, environmental, cost and logistics analysis and trade studies.
- o Conduct EUCOM and PACOM TMD exercise to assess interface/operational requirements issues.

Program Plan to Completion: This is a continuing program.

D. WORK PERFORMED BY:

- o Mitsubishi Heavy Industry
- o Wales
- o LTV Missiles and Electronics Group
- o USN Strategic System Program Organization (SSPO)
- o MCRADC
- o Air Combat Command
- o MRJ
- o Various FFRDCs and contracted study corporations

E. COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. TECHNICAL CHANGES: None
2. SCHEDULE CHANGES: None
3. COST CHANGES: None

F. PROGRAM DOCUMENTATION:

G. RELATED ACTIVITIES:

Program Element: 0603216C
PE Title: Theater Missile Defenses

Project Number: 3205
Budget Activity: 04
Tactical Programs
March 1993

o	1106 Sensor Studies and Experiments	PE No. 0603216C
o	1109 TMD Discrimination	PE No. 0603216C
o	1206 Theater Interceptor	PE No. 0603216C
o	1501 Survivability	PE No. 0603216C
o	1502 Lethality and Survivability	PE No. 0603216C
o	2104 Ground Based Radar	PE No. 0603216C
o	2106 Advanced Theater Sensors	PE No. 0603216C
o	2203 Endo/Exo Interceptor	PE No. 0603216C
o	2207 Patriot	PE No. 0603216C
o	2208 Erint	PE No. 0603216C
o	2209 ACES	PE No. 0603216C
o	2210 THAAD	PE No. 0603216C
o	2212 CORPSAM	PE No. 0603216C
o	3203 Threat Development	PE No. 0603216C
o	3208 TMD Integration and Balancing	PE No. 0603216C
o	3210 Attack Operations/Counterforce	PE No. 0603216C
o	3211 C*I & Operational Analysis	PE No. 0603216C
o	3213 Active Defense	PE No. 0603216C
o	3305 Theater Testbed	PE No. 0603216C

There is no unnecessary duplication of effort within SDIO or the DoD.

H. OTHER APPROPRIATION FUNDS: None

I. INTERNATIONAL COOPERATIVE AGREEMENTS: Yes

J. MILESTONE SCHEDULE:

- o Phased European Architecture IPR/FPR
- o Phased Northeast Asia Architecture IPR/FPR
- o Phased UK-US AI-based Demonstrators IPR/FPR
- o Phased UK-US AI-based Demonstrators Software
- o Israeli Studies and Analysis
- o Conduct CINC TMD Workshop
- o Conduct EUCOM Exercise
- o Boost Phase Intercept Study
- o Conduct PACOM Exercise
- o Israeli Studies and Analysis
- o UK-US AI-based Demonstrator Experiment
- o Israeli Studies and Analysis
- o Decision Aids Field Demonstration
- o AI-based threat discrimination demonstration

Program Element: 0603216C
PE Title: Theater Missile Defenses

Project Number: 3207
Budget Activity: 04
Tactical Programs
April 1993

A. RESOURCES: ($ in Thousands)
Project Title: Systems Analysis

Program Name:	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	Total Program
TMD DEM/VAL	0	1,000	977	Continuing

B. BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

The objective of this project is to conduct systems analysis on alternative theater ballistic missile defense architectures. Independent studies of the architectures, the design of elements comprising architectures and the interfaces between elements will be carried out to determine operational effectiveness and cost of various alternatives. Complex technical issues affecting performance will be analyzed in detail. The results will determine the impact of changing threats, protection requirements and advances in technology on current and proposed missile defense systems. Part of the effort will involve the development of sophisticated computer models to simulate all aspects of a ballistic missile engagement by defensive sensors and interceptors. This project will provide recommendations on theater system elements, command and control, battle management, acquisition strategies, and deployment basing. This project will also provide inputs to element requirements, Cost and Operational Effectiveness Analysis (COEA), and other required acquisition documents.

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

- Completed integration study of theater elements.
- Identified technical issue affecting theater element development programs.
- Complete a Theater Defense Scoping Study which will put in context the relationship between Active Defense and the other elements of Theater Missile Defense (attack operations, passive defense and BM/C3).
- Lethality issues with respect to interceptor warheads and hit-to-kill aimpoint selection will be studied and recommendations made to improve the current development programs.
- A preliminary evaluation will be made of the concepts for theater boost phase intercept.
- The ability of shaped-charged warheads to kill chemical submunitions will be determined.
- The need and effectiveness of defenses based on multi-tiered architectures will be evaluated.
- Potential C3 subsystems to handle overlap between Patriot and THAAD weapons will be studied.
- Performance and cost of advanced theater missile defense concepts based on LEAP technology will be assessed.
- The performance of specific concepts for theater boost phase intercept will be studied in detail.

Program Element: 0603216C
PE Title: Theater Missile Defenses

Project Number: 3207
Budget Activity: 04
Tactical Programs
April 1993

Program Plan to Completion: This is a continuing program.

D. WORK PERFORMED BY:

- o TASC
- o BDM
- o Riverside Research, Inc

E. COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. TECHNICAL CHANGES: None
2. SCHEDULE CHANGES: None
3. COST CHANGES: None

F. PROGRAM DOCUMENTATION:

G. RELATED ACTIVITIES:

- o Space-Based Interceptors — PE No. 0603214C
- o Limited Defense System — PE No. 0603215C
- o Other Follow-On Systems — PE No. 0603217C
- o Research and Support Activities — PE No. 0603218C
- o There is no unnecessary duplication of effort within SDIO or DoD.

H. OTHER APPROPRIATION FUNDS: None.

I. INTERNATIONAL COOPERATIVE AGREEMENTS: None.

J. MILESTONE SCHEDULE:

- o Bimonthly progress briefings
- o Technical reports and briefings as work on specific issues as completed
- o Final Technical Report

FY1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: 0603216C
PE Title: Theater Missile Defenses

Project Number: 3208
Budget Activity: 04
Tactical Programs
April 1993

A. RESOURCES: ($ in Millions)
Project Title: Integration and Balancing

Program Name:	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	Total Program
TMD DEM/VAL	6,803	4,600	4,395	Continuing

B. BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

This project provides the broad engineering support required for integration across the pillars. The tools, techniques, and plans needed for specific pillar integration tasks are developed within this PMA. Provides support to ensure joint service participation in TMD pillar integration activities, and interfaces combat and materiel developers. Includes threat characterization and scenario definition in mature and contingency theaters.

Pillar Integration Studies:

Establishes the tools, techniques, and methodology for integration across the TMD pillars. Baselines TMD integrated pillar effectiveness for the Near Term, Mid Term, and Far Term SDIO TMD program architectures. Evaluates Army TMD worldwide mission in Joint Service context. Reviews pillar and system elements analyses, and integrates pillar analysis results into integration analysis. Determines range of operational capability achievable by each pillar.

Cost Support:

Develop tools and methodology to perform cost analysis of TMD mission cost for multi-mission systems.

Architecture Integration:

This effort will also define and integrate the architecture and external interfaces required to satisfy Theater Missile Defense (TMD) mission needs in a joint and allied (coalition) battlefield environment. New theater missile defense systems will be integrated into the existing US and allied air defense architectures. Timeliness and quality of BM/C3I information have a direct impact on the required effectiveness of the overall TMD internal and optimal TMD performance. Therefore, the focus will be on TMD internal and external information exchange, emerging technologies, and data distribution requirements.

Program Element: 0603216C
PE Title: Theater Missile Defenses

Project Number: 3208
Budget Activity: 04
Tactical Programs
April 1993

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

- Completed SEM planning (all pillars) and institute procedures for total system TMD configuration management. Supported development of system requirements, descriptions and specifications (all pillars), by both combat and material developers.
- Continued the Integrated and Balancing (I&B) Working Group and studies. Completed top level survey of all regions and Army TMD missions; defined interpillar active, passive, and attack operations for each. Initiated detailed studies and regional characterizations for SWA and NEA.
- Initiated adjunct sensor trade studies.
- Collected, catalogued, reviewed, and compared threat data.
- Supported validation of "design to" and excursion threats.
- Initiated Army Integrated TMD Plan.
- Developed Risk Management Plan.
- Continue Pillar Integration Working Group.
- Continue to provide system engineering COEA support to the user on PATRIOT, CSAM, THAAD, and ERINT.
- Refine C3I architecture based on design details from THAAD and GBR.
- Support GPALS SRR/SDR, PAC-3 ASARC, and CSAM ORD development.
- Conduct Army active defense integration analysis for near-, mid-, and far-term capabilities to develop integration and interoperability requirements of upper and lower tiers within the active defense pillar, between active defense and the other pillars, and with joint service capabilities.
- Initiate interface documentation for the active defense system of systems.
- Continue TMD Integration Working Group. Refine studies as required.
- Continue to provide COEA support to the user.
- Support CSAM ASARC/DAB.
- Complete interface documentation for the active defense system of systems.
- Continue Army active defense integration studies.

Program Plan to Completion: This is a continuing program.

D. WORK PERFORMED BY:

- PEO GPALS TMDPO

Major Contractors:
- BDM
- CAS
- Coleman Research Corporation

E. COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. TECHNICAL CHANGES: Reduced Level of Effort
2. SCHEDULE CHANGES: Reflect Reduced Level of Effort
3. COST CHANGES: Reduced Funding

Program Element: 0603216C
PE Title: Theater Missile Defenses

Project Number: 3208
Budget Activity: 04
Tactical Programs
April 1993

F. PROGRAM DOCUMENTATION:

G. RELATED ACTIVITIES:

Technology programs are coordinated among DoD and other SDIO agencies to preclude duplication of effort and take advantage of jointly conducted missions wherever practical. SDIO program elements being supported include:

- o 3213 Active Defense Integration PE No. 0603216C
- o 3205 UK Architecture Study PE No. 0603216C
- o 3210 Attack Operations/Counterforce PE No. 0603216C
- o 3211 BM/C3I PE No. 0603216C
- o 3212 Passive Defense PE No. 0603216C

There is no unnecessary duplication of effort within SDIO or the DoD.

H. OTHER APPROPRIATION FUNDS: None

I. INTERNATIONAL COOPERATIVE AGREEMENTS: None

J. MILESTONE SCHEDULE:

- o TMD Integrated Baseline
- o PATRIOT COEA
- o GPALS SRR/SDR
- o Support CAC development of Deep Operations Handbook

FY1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: 0603216C
PE Title: Theater Missile Defenses

Project Number: 3210
Budget Activity: 04
Tactical Programs
April 1993

A. RESOURCES: ($ in Thousands)
Project Title: Tactical Missile Defense Attack Operations/Counterforce

Program Name:	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	Total Program
TMD DEM/VAL	3,935	2,570	3,906	Continuing

B. BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

The purpose of this project is to undertake studies to develop and demonstrate the means to counter tactical missiles (TMs) through a centrally managed anti-TM research program concentrating on operations to destroy TM launchers and supporting equipment. This includes: command, control, communications, and intelligence (C^3I) functions; sensors and sensor fusion; and weapon systems. This effort will lead to materiel requirements definitions and needs to counter TMs. The study and development program will be a multi-service effort. The service executing agency will centrally manage its service's efforts and report to the SDIO.

The project currently has three major areas of research. Research into promising sensor technologies, with concentration on overhead assets, will yield technical design requirements for both theater fire control and warning functions. Research into information and intelligence fusion research to identify and strike critical mobile targets. Research into weapon systems capabilities to determine design requirements for near term product improvement programs and technical requirements for long term acquisition items.

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

- Assessed parametrically the effectiveness of current and planned weapons systems and sensors in anti-TBM role.
- Examined sensor technology for fire control and warning/cuing use in TMD.
- Conduct research and experiments in sensor and data fusion.
- Evaluate C^3I performance in counterforce operations.
- Conduct counterforce CIS targeting and identification study to determine signatures and vulnerabilities of CIS and ROW, TBM systems and infrastructure.
- Conduct sensor allocation and fusing studies to determine architectural implications of TMD counterforce applications.

Program Plan to Completion: This is a continuing program.

D. WORK PERFORMED BY:

- Ballistic Research Lab, APL
- Army Materiel Systems Analysis Activity, APL
- Missile Command

Program Element: 0603216C
PE Title: Theater Missile Defenses

Project Number: 3210
Budget Activity: 04
Tactical Programs
April 1993

- TRADOC Research Analysis Center
- Program Executive Officers for: Fire Support, Aviation, Intelligence and Electronic Warfare.

E. COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. TECHNICAL CHANGES: None
2. SCHEDULE CHANGES: None
3. COST CHANGES: None

F. PROGRAM DOCUMENTATION:

G. RELATED ACTIVITIES:

o	1106	Sensor Studies and Experiments	PE No. 0603214C
o	1109	TMD Discrimination	PE No. 0603216C
o	1206	Advanced TMD Weapons	PE No. 0603216C
o	1501	Survivability	PE No. 0603216C
o	1502	Lethality and Target Hardening	PE No. 0603216C
o	2104	Ground Based Radar	PE No. 0603216C
o	2106	Advanced Theater Sensors	PE No. 0603216C
o	2300	Command Center Element	PE No. 0603215C
o	3102	Engineering and Integration	PE No. 0603216C
o	3205	TMD Special Studies	PE No. 0603216C
o	3208	TMD Integration and Balancing	PE No. 0603216C
o	3211	C^4I & Operational Analysis	PE No. 0603216C
o	3212	Passive Defense	PE No. 0603216C
o	3213	Active Defense	PE No. 0603216C
o	3305	Theater Testbed	PE No. 0603216C

There is no unnecessary duplication of effort within SDIO or the DoD.

H. OTHER APPROPRIATION FUNDS: None

I. INTERNATIONAL COOPERATIVE AGREEMENTS: None

J. MILESTONE SCHEDULE:

- Weapons System Assessment
- Counterforce simulation
- Counterforce C^3I Analysis
- Sensor Fusion Analysis and Experiments
- Target Acquisition/Sensor Assessment
- Counterforce BM/C^3I Study
- Attack Operations simulations
- Counterforce targeting and Identification study

FY1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: 0603216C/0604225C
PE Title: Theater Missile Defenses

Project Number: 3211
Budget Activity: 04
Tactical Programs
April 1993

A. RESOURCES: ($ in Thousands)
Project Title: C⁴I and Operational Analysis

Program Name:	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	Total Program
TMD DEM/VAL	14,642	8,800	12,697	Continuing
TMD EMD	0	0	1,953	Continuing

B. BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

C⁴I, in the context of this project, is defined as all those command, control and intelligence functions, serviced by computers and communications systems, beyond weapon control functions. This project assumes theater missile defense is an extension of traditional air defense. As such, TMD will integrate into the existing theater air defense command and control structure. This project will contain those upgrades to the theater air defense structure which are required to meet the dynamics of ballistic missile defense. Integration of sensors and communications systems will provide enhanced support not only to active defense but attack operations and passive defense as well.

This effort includes analyzing known and planned unified theater air defense CONOPS and C³I architectures; identifying information types and information flows based on stratagems and use; determining the optimum architecture via trade studies; prototyping of a tactical operation center to integrate Army TMD assets; initiating upgrades to Air Force command and control nodes; making improvements for the dissemination of attack warning, target acquisition, cueing and command information to battlefield systems; and developing a standard message set that will support the TBM mission.

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

- Provided analytical support to JROC Special Study Group on C³I.
- Analyzed theater air defense C³I architectures using Extended Air Defense Simulator (EADSIM).
- Created IV&V environment for theater air defense C³I software
- Began ADTOC concept development.
- Conducted C³I experiments on space-based and strategic assets to counter theater missile threat.
- Finalize TMD C³I system requirements.
- Initiate acquisition efforts for necessary C³ modifications.
- Finalize ADTOC Acquisition Plan.
- Identify and submit message standards for approval.
- Begin prototyping of Air Defense Command Post.
- Demonstrate C² connectivity to national assets.
- Define AF TACS required upgrades.
- Perform interoperability testing.
- Demonstrate Joint Service data link connectivity for C³I.

Program Plan to Completion: This is a continuing program.

Program Element: 0603216C/0604225C
PE Title: Theater Missile Defenses

Project Number: 3211
Budget Activity: 04
Tactical Programs
April 1993

D. WORK PERFORMED BY:

- o ESC
- o Sencom Inc
- o CAS
- o MITRE Corp
- o GPALS PEO-TMD
- o ACC

E. COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. TECHNICAL CHANGES: None
2. SCHEDULE CHANGES: None
3. COST CHANGES: None

F. PROGRAM DOCUMENTATION:

G. RELATED ACTIVITIES:

o	1106	Sensor Studies and Experiments	PE No. 0603216C
o	1206	Theater Interceptor	PE No. 0603216C
o	1501	Survivability	PE No. 0603216C
o	1502	Lethality and Hardening	PE No. 0603216C
o	2104	Ground Based Radar	PE No. 0603216C
o	2106	Advanced Theater Sensors	PE No. 0603216C
o	2203	Endo/Exo Interceptor	PE No. 0603216C
o	2207	Patriot	PE No. 0603216C
o	2208	ERINT	PE No. 0603216C
o	2209	ACES	PE No. 0603216C
o	2210	THAAD	PE No. 0603216C
o	2212	CORPS SAM	PE No. 0603216C
o	3203	Threat Development	PE No. 0603216C
o	3205	TMD Special Studies	PE No. 0603216C
o	3208	TMD Integration and Balancing	PE No. 0603216C
o	3210	Attack Operations/Counterforce	PE No. 0603216C
o	3212	Passive Defense	PE No. 0603216C
o	3213	Active Defense	PE No. 0603216C
o	3305	Theater Testbed	PE No. 0603216C

There is no unnecessary duplication of effort within SDIO or the DoD.

H. OTHER APPROPRIATION FUNDS: None

I. INTERNATIONAL COOPERATIVE AGREEMENTS: Yes

Program Element: 0603216C/0604225C
PE Title: Theater Missile Defenses

Project Number: 3211
Budget Activity: 04
Tactical Programs
April 1993

J. MILESTONE SCHEDULE:

- Architecture IRP/FPR
- JROC Analysis
- IV&V CDR
- Acquisition Strategy for ADTOC
- Forward TMD message standards for Joint Integration Engineering Organization approval
- AF C^2 TMD C^2 definition complete

Program Element: 0603216C
PE Title: Theater Missile Defenses

Project Number: 3212
Budget Activity: 04
Tactical Programs
April 1993

A. RESOURCES: ($ in Thousands)
Project Title: Passive Defense

Program Name:	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	Total Program
TMD DEM/VAL	1,000	0	0	Continuing

B. BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

The purpose of this project is to undertake studies to develop and demonstrate the means to minimize the effectiveness of Tactical Missiles (TMs) against high priority assets within the theater. The program will examine theater asset vulnerability to TMs and conduct analysis to develop methods to increase survivability against TMs without degrading overall survivability or mission capability. This program will be centrally managed and directed by the U.S. Army Strategic Defense Command, which will report to the SDIO.

The project is currently conducting research into sensor negation, asset hardening, and other survivability measures for the following potential targets; GUARDRAIL ground station, corps command posts, US Army aviation forward area rearm refuel points (FARRPs), the POMCUS sites. Future year work will address early warning, TM systemic issues, and additional theater assets as determined by value and vulnerability.

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

- o Determined vulnerabilities and defense requirements for GUARDRAIL ground station and FARRPs.
- o Began work on Corps CPs and POMCUS sites.

Program Plan to Completion: This is a continuing program.

D. WORK PERFORMED BY:

- o Army TMD Program Office
- o Waterways Experiment Station
- o Ballistic Research Lab, APL
- o Army Materiel Systems Analysis Activity, APL
- o JTMDPO; WES; BRL; LABCOM; AMSAA

E. COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. TECHNICAL CHANGES: None
2. SCHEDULE CHANGES: None
3. COST CHANGES: None

F. PROGRAM DOCUMENTATION:

G. RELATED ACTIVITIES:

Program Element: 0603216C
PE Title: Theater Missile Defenses

Project Number: 3212
Budget Activity: 04
Tactical Programs
April 1993

o	1106	Sensor Studies and Experiments	PE No. 0603216C
o	1501	Survivability	PE No. 0603216C
o	2104	Ground Based Radar	PE No. 0603216C
o	2106	Advanced Theater Sensors	PE No. 0603216C
o	2300	Command Center Element	PE No. 0603215C
o	3102	Engineering and Integration	PE No. 0603216C
o	3205	TMD Special Studies	PE No. 0603216C
o	3208	TMD Integration and Balancing	PE No. 0603216C
o	3210	Attack Operations/Counterforce	PE No. 0603216C
o	3211	C^{4}I & Operational Analysis	PE No. 0603216C
o	3213	Active Defense	PE No. 0603216C
o	3305	Theater Testbed	PE No. 0603216C

There is no unnecessary duplication of effort within SDIO or the DoD.

H. OTHER APPROPRIATION FUNDS: None

I. INTERNATIONAL COOPERATIVE AGREEMENTS: None

J. MILESTONE SCHEDULE:

- o FARRP Assessment
- o GUARDRAIL Assessment
- o Corps CP Assessment
- o POMCUS Assessment
- o SAM Assessment

FY1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: 0603216C
PE Title: Theater Missile Defenses

Project Number: 3213
Budget Activity: 04
Tactical Programs
March 1993

A. RESOURCES: ($ in Thousands)
Project Title: Active Defense Engineering

Program Name:	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	Total Program
TMD DEM/VAL	6,000	200	9,767	Continuing

B. BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

This project provides system engineering and mission analysis support to define and document the near-term enclave (mid-90s), boost-phase intercept, and the objective active defense system of systems that meets user requirements; can be fielded in the required timeframes; and provides a balance between operational effectiveness, cost and risk.

Conduct theater-level joint BM/C3I active defense architecture trade studies to provide assessments of various C2, communications, and sensor options necessary to effectively carry out the joint TMD mission. Assess required performance levels and necessary timelines for accurate and timely launch notification, command and control option execution, and weapon firing doctrine selection.

Establish active defense weapon cueing requirements as a function of defended area, weapon inventory, and warning system architecture. Quantify the benefits of early state vector development in terms of interceptor management, communications loading, counterforce asset cueing, and passive defense implementation options. Complete tradeoffs in sensor performance and cost. Quantify the benefits of the current Brilliant Eyes design to TMD and assess the costs and benefits of existing near-term airborne options.

Building on the effort performed in FY93, develop a detailed implementation for boost-phase intercept. Refine the preferred approaches from the FY93 study. Conduct further interceptor trades for concepts which have only boost intercept capability with those concepts which permit intercept in early midcourse and boost. Develop a low-fidelity model suitable for use in various simulation analyses. Determine the appropriate mix of technology development and demonstration. Initiate development activities consistent with long-term service and SDIO boost-phase plans.

The Army Integrated TMD Plan will be revised and completed to be consistent with current guidance and GPALS architecture.

Conduct effectiveness analyses for different theaters and scenarios. Evaluate countermeasures and different force postures. Provide data for the BPI COEA.

Program Element: 0603216C
PE Title: Theater Missile Defenses

Project Number: 3213
Budget Activity: 04
Tactical Programs
March 1993

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

- Developed active defense C^3I requirements and architectures.
- Evaluated battlefield sensor performance requirements.
- Provided engineering analysis to support TRADOC preparation of COEAs for Patriot, Corps SAM, and HATMD.
- Supported CORPS SAM concept definition.
- Supported GPALS SRR/SDR.
- Previous planned activities accomplished under project 3208.
- Update BM/C^3 design and update GPALS SDR as required.
- Continue to provide COEA support to the user.
- Support CSAM ASARC/DAB.
- Complete interface documentation for the active defense system of systems.
- Continue Army active defense integration analyses.
- Continue interface definition for the active defense system of systems.
- Develop Air Force integrated TMD plan.
- Conduct joint BM/C3 defense architecture trade studies.
- Conduct comprehensive cueing study.
- Initiate boost-phase active defense technology demonstration.
- Perform boost phase analysis and COEA

Program Plan to Completion: This is a continuing program.

D. WORK PERFORMED BY:

- ESC
- SMC
- GRC
- NRC
- ASC

E. COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY

1. TECHNICAL CHANGES: Integration activities moved to 3208
2. SCHEDULE CHANGES: As originally planned in project 3208
3. COST CHANGES: Cost reduced per new level of effort

F. PROGRAM DOCUMENTATION:

G. RELATED ACTIVITIES:

o	1501 Survivability	PE No. 0603216C
o	1502 Lethality	PE No. 0603216C
o	2104 GBR	PE No. 0603216C
o	2106 Advanced Theater Sensors	PE No. 0603216C
o	2207 Patriot	PE No. 0603216C
o	2208 ERINT	PE No. 0603216C
o	2210 THAAD	PE No. 0603216C
o	2212 Corps SAM	PE No. 0603216C
o	3205 Architecture/Studies	PE No. 0603216C

Program Element: 0603216C
PE Title: Theater Missile Defenses

Project Number: 3213
Budget Activity: 04
Tactical Programs
March 1993

- o 3208 Integration and Balancing PE No. 0603216C
- o 3211 C4I and Operational Analysis PE No. 0603216C
- o 3305 EADTB PE No. 0603216C

There is no unnecessary duplication of effort within SDIO or the DoD.

H. OTHER APPROPRIATION FUNDS: None

I. INTERNATIONAL COOPERATIVE AGREEMENTS: None

J. MILESTONE SCHEDULE:

- o Air Force Integrated TMD Plan
- o Cueing Study
- o Boost Phase Plan
- o Technology Demonstration #1
- o Interface Definition Document
- o BPI COEA

Program Element: 0603216C
PE Title: Theater Missile Defenses

Project Number: 3301
Budget Activity: 04
Tactical Programs
April 1993

A. RESOURCES: ($ in Thousands)
Project Title: SDIO Test Data Centers

Program Name:	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	Total Program
TMD DEM/VAL	0	20	3,711	Continuing

B. BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

This task provides for overall coordination of Test and Experiment Data Management support throughout the SDI Program and, as such, is funded across several SDIO Program Elements.

These Centers archive, catalog, maintain, process, distribute, and provide controlled access to SDIO experiment data. Their mission is to serve as the principal repository for SDIO experiment data, and to assist the analysis and science community with their requirements for information to evaluate Strategic Defense System feasibility, development, and implementation. Additionally, the Data Centers provide specialized data products and analysis support for SDIO System Elements. Presently, there are three Data Centers located at DoD centers of expertise in specific areas of science and technology. They are the Backgrounds Data Center (BDC), the Plume Data Center (PDC), and the Midcourse Data Center (MDC), and the Kinetic Energy Weapon Data Center (KDC). Consolidation of MDC and KDC is under consideration.

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

- Integrated into the Data Centers data from the AST, ARROW, ERINT, KITE 2, ODES, SRMP, Red Gemini V, Firefly, Red Tigress, DBSS, and Starbird.
- Developed detailed plans for the management of data from the Midcourse Space Experiment (MSX).
- Finished developing design and implementing master Data Center catalog.
- Developed detailed data center cost models based on ingest rates, archive maintenance, level of archive, total data stored, etc.
- Began upgrading BDC and MDC capabilities to handle MSX data (approx. 1 TeraByte/yr).
- Completed development and implemented prototype of Common User Interface for Data Centers.
- Completed database on experiment data archive locations.
- Begin archiving Pre-Launch Data from MSX Program.
- Integrate into the Data Centers data from ZB, STARS, and other SDIO experiment programs.
- Begin Data Center mass storage upgrades.
- Integrate AST support data into MDC.
- Populate database from ground and flight test interceptor experiments such as THAAD, LEAP, ERINT, Patriot, ARROW, etc.
- All data centers will continue to support archiving, processing, and distribution for data received through FY 94.

Program Element: 0603216C
PE Title: Theater Missile Defenses

Project Number: 3301
Budget Activity: 04
Tactical Programs
April 1993

- o Assess data center requirements at all centers to support TMD.
- o Complete distributed database development at BDC.
- o Begin receiving MSX data at the BDC, MDC and PDC.
- o Receive ERINT data at MDC and KDC.
- o Receive Patriot data at KDC and MDC.
- o Receive THAAD data at MDC and KDC.
- o Begin receiving MSTI Booster Test Flight data at MDC.
- o Receive ODES flight test data at PDC.
- o Continue receiving Rapid Fire HVG test data at MDC.
- o Begin receiving THAAD flight test data at MDC.
- o Receive ARE-3 data at MDC.
- o Receive CORPS SAM data at MDC and KDC.
- o Store and manage BE data at PDC, BDC, MDC.
- o Receive and archive SPASII/III Data at PDC.
- o Support SDI Plume Analysis Data Program (SPDAP).
- o Support RAIDS at BDC.
- o Provide various levels of support for AST at MDC.
- o Continue preparing ARGUS/HALO imaging data at PDC.

Program Plan to Completion: This is a continuing program.

D. WORK PERFORMED BY:

- o Naval Research Lab
- o Arnold Engineering Development Center
- o U.S. Army Strategic Defense Command

E. COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. TECHNICAL CHANGES: None
2. SCHEDULE CHANGES: None
3. COST CHANGES: None

F. PROGRAM DOCUMENTATION:

G. RELATED ACTIVITIES:

o 1101 Passive Sensors	PE No. 0603215C PE No. 0603214C
o 1105 Discrimination Technology	PE No. 0603215C
o 1106 Sensors Studies and Experiments	PE No. 0603215C/ PE No. 0603216C/ PE No. 0603217C
o 1202 Exo Integration Technology	PE No. 0603215C/ PE No. 0603217C
o 1209 Endo Integration Technology	PE No. 0603215C
o 2102 BE	PE No. 0603215C/ PE No. 0603216C
o 2103 GSTS	PE No. 0603215C
o 2104 GBR	PE No. 0603215C/ PE No. 0603216C
o 2202 Ground Based Interceptor	PE No. 0603215C

o 2205 Brilliant Pebbles PE No. 0603214C

There is no unnecessary duplication of effort within SDIO or the DoD.

H. OTHER APPROPRIATION FUNDS: None

I. INTERNATIONAL COOPERATIVE AGREEMENTS: None

J. MILESTONE SCHEDULE:

- o Begin Starbird Data Management
- o BDC Integrated Science Catalog
- o Begin IBSS Data Management
- o Begin AST Data Management
- o Begin Red Gemini V Data Management
- o BDC Complete Physical Archive System
- o Prototype Visual Interface for Space and Terrestrial Analysis (VISTA)
- o KDC FOC
- o Begin MSX Data Management (BDC & MDC)
- o Support Endo LEAP at KDC
- o Receive GBI data at MDC and KDC
- o Complete distributed database development at BDC
- o Begin receiving MSX data at the BDC, MDC and PDC

Program Element: 0603216C
PE Title: Theater Missile Defenses

Project Number: 3304
Budget Activity: 04
Tactical Programs
April 1993

A. RESOURCES: ($ in Thousands)
Project Title: Targets

Program Name	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	Total Program
TMD DEM/VAL	29,900	39,782	64,062	Continuing

B. BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

This task provides for overall coordination of targets and target support throughout the TMD Program.

The objective of the Targets Program is to provide engineering and threat representative test targets for experiments and for Developmental/ Operational Test (DT/OT). These targets must meet TMD performance, engineering, and threat characteristics requirements to provide test articles that will adequately emulate the expected threat and support engineering and development tests. Test and Evaluation is the staff function designated to provide for the design, development, characterization, validation, production, acquisition, and support system tests. The targets of concern are Boosters, and Re-entry vehicles (RV).

Targets will be designated and developed based on element and system level development test/experiment requirements. Initial target design and development will include an engineering and threat representative target set approved by the Test and Evaluation Working Group (TEWG), and validated by the intelligence community. Testing will be conducted on the test targets to ensure that they meet the characterization and validation requirements of the standard/threat target set. This characterization will ensure the proper data is available, post test, for accurate and timely test evaluation.

Products resulting from this effort will include:

- o Pre-production prototypes (target booster, RVs)
- o Flight qualified hardware
- o Pre-production, validated test articles (RVs, Boosters) for Patriot, ERINT, THAAD
- o Launcher Boosters (STORM, HERA)
- o Range Telemetry Communication Equipment and sensors for data collection and characterization

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

- o Fabricated, targets for: ERINT.
- o Continued planning for ERINT, Patriot, THAAD
- o Conduct ERINT (2) target flights and 1 Patriot Target Flight.
- o Initiate Verification and Validation of Theater target systems.
- o Provide infrastructure support for Boosters systems.
- o Define Navy TMD target requirements.

Program Element: 0603216C
PE Title: Theater Missile Defenses

Project Number: 3304
Budget Activity: 04
Tactical Programs
April 1993

- o Conduct ERINT target flight tests.
- o Demonstrate HERA target booster system.
- o Conduct Patriot target flight tests.
- o Conduct THAAD target flight tests.
- o Provide infrastructure support for Minuteman and STARS boosters.
- o Support Navy TMD Target requirements.

Program Plan to Completion: This is a continuing program.

D. WORK PERFORMED BY:

- o USASDC
- o Technical & Analytical Services Support/SRS Technologies

E. COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. TECHNICAL CHANGES: None
2. SCHEDULE CHANGES: None
3. COST CHANGES: None

F. PROGRAM DOCUMENTATION:

G. RELATED ACTIVITIES:

o 1206	TMD	PE No. 0603216C
o 2104	TMD-GBR	PE No. 0603216C
o 2207	PATRIOT	PE No. 0603216C
o 2208	ERINT	PE No. 0603216C
o 2210	THAAD	PE No. 0603216C

There is no unnecessary duplication of effort within SDIO or the DoD.

H. OTHER APPROPRIATIONS: None

I. INTERNATIONAL COOPERATIVE AGREEMENTS: None

J. MILESTONE SCHEDULE:

- o Conducted Target Demo flights
- o Conduct ERINT-1 target flight
- o Conduct ERINT-2 target flight
- o Conduct Patriot target flight
- o Conduct ERINT-3 target flight
- o Conduct ERINT-4 target flight
- o Conduct THAAD target flight tests
- o Conduct Patriot target flight tests
- o Conduct THAAD target flights
- o Conduct Corps Sam test flights

FY1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: 0603216C
PE Title: Theater Missile Defenses

Project Number: 3305
Budget Activity: 04
Tactical Programs
April 1993

A. RESOURCES: ($ in Millions)
Project Title: Theater Test Bed

Program Name:	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	Total Program
TMD DEM/VAL	55,637	40,952	38,296	Continuing

B. BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

The Theater Test Bed effort will develop and maintain computer-based analysis centers to evaluate the component and overall system designs postulated for Theater Missile Defense. The Theater Test Bed Program will provide the capability for operational, doctrine, and materiel developers and systems engineers and analysts to address the issues associated with Theater Missile Defense. This effort will develop a common base for simulation software and the means to augment it with location-unique software for the specific, local analysis and provide the capability for man-in-the-loop/hardware-in-the-loop experiments and the networking of test bed centers. In addition, the effort will identify, design, and evaluate appropriate joint and unilateral experiments. Major test bed characteristics include real-time operations, a highly interactive user environment, modular, parameter driven models for flexible experiment construction, direct user control, Ada and maximum software portability, and security requirements compatible with multinational participation.

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

- EADTB Program completed the software requirements, and the Preliminary Design and Critical Design Reviews; formulated the software Test Plans and procedures and initiated efforts in scenario development and data collection.
- UK Test Bed designed the detailed software modules for the planned experiment.
- Israeli Test Bed became operational in 2Q/FY92. Some enhancements were identified and the software requirements and design for these enhancements were developed. An Experiment Plan has been developed to evaluate missile defense designs and BMC^3 against defined threats.
- Negotiations for EADTB MOAs with the USAF and STC were initiated.
- A cooperative effort with the Germans was initiated examining the feasibility of interoperability between the EADTB software and German Air Defense simulations.
- EADSIM O&M continued. EADSIM was integrated with the Patriot Tactical Operation Simulator at Ft. Bliss, and enhancements will be made to the software.
- Negotiations on an MOA with the French Government were initiated to conduct experiments on US (EADSIM) and French simulations that will identify joint analysis efforts and allow the French to make a more informed decision on future involvement in the EADTB Program.

Program Element: 0603216C
PE Title: Theater Missile Defenses

Project Number: 3305
Budget Activity: 04
Tactical Programs
April 1993

- Supported the evolution of architecture concepts and key technology contributions to TMD by providing a near-term simulation capability with EADSIM and the continued development of the EADTB.
- EADTB software development, testing, and integration will be completed for Initial Operating Capability which will provide critical analysis support for the TMD acquisition process. Define and implement experiments at EADTB locations.
- EADTB nodes will be initiated at SDC, USAADASCH, Ft. Bliss, USAF, and STC.
- EADTB O&M will start and enhancements will be identified.
- UK Test Bed Program will be replanned to meet emerging US-UK joint missile defense requirements. An initial experiment will be defined and planned in detail.
- Israeli Test Bed O&M and experiments will continue; initial enhancements will be completed.
- EADSIM O&M will continue; enhancements for next version of the software will be developed .
- French MOA negotiations will continue.
- Cooperative effort with the Germans will be completed outlining the feasibility for interoperability between EADTB software and German simulation.
- Continue discussions with allied countries for cooperative efforts for EAD and EADTB.
- EADTB Program was rebaselined. EADTB Program completed software development and unit testing for Initial Operating Capability which provides critical analysis support for the TMD Acquisition process.
- EADTB nodes at SSDC, in the Advanced Research Center, and at US Army Air Defense Artillery School were completed. USAF EADTB node hardware was purchased.
- SHAPE Technical Center EADTB MOA was negotiated and initial planning for software integration and joint experiments were initiated.
- UK Test Bed Program was replanned to meet emerging UK missile defense requirements. Development of experiment software continued at a reduced level of effort waiting UK funding decision.
- Israeli Test Bed joint experiments continued examining battle management command and control issues for an Israeli missile defense architecture. Man-in-the-loop experiments were planned and executed. Improvements to weapon capabilities were completed and software was developed for radar and boost phase intercept enhancements.
- EADSIM O&M continued with enhancements made to TBM trajectories and command and control capabilities.
- French MOA for joint simulation-based analyses was signed by US and forwarded to French MOD for signature.
- Cooperative effort with Germans was completed that outlined requirements for interoperability between EADTB software and German simulations. Discussions for an agreement on EADTB with the German MOD were initiated.
- Continue critical analysis support for TMD acquisition process with experiments at the EADTB locations.
- Plan and support MS II preparation for TMD systems.

Program Element: 0603216C
PE Title: Theater Missile Defenses

Project Number: 3305
Budget Activity: 04
Tactical Programs
April 1993

- Complete simulation accreditation process and supporting IV & V actions.
- Continue Israeli test bed experiment program in BMC^3 and boost phase intercept. Develop follow-on joint experiments program.
- Continue UK node experiments.
- Continue EADSIM O&M.
- EADTB integration testing and software acceptance for Initial Operating Capability; software development and testing for Final Operating Capability.
- EADTB node initiated at SHAPE Technical Center and joint experiments started.
- Execute the French MOA on missile defense simulation-based analysis.
- Negotiate and execute a joint EADTB Program with the German MOD.
- Continue discussions with allied countries and friends for cooperative EAD and EADTB efforts.

Program Plan to Completion: This is a continuing program.

D. WORK PERFORMED BY:

- Hughes Aircraft Corporation
- TRW
- Teledyne Brown Engineering
- UK Defense Research Agency, Electronics Division
- Data Sciences
- Tadiran
- IABG
- Wales

E. COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. TECHNICAL CHANGES: None
2. SCHEDULE CHANGES: EADTB Program delayed 3 months due to delays in software development.
3. COST CHANGES: EADTB Program FY93 cost increase covered by small reductions in other tasks within PMA.

F. PROGRAM DOCUMENTATION:

G. RELATED ACTIVITIES:

- 1206 Advanced TMD Weapons — PE No. 0603216C
- 3205 TMD Studies — PE No. 0603216C
- Army Air Defense Modernization Plan
- Army EAD O&O Plan
- SDIO/SSDC Technical Working Groups

There is no unnecessary duplication of effort within SDIO or the DoD.

H. OTHER APPROPRIATION FUNDS: None

I. INTERNATIONAL COOPERATIVE AGREEMENTS:

Program Element: 0603216C
PE Title: Theater Missile Defenses

Project Number: 3305
Budget Activity: 04
Tactical Programs
April 1993

J. MILESTONE SCHEDULE:

Israeli Test Bed:
- o MOA on Test Bed ends
- o Develop follow-on joint BM/C^3 experiments

UK Test Bed:
- o Experiment complete
- o Develop follow-on joint experiments

Extended Air Defense Test Bed:
- o Initial operating capability
- o Huntsville and Ft. Bliss nodes operational
- o Additional EADTB node installed
- o Full operating capability
- o MIL/HWIL development mods complete
- o Additional EADTB node installed

FY1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: 0603216C
PE Title: Theater Missile Defense

Project Number: 3310
Budget Activity: 03
Strategic Programs
April 1993

A. RESOURCES ($ in Thousands)
Project Title Test and Evaluation Facilities

Program Name:	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	Total Program
TMD DEM/VAL	0	1,000	9,962	Continuing

B. BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

This task provides for overall coordination of centrally managed test facilities throughout the SDI Program and, as such, is funded across several Program Elements.

This objective of this project is to provide adequate, common-user test and evaluation (T&E) facilities to enable SDIO test and experiment programs to meet their objectives. Prudent consolidation can enhance efficiency and economy while satisfying user requirements. Facilities requirements will be satisfied using existing resources whenever possible. New and upgraded facilities will only be pursued when no existing capability will meet basic requirements. This project includes the following facilities: Kinetic Energy Digital Emulation Center (KDEC), National Hover Test Facility (NHTF), and Kinetic Kill Vehicle Hardware-in-the-Loop (KHILS), and the Tunnel 9 Facility.

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

- KDEC: Provided an archive and information retrieval system for data, models and simulations associated with KEW development and production.
- NHTF: Provided an indoor, inexpensive, repeatable test capability to demonstrate and validate the propulsion of integrated kinetic energy interceptor configurations. Performed LEAP hover tests.
- KHILS: Development of high performance infrared (IR) scene generation system to support integrated interceptor hardware-in-the-loop testing. Performed hardware-in-the-loop tests for SEEDD and ULTRASEEK programs.
- KDEC: Provide analysis support for TMD. FOC for 6 DOF simulations for endo and exoatmospheric interceptors complete.
- NHTF: Perform hover tests to support solid and liquid propulsion, and other technology programs.
- KHILS: Development of advanced scene generation and projection system to include broadband spectrum and the inclusion of aero-optic effects. Perform tests to support TMD, SIT and INETS programs.
- TUNNEL 9: Develop shroud removal and jet interaction tests for TMD. Development of full flight aerothermal heat soak capability for endointerceptors.
- KDEC: Perform TMD interceptor 6 DOF simulations.
- NHTF: Perform hover tests to support THAAD. Incorporate captive carry test capability to augment hover testing.

Program Element: 0603216C
PE Title: Theater Missile Defense

Project Number: 3310
Budget Activity: 03
Strategic Programs
April 1993

- o KHILS: Complete advanced wideband scene generation and projection capability. Support hardware-in-the-loop tests for TMD, SIT and ISTC.
- o TUNNEL 9: Perform thermostructural tests of THAAD interceptor.

Program Plan to Completion: This is a continuing program.

D. WORK PERFORMED BY:

- o US Army Strategic Defense Command
- o Wright Labs
- o Phillips Labs
- o Naval Surface Warfare Center

E. COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. TECHNICAL CHANGES: None.
2. SCHEDULE CHANGES: None.
3. COST CHANGES: Cost reflects increase in TMD activities in 3310.

F. PROGRAM DOCUMENTATION:

G. RELATED ACTIVITIES:

o	1202	LEAP	PE No. 0603217C
o	1502	Lethality & Tgt Hardening	PE No. 0603216/17C
o	2104	GBR	PE No. 0603216C
o	2201	Space Based Interceptor	PE No. 0603216C
o	2207	Patriot	PE No. 0603216C
o	2207	TMD	PE No. 0603216C
o	2208	ERINT	PE No. 0603216C
o	2209	ACES	PE No. 0603216C
o	2210	UTTMDS	PE No. 0603216C
o	2210	THAAD	PE No. 0603216C
o	2212	Corps SAM	PE No. 0603216C
o	3107	Environ, Siting & Facilities	PE No. 0603218C
o	3208	TMD Integration and Balancing	PE No. 0603216C
o	3301	Test Data Centers	PE No. 0603216/17C
o	3304	Test Facilities/Targets	PE No. 0603216C
o	3311	Mobile Test Assets	PE No. 0603216/17C
o	3313	Test Ranges	PE No. 0603216C

There is no unnecessary duplication of effort within SDIO or the DoD.

H. OTHER APPROPRIATION FUNDS: None

I. INTERNATIONAL COOPERATIVE AGREEMENTS: None

J. MILESTONE SCHEDULE:

- o KDEC THAAD Build complete
- o KHILS TMD testing

Program Element: 0603216C
PE Title: Theater Missile Defense

Project Number: 3310
Budget Activity: 03
Strategic Programs
April 1993

- Tunnel 9 THAAD testing
- KDEC FOC
- KDEC TMD Support
- Tunnel 9 Flight Dup Upgrade IOC
- NHTF THAAD Hover Tests
- KHILS FOC Broad band scene generation
- THAAD DT Testing
- Patriot
- ERINT

Program Element: 0603216C
PE Title: Theater Missile Defenses

Project Number: 3311
Budget Activity: 04
Tactical Programs
April 1993

A. RESOURCES: ($ in Thousands)
Project Title: Mobile Test Assets

Program Name:	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	Total Program
TMD DEM/VAL	0	290	0	Continuing

B. BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

This task provides for overall coordination of test mobile assets throughout the SDI Program and, as such, is funded across several Program Elements.

This project allocates resources to develop, operate, maintain, and upgrade SDIO mobile test assets. SDIO test and technology experiment programs require adequate test resources, ranges, monitoring and data collection to accomplish their test objectives. When existing ranges/launch locations and fixed facilities do not have sufficient capability to support SDIO test and experiment requirements, mobile assets will be programmed consistent with overall T&E requirements. This project currently supports the range support ship, USNS *Redstone* and High Altitude Observatory (HALO). In subsequent years the plan is to consolidate other common user mobile test assets under this project. The USNS *Redstone* and her electronic system, the M247 Flight Test Support System, were specifically designed and developed by the Navy Strategic Systems Program. It will be used to perform the range support mission for SDIO Theater Missile Defense (TMD) tests where Wake Island serves as the target launch location. Wake Island has not traditionally been used as a range asset and is not equipped for this mission. HALO is a Gulfstream III B aircraft which has the ability to fly at very high altitudes. HALO is outfitted with many sensors designed to record tests such as missile reentries, booster launches, and experiments in earth orbit.

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

- Provide flight test support, range safety and data collection for interceptor technology programs at Wake Island with the USNS *Redstone*.
- Provide flight test support, range safety and data collection for Theater Missile Defense Countermeasure Mitigation Program (TCMP).
- Provide flight test support, range safety, and data collection for interceptor tests.

Program Plan to Completion: This is a continuing program.

D. WORK PERFORMED BY:

- U.S. Army Strategic Defense Command
- Strategic Systems Program, Department of the Navy
- 45th Space Wing, Department of the Air Force

Program Element: 0603216C
PE Title: Theater Missile Defenses

Project Number: 3311
Budget Activity: 04
Tactical Programs
April 1993

E. COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. TECHNICAL CHANGES: None
2. SCHEDULE CHANGES: None
3. COST CHANGES: None

F. PROGRAM DOCUMENTATION:

G. RELATED ACTIVITIES:

- 1701 Launch Services — PE No. 0603217C
- 3304 Targets — PE No. 0603218C
- 3310 T&E Facilities — PE No. 0603218C

There is no unnecessary duplication of effort within SDIO or the DoD.

H. OTHER APPROPRIATION FUNDS: None

I. INTERNATIONAL COOPERATIVE AGREEMENTS: None

J. MILESTONE SCHEDULE:

- Memorandum of Agreement signed
- Compatibility Test
- Arrival Wake Island
- System Checkout
- TCMP Tests
- Target Demo Tests
- TCMP Tests

FY 1994-95 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: 0603216C
PE Title: Theater Missile Defenses

Project Number: 3313
Budget Activity: 04
Tactical Programs
April 1993

A. RESOURCES: ($ in Thousands)
Project Title: Test Ranges

Program Name:	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	Total Program
TMD DEM/VAL	0	750	14,944	Continuing

B. BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

This task provides for overall coordination of centrally managed test range support throughout the SDI Program and, as such, is funded across several Program Elements.

This objective of this project is to provide adequate, common-user test and evaluation (T&E) ranges to enable SDIO test and experiment programs to meet their objectives. This is the first year these projects are consolidated for management purposes; the plan is to further consolidate management for other multi-user ranges in future years. Prudent consolidation can enhance efficiency and economy while satisfying user requirements. Range requirements will be satisfied using existing resources whenever possible. New and upgraded ranges will only be pursued when no existing capability will meet basic requirements. This project includes the following ranges: WSMR, USAKA, Wake Island, ESMC LC-20, Rapid Optical Beam Steering (ROBS) support, Millstone Hill, Wake Instrumentation and KMR Instrumentation.

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

- o USAKA operations and maintenance: Provided test infrastructure support to include range instrumentation upgrades, power station, fire station, security, inter-island transportation and maintenance of facilities to meet planned flight test requirements.
- o WSMR operations: Provided test infrastructure support for SDIO interceptor technology programs.
- o WAKE ISLAND: Provide overall launch services management for targets supporting SDIO flight experiments. Provide test infrastructure support including communication, security CCTV, photography and instrumentation interfaces.
- o USAKA: Provide test infrastructure support to include range instrumentation upgrades, power station, fire station, security, inter-island transportation and maintenance or facilities to meet planned flight test requirements.
- o WSMR: Provide test infrastructure support for SDIO interceptor technology programs. Began work on activation of off-range corridors for TMD THAAD.
- o WSMR: Improve communications system (secure and non-secure). Improve multi-object tracking capability. Install real-time data/graphics displays to support new tests. Support ERINT, Patriot MMS, and THAAD flights. Support LENS test(s). Operate Off-Range Corridors.

FY 1994-95 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: 0603216C
PE Title: Theater Missile Defenses

Project Number: 3313
Budget Activity: 04
Tactical Programs
April 1993

A. RESOURCES: ($ in Thousands)
Project Title: Test Ranges

Program Name:	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	Total Program
TMD DEM/VAL	0	750	14,944	Continuing

B. BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

This task provides for overall coordination of centrally managed test range support throughout the SDI Program and, as such, is funded across several Program Elements.

This objective of this project is to provide adequate, common-user test and evaluation (T&E) ranges to enable SDIO test and experiment programs to meet their objectives. This is the first year these projects are consolidated for management purposes; the plan is to further consolidate management for other multi-user ranges in future years. Prudent consolidation can enhance efficiency and economy while satisfying user requirements. Range requirements will be satisfied using existing resources whenever possible. New and upgraded ranges will only be pursued when no existing capability will meet basic requirements. This project includes the following ranges: WSMR, USAKA, Wake Island, ESMC LC-20, Rapid Optical Beam Steering (ROBS) support, Millstone Hill, Wake Instrumentation and KMR Instrumentation.

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

- o USAKA operations and maintenance: Provided test infrastructure support to include range instrumentation upgrades, power station, fire station, security, inter-island transportation and maintenance of facilities to meet planned flight test requirements.
- o WSMR operations: Provided test infrastructure support for SDIO interceptor technology programs.
- o WAKE ISLAND: Provide overall launch services management for targets supporting SDIO flight experiments. Provide test infrastructure support including communication, security CCTV, photography and instrumentation interfaces.
- o USAKA: Provide test infrastructure support to include range instrumentation upgrades, power station, fire station, security, inter-island transportation and maintenance or facilities to meet planned flight test requirements.
- o WSMR: Provide test infrastructure support for SDIO interceptor technology programs. Began work on activation of off-range corridors for TMD THAAD.
- o WSMR: Improve communications system (secure and non-secure). Improve multi-object tracking capability. Install real-time data/graphics displays to support new tests. Support ERINT, Patriot MMS, and THAAD flights. Support LENS test(s). Operate Off-Range Corridors.

Program Element: 0603216C
PE Title: Theater Missile Defenses

Project Number: 3313
Budget Activity: 04
Tactical Programs
April 1993

- o USAKA: Upgrade telemetry system and recording capability. Improve range safety system for high-dynamic interceptors. Expand communications to accommodate more complex tests. Upgrade to radar system (ALCOR, etc.), Global Positioning System.
- o Wake Island: Preparation for TCMP tests. Install range safety system.
- o ROBS: Conduct range demonstration. Begin upgrade.

Program Plan to Completion: This is a continuing program.

D. WORK PERFORMED BY:

- o US Army Strategic Defense Command
- o White Sands Missile Range

E. COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. TECHNICAL CHANGES: None
2. SCHEDULE CHANGES: None
3. COST CHANGES: None

F. PROGRAM DOCUMENTATION:

G. RELATED ACTIVITIES:

o	2207 Patriot	PE No. 0603216C
o	2208 ERINT	PE No. 0603216C
o	2210 THAAD	PE No. 0603216C
o	2212 Corps SAM	PE No. 0603216C
o	3304 Targets	PE No. 0603218C
o	3311 Mobile Test Assets	PE No. 0603218C

There is no unnecessary duplication of effort within SDIO or the DoD.

H. OTHER APPROPRIATION FUNDS: None

I. INTERNATIONAL COOPERATIVE AGREEMENTS: None

J. MILESTONE SCHEDULE:

- o TMD Program Introduction to 45th Space Wing
- o TMD Program PRD for Wake Island
- o TMD Program OR for Wake Island
- o THAAD
- o Patriot
- o ERINT

FY1994 RDT&E DESCRIPTIVE SUMMARY

Program Elements: 0603216C
PE Titles: Theater Missile Defenses

Project Number: 4000
Budget Activity: 04
Tactical Programs
April 1993

A. RESOURCES: ($ in Thousands)
Project Title: Operational Support Costs

Program Name:	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	Total Program
TMD DEM/VAL	891	322	0	Continuing

B. BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

This project provides program management, system engineering, and program control support common to all other projects within these PEs. Program management tasks include SDIO and Executing Agent central management functions, including those that support the Office of the Director, Strategic Defense Initiative and his supporting staff located within the Pentagon. Typical system engineering tasks include review and analysis of technical project design, development and testing, test planning, assessment of technology maturity and technology integration across SDIO projects; and support of design reviews and technology interface meetings. Program control tasks include assessment of schedule, cost, and performance, with attendant documentation of the many related programmatic issues. This project supports funding for personnel and expenses for travel (TDY), training, rents, communications, information management, utilities, printing, reproduction, supplies, and equipment.

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

- The funding provided by this project has enabled and will enable the executing agents to centralize funding and management of common and recurring operating costs. This optimizes their value across the entire range of SDIO projects, and allows technical research funding to be devoted solely toward that purpose. This strategy of centralizing management will continue to occur throughout this program.

D. WORK PERFORMED BY: The System Engineering and Program Control tasks could be performed through a number of support contracts, and civilian program managers as employees of the Army Strategic Defense Command and the Air Force. Work could be performed by the following major contractors:

- Ford Aerospace Division
- ANSER Inc.
- COLSA Inc.
- GRC Inc.
- Hewlett Packard

E. PROGRAM DOCUMENTATION:

F. RELATED ACTIVITIES: This project supports all other SDIO projects within these PEs. There is no unnecessary duplication of effort within SDIO or the DoD.

Program Elements: 0603216C
PE Titles: Theater Missile Defenses

Project Number: 4000
Budget Activity: 04
Tactical Programs
April 1993

G. OTHER APPROPRIATION FUNDS: None

H. MILESTONE SCHEDULE:

- Products are generated on an as-required basis in support of the SDIO technology and management projects.

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SDIO

FY 1994

BUDGET ESTIMATES

SDI

PROGRAM

ELEMENT

SUMMARIES

Program Element: 0603214C
PE Title: Space-Based Interceptors

Budget Activity: 03
Strategic Programs

A. RESOURCES: ($ In Thousands)

Project Number and Title:	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	Total Program
1101 Passive Sensors	9,000	0	0	Continuing
1104 Signal Processing	2,200	0	0	Continuing
1501 Survivability	4,700	0	0	Continuing
1502 Leth & Tgt Hard	5,600	1,390	0	Continuing
1504 Matls & Structure	2,766	0	0	Continuing
2205 Brilliant Pebbles	384,075	218,610	0	Continuing
3304 Targets	6,693	0	0	Continuing
4000 Operational Support	18,863	0	0	Continuing
TOTAL	433,897	220,000	0	

B. BRIEF DESCRIPTION OF ELEMENT:

Includes manpower authorizations and the associated costs specifically identified and measurable to the following:

Programs, projects, and activities (and supporting programs, projects, and activities) that have as a primary objective the conduct of research on space-based kinetic-kill interceptors and associated sensors that could provide an overlay to ground-based anti-ballistic missile interceptors.

C. MAJOR PROGRAM ELEMENT CHANGES:

Project funding has been shown under the Program Element to which each project was assigned in each year. Some of these Program Elements have subsequently been redefined due to program and organizational restructuring. Such project funding changes include the following:

* Due to a recent Secretary of Defense decision, the Brilliant Pebbles project has been transferred to the Follow-On Technologies Program Element and changed from a budget category 6.3B to a budget category 6.3A program.

PE SUMMARY

Program Element: 0603215C
PE Title: Limited Defense System

Budget Activity: 03
Strategic Programs

A. RESOURCES: ($ In Thousands)

Project Number and Title:	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	Total Program
1101 Passive Sensors	25,563	21,780	24,417	Continuing
1102 Mwave Radar Tech	11,950	10,305	6,544	Continuing
1103 Laser Radar Tech	13,500	0	0	Completed
1104 Signal Processing	28,355	18,510	14,650	Continuing
1105 Discrimination	85,066	84,409	68,368	Continuing
1106 Sens Stud & Exp	165,049	141,788	83,021	Continuing
1110 Sensor Integration	20,900	48,670	0	Continuing
1201 Int Studies & Anal	35,818	15,235	14,651	Continuing
1202 Interceptor Integ	78,000	140,392	0	Continuing
1204 Int Studies & Anal	0	7,500	4,884	Continuing
1208 Disc Int	475	200	0	Completed
1209 Endo Tech	24,500	18,910	0	Completed
1211 Inter/Facil	16,525	0	0	Transferred
1403 Computer Eng	704	3,600	0	Continuing
1405 Communications Eng	10,322	12,205	10,037	Continuing
1501 Survivability	57,292	25,367	19,533	Continuing
1502 Leth & Tgt Hard	0	4,725	4,884	Continuing
1504 Matls & Structure	0	11,065	1,172	Continuing
1701 Launch Services	0	29,868	0	Continuing
2102 BE	73,793	239,500	140,074	Continuing
2103 GSTS	118,186	11,500	0	Completed
2104 GBR	23,007	91,180	100,124	Continuing
2201 SBI	9,000	0	0	Completed
2202 GBI	182,730	90,000	238,176	Continuing
2203 E2I	63,630	0	0	Completed
2300 Command Center	71,943	51,220	76,318	Continuing
2304 Software Eng	7,981	6,625	4,980	Continuing
2307 CINC Command Element	0	1,128	1,757	Continuing
3102 System Eng	89,985	88,052	49,580	Continuing
3103 SDI Metrology	2,105	2,350	1,451	Continuing
3104 ILS	4,304	2,920	3,906	Continuing
3105 Prod & Manu	8,997	8,839	3,476	Continuing
3108 Ops Environments	958	59	0	Completed
3109 Sys Sec Eng	11,513	12,595	12,776	Continuing
3110 Surviv Eng	1,449	562	600	Continuing
3111 Surveillance Eng	9,320	4,950	3,900	Continuing
3112 Sys Eng Support	26,550	11,120	9,744	Continuing
3113 Ground Common	14,250	0	965	Continuing
3114 Launch Common	600	0	0	Continuing
3115 GPALS Sys Eng	0	4,993	0	Continuing
3201 Architecture & Anal	0	4,320	4,084	Continuing
3202 Operations Interface	0	8,041	0	Continuing
3207 System Analysis	25,175	11,950	6,837	Continuing
3301 Data Center	0	10,000	9,767	Continuing
3302 System Test Envir	0	91,067	53,718	Continuing
3303 System Test Eval	0	3,758	5,860	Continuing
3304 Targets	70,404	99,770	84,974	Continuing
3306 Comp Res & Eng	0	17,045	11,731	Continuing
3307 AST	38,314	37,830	24,418	Continuing
3308 Sys Simulator	10,123	7,398	5,458	Continuing

PE SUMMARY

Program Element: 0603215C
PE Title: Limited Defense System

Budget Activity: 03
Strategic Programs

A. RESOURCES: ($ In Thousands)

Project Number and Title:	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	Total Program
3309 Sys Level T&E	24,419	31,215	35,069	Continuing
3310 T&E Facilities	0	25,370	19,534	Continuing
3311 Mobile Test Assets	0	16,410	0	Continuing
3312 Sys Tst Env Spt	0	7,421	4,884	Continuing
3313 Test Ranges	0	19,995	14,651	Continuing
3314 BMD OT&E	0	925	4,000	Continuing
4000 Operational Support	19,229	59,717	10,486	Continuing
SUBTOTAL	1,481,984	1,674,354	1,195,459	
Military Construction				
1105 Discrimination	0	5,400	0	Continuing
2300 Command Center	0	0	30	Continuing
SUBTOTAL	0	5,400	30	
TOTAL	1,481,984	1,679,754	1,195,489	

B. BRIEF DESCRIPTION OF ELEMENT:

Includes manpower authorizations and the associated costs specifically identified and measurable to the following:

Programs, projects, and activities (and supporting programs, projects, and activities) which have as a primary objective the development of systems, components, and architectures for a deployable anti-ballistic missile system, including one or an additional number of anti-missile sites and space-based sensors, that is capable of providing a highly effective defense of the United States against limited ballistic missile threats, including accidental or unauthorized launches or Third World attacks, but below a threshold that would bring into question strategic stability. Such activities shall include those activities necessary to develop and test systems, components, and architectures capable of deployment as part of an ABM Treaty-compliant initial site defensive system. For purposes of planning, evaluation, design, and effectiveness studies, such programs, projects, and activities may take into consideration both the current limitations of the ABM Treaty and modest changes to its numerical limitations and its limitations on the use of space-based sensors.

C. MAJOR PROGRAM ELEMENT CHANGES:

Project funding has been shown under the Program Element to which each project was assigned in each year. Some of these Program Elements have subsequently been redefined due to program and

organizational restructuring. Such project funding changes include the following:

* Funding for Targets, National Test Bed, T&E Facilities/Launch, Test Ranges and Test Assets has been moved from Program Element 0603218C to this Program Element to more properly align the project funding with the intended application of the project.

Program Element: 0603217C
PE Title: Follow-On Technologies

Budget Activity: 02
Advanced Technology Development

A. RESOURCES: ($ In Thousands)

Project Number and Title:	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	Total Program
1110 Sensor Integration	0	0	29,301	Continuing
1201 Int Studies & Anal	0	2,500	0	Continuing
1202 Interceptor Integ	47,035	44,023	48,835	Continuing
1203 Hypervelocity Tech	6,166	0	0	Continuing
1204 Int Studies & Anal	10,993	0	5,861	Continuing
1209 Endo Tech	25,530	0	0	Completed
1210 Navy Exo	6,550	0	0	Transferred
1212 D-2 Program	5,768	9,800	4,884	Continuing
1301 FEL Technology	22,269	14,232	0	Transferred
1302 Chem Laser Tech	99,158	69,464	59,100	Continuing
1303 Neutral Part Beam	75,020	39,226	25,577	Continuing
1304 NDEW Tech	4,817	0	0	Completed
1305 ATP/FC Tech	60,106	20,867	10,597	Continuing
1307 DE Demo	0	18,188	4,862	Continuing
1502 Leth & Tgt Hard	25,127	1,551	0	Continuing
1503 Power	23,795	22,879	9,767	Continuing
1504 Matls & Structure	24,705	2,600	4,828	Continuing
1701 Launch Services	57,661	0	50,556	Continuing
1702 Spec Test Act	31,081	32,380	4,884	Completed
2106 ACTS	0	15,435	22,464	Continuing
2204 DEW Concept Def	1,478	0	0	Completed
2205 Brilliant Pebbles	0	0	72,671	Continuing
3301 Data Center	0	2,990	0	Continuing
3311 Mobile Test Assets	0	850	0	Continuing
4000 Operational Support	88	2,279	0	Continuing
4305 Min Acc for PET	1,027	500	0	Completed
TOTAL	528,374	299,764	354,187	

B. BRIEF DESCRIPTION OF ELEMENT:

Includes manpower authorizations and the associated costs specifically identified and measurable to the following:

Programs, projects, and activities that have as a primary objective the development of technologies capable of supporting systems, components, and architectures that could produce highly effective defenses for the future and which the Secretary has determined are necessary in the national security interests of the United States to be maintained under the Strategic Defense Initiative Organization.

C. MAJOR PROGRAM ELEMENT CHANGES:

Project funding has been shown under the Program Element to which each project was assigned in each year. Some of these Program Elements have subsequently been redefined due to program and organizational restructuring. Such project funding changes include the following:

PE SUMMARY

Program Element: 0603217C
PE Title: Follow-On Technologies

Budget Activity: 02
Advanced Technology Development

* A recent Secretary of Defense budget decision has proposed a Program Element name change from Other Follow-On Technologies to Follow-On Technologies

* Under the same SECDEF budget decision, the Brilliant Pebbles has been transferred into this Program Element from the Spaced-Based Interceptors Program Element.

* In accordance with the guidance provided in the FY93 Defense Authorization Act, two far-term directed energy projects have been transferred out of SDIO sponsorship, as follows:

  Project 1301, Free Electron Laser (FEL), has been transferred to the Army.

  The Airborne Laser portion of Project 1307, DE Demonstrations, has been transferred to the Air Force.

PE SUMMARY

Program Element: 0602790C
PE Title: SBIR/STTR

Budget Activity: 01
Technology Base

A. RESOURCES: ($ In Thousands)

Project Number and Title:	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	Total Program
1602 New Concepts Dev	0	0	42,552	Continuing
TOTAL	0	0	42,552	

B. BRIEF DESCRIPTION OF ELEMENT:

Includes manpower authorizations and the associated costs specifically identified and measurable to the following:

Programs, projects, and activities pursued under the Small Business Research and Development Enhancement Act of 1992 that have as a primary objective:

- o Small Business Innovative Research (SBIR) Program projects
- o Small Business Technology Transfer (STTR) Program projects

C. MAJOR PROGRAM ELEMENT CHANGES:

Project funding has been shown under the Program Element to which each project was assigned in each year. Some of these Program Elements have subsequently been redefined due to program and organizational restructuring. Such project funding changes include the following:

* All SBIR/STTR activities have been transferred out of the Research & Support Activities Program Element 0603218C (Budget Activity 03) and moved into Program Element 0602790C (Budget Activity 01).

PE SUMMARY

Program Element: 0603218C
PE Title: Research & Support Activities

Budget Activity: 03
Strategic Programs

A. RESOURCES: ($ In Thousands)

Project Number and Title:	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	Total Program
1503 Power	505	21,600	0	Continuing
1504 Matls & Structure	250	10,150	0	Continuing
1601 IS&T	62,259	85,205	50,409	Continuing
1602 New Concepts Dev	37,145	41,513	0	Transferred
3107 Envir Siting & Facil	6,102	5,680	5,606	Continuing
3201 Architecture & Anal	3,259	850	0	Continuing
3202 Operations Interface	7,505	0	0	Continuing
3203 Intel Threat Dev	10,274	14,875	10,245	Continuing
3204 Countermeasures Integ	17,127	17,266	22,330	Continuing
3206 System Threat	8,350	9,231	10,062	Continuing
3301 Data Center	12,591	0	0	Continuing
3302 System Test Envir	77,398	0	0	Continuing
3303 System Test Eval	5,220	0	0	Continuing
3304 Targets	49,417	13,270	0	Continuing
3306 Comp Res & Eng	29,114	0	0	Continuing
3310 T&E Facilities	42,426	0	0	Continuing
3311 Mobile Test Assets	12,439	0	0	Continuing
3312 Sys Tst Env Spt	12,142	0	0	Continuing
4000 Operational Support	269,647	201,546	256,709	Continuing
4302 Technology Transfer	2,592	2,239	2,862	Continuing
SUBTOTAL	665,762	423,425	358,223	
Military Construction				
3107 Envir Siting & Facil	5,100	0	2,697	Continuing
SUBTOTAL	5,100	0	2,697	
TOTAL	670,862	423,425	360,920	

Program Element: 0603218C
PE Title: Research & Support Activities

Budget Activity: 03
Strategic Programs

B. BRIEF DESCRIPTION OF ELEMENT:

Includes manpower authorizations and the associated costs specifically identified and measurable to the following:

Programs, projects, and activities that have as primary objectives the following:

o The provision of basic research and technical, engineering, and managerial support to the programs, projects, and activities within the other SDIO program elements.

o Innovative science and technology projects.

o The provision of necessary test and evaluation services other than those required for a specific program element.

o Program management.

C. MAJOR PROGRAM ELEMENT CHANGES:

Project funding has been shown under the Program Element to which each project was assigned in each year. Some of these Program Elements have subsequently been redefined due to program and organizational restructuring. Such project funding changes include the following:

* Funding for Targets, National Test Bed, T&E Facilities/Launch, Test Ranges and Test Assets has been moved from this Program Element to Program Elements 0603216C and 0603215C to more properly align the project funding with the intended application of the project.

SDIO

FY 1994

BUDGET ESTIMATES

SDI

CONGRESSIONAL

DESCRIPTIVE

SUMMARIES

FY1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: 0603215C
PE Title: Limited Defense System

Project Number: 1101
Budget Activity: 03
Strategic Programs
April 1993

A. RESOURCES: ($ in Thousands)
Project Title: Passive Sensors

Program Name:	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	Total Program
LDS DEM/VAL	25,563	21,780	24,417	Continuing
SBI DEM/VAL	9,000	0	0	Continuing

B. BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

This program performs research & development in: visible through infrared focal plane arrays, cryogenic cooling, optics hardware and cryogenic-based signal processing technologies. The efforts are crucial toward fielding National and Theater Missile (NMD, TMD) systems. Specific technology areas include: infrared focal plane arrays using silicon and mercury cadmium telluride materials, focal plane readouts using state-of-the-art electronics components, mirror hardware using silicon carbide or beryllium, innovative cryogenic signal processing techniques; maintenance of optical and electro-optical test facilities to verify component performance, cryogenic cooler development to cool focal plane arrays and associated optical hardware, sensor performance models and optical signature software codes which allow modeling of optical systems.

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

- The Mosaic Array Data Compression and Analysis Program continued to refine the baseline design for advanced focal plane array analog signal processing modules.
- Silicon detectors with on-chip correlated double sampling were fabricated.
- Silicon detectors with internal gain were fabricated.
- An effort to fabricate readouts for large area MWIR HgCdTe detector arrays was initiated.
- Fabricated InSb detector arrays for application to BE and BP programs.
- Advanced materials processing techniques using Molecular Beam Epitaxy (MBE) and Metallic Oxide Chemical Vapor Deposition (MOCVD) was continued.
- LWIR HgCdTe detector arrays were evaluated for low background applications (for space environments).
- Cooler assessments for BP and BE applications were initiated and manufacturability issues identified.
- Fabrication of two different 65K Stirling cryocooler designs was completed and testing began.
- A producibility program for BE and BP detectors was initiated.
- Investigation into anomalous scatter of beryllium mirrors was continued.
- Optical Signatures Code was extended to include visible sensors.
- HYWAYS focal plane arrays were tested.
- Deliverables of HYWAYS Phase 2, Producibility Engineering and Planning, were tested.

Program Element: 0603215C
PE Title: Limited Defense System

Project Number: 1101
Budget Activity: 03
Strategic Programs
April 1993

- o Deliverables of HYWAYS advanced technology hybrid focal plane arrays were characterized.
- o Deliverables of HYWAYS prepilot line production hybrid focal plane arrays were characterized.
- o The Mosaic Array Data Compression and Analysis Program (MADCAP) was continued. Prototype processors will be developed.
- o An effort to fabricate readouts for large area MWIR HgCdTe detector arrays was continued.
- o Advanced focal plane technology development in VLWIR IBC silicon arrays was developed.
- o Prototype low background LWIR HgCdTe detector arrays continued in development.
- o The ALIRT effort completed fabrication of a 512 x 512 focal plane subsystem.
- o Life testing of 65K Stirling cryocoolers continued.
- o The Single Stage Turbocooler program was continued.
- o The 65K Stirling cryocooler for SPAS III was integrated for flight test.
- o Fabricated six 14.6 x 12.9 cm lightweight rectangular beryllium mirror blanks and spherically polished one.
- o Four beryllium mirror blanks were spherically polished to BRDF of 1×10^{-4} at 2° and 10.6 μm.
- o Beryllium mirror blanks will be fabricated, polished, and tested.
- o Demonstration of contamination removal techniques.
- o Demonstration of 65K Stirling cryocooler.
- o LWIR HgCdTe focal plane array program continued.
- o 10K sorption cryocooler continued.
- o Very large area MWIR hybrids demonstrated.
- o MADCAP program continued.

Program Plan to Completion: This is a continuing program.

D. WORK PERFORMED BY:

Major Contractors:

- o Hughes Aircraft
- o Rockwell International
- o Lockheed Missile Systems
- o Amber Engineering
- o Santa Barbara Research Center
- o JPL
- o Aerojet

E. COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. TECHNICAL CHANGES: None
2. SCHEDULE CHANGES: 65K Cryocooler Program Delayed
3. COST CHANGES: TBD

F. PROGRAM DOCUMENTATION:

Program Element: 0603215C
PE Title: Limited Defense System

Project Number: 1101
Budget Activity: 03
Strategic Programs
April 1993

G. RELATED ACTIVITIES: This project provides high performance, radiation hardened, producible IR focal planes for programs requiring IR sensors.

o	2102 BE	PE No. 0603215C
o	2103 GSTS	PE No. 0603215C
o	2205 BP	PE No. 0603214C
o	2202 GBI	PE No. 0603215C
o	2201 SBI	PE No. 0603215C

Producibility efforts as well as radiation hardness goals will be coordinated with DARPA, DNA, and NASA. There is no duplication of effort within SDIO or the DoD.

H. OTHER APPROPRIATION FUNDS: None

I. INTERNATIONAL COOPERATIVE AGREEMENTS: Yes

J. MILESTONE SCHEDULE:

- o SSC Cooler Life Testing started
- o SHIELD, LLUM, and SHADOW program underway to design, fabricate, and test hybrids to BE GPALS Specs
- o LLUM program currently underway to design, fabricate, and test LWIR hybrids for BE GPALS
- o Materials Research for a LWIR sensor completed
- o BE GPALS option design under the SHIELD program almost complete. The HYWAYS and Si BRIDGE technology transferred to the SHIELD program
- o LWIR Low Background Hybrids demonstrated
- o VLWIR Production Readiness demonstration
- o SHADOW program completed and will deliver an X number of hybrids that have met BE's requirements
- o SHADOW technology transferred into the MWIR hybrid MANTECH program to enhance producibility for BE GPALS
- o SHIELD program delivers 6 staring and 6 scanning hybrids for use for GPALS
- o SHADOW technology transferred to a MWIR hybrid MANTECH program that will enhance producibility for GPALS
- o Production Line Demonstration of M/LWIR Hybrids

FY1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: 0603215C
PE Title: Limited Defense System

Project Number: 1102
Budget Activity: 03
Strategic Programs
April 1993

A. RESOURCES: ($ in Thousands)
Project Title: Microwave Radar Technology

Program Name:	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	Total Program
LDS DEM/VAL	11,950	10,305	6,544	Continuing

B. BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

This project addresses advanced radar system designs and critical component technologies needed to build long range radar systems with search, detection, tracking, discrimination and kill assessment functions for multiple targets. Targets are threat ballistic missile reentry vehicles and associated objects at both endo- and exo-atmospheric ranges. The project provides the critical technologies for radar systems that support Strategic and Theater Missile Defense architectures.

Large Radar Technology: This program is developing an advanced radar technology base necessary to meet the functional performance requirements of large aperture, phased array radars to support strategic and theater missile defense during all phases of threat flight, emphasizing endo- and exo-atmospheric tracking, fire control, and engagement functions with focus on developing solid state RF components, fiber optic interconnects and waveform processors.

Innovative Radar Technology: This program is developing radar technologies which have direct benefit for national and theater radars operating in electronic countermeasure and nuclear environments. Projects include resonant target phenomenology, synthetic aperture radar hardware and demonstrations, and track error compensation technologies.

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

- Fabricated and evaluated high power X-band solid state transmit/receive modules for populating 32-element tray.
- Continued development and fabrication of real-time waveform processor (RTWP).
- Completed fabrication of medium power X-band transmit/receive modules.
- Accepted delivery of 32 high power, solid state, transmit and receive modules assembled onto a single tray with 32 antenna elements.
- Accepted delivery of 20 medium power, transmit and receive modules and 10 antenna elements.
- Evaluated performance of high and medium power transmit and receive modules.
- Started an advanced radar processing experiment (ARPEX) development program.
- Demonstrated RF-to-Light-to-RF transmission with fiber optic components.
- Developed and demonstrated fiber optic time delay unit.

- o Delivered High Density Power Conditioners.
- o Completed resonant radar cross section (RCS) signature testing.
- o Continue development and fabrication of Real Time Waveform Processor (RTWP).
- o Delivery of waveform generator.
- o Continue development of Fiber Optic beamformer assembly.
- o Continue development of hardware and software components in support of Radar Waveform Processing Demonstration.
- o Continue fabrication and assembly of ARPEX processor planned for HWIL signal processing demonstration.

Program Plan to Completion: This is a continuing program.

D. WORK PERFORMED BY:

This program is managed by the U.S. Army Strategic Defense Command, and by SDIO/TNS for Innovative Microwave Radar Research.

Major Contractors:
- o Phase IV (subcontractor Westinghouse)
- o Texas Instruments
- o Dynetics
- o GE Aerospace

E. COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. TECHNICAL CHANGES: Due to funding shortfall, limited testing of key components developed and no advanced development of key components.
2. SCHEDULE CHANGES: Due to funding shortfall, the Fiber Optic Control of Phased Array Technology program and the Real Time Waveform Processor program slip by 6 months. Three new efforts are delayed by 12 months.
3. COST CHANGES: Due to $10.3M shortfall, the Fiber Optic Control of Phased Arrays Technology program and the Real Time Waveform Processor program slip by 6 months. Three new efforts are delayed by 12 months. Limits testing of key components developed and allows no advanced development of key components.

F. PROGRAM DOCUMENTATION:

G. RELATED ACTIVITIES:

Supports the effort to build and test the demonstration/ validation Ground Based Radars in 1995-96, and the independent radar discrimination engineering developments needed for exo-atmospheric target identification for GPALS deployment. These technologies further complement radar enhancement programs being undertaken in the SDIO Theater Missile Defense office (TMD). There is no unnecessary duplication of effort within SDIO or the DoD.

H. OTHER APPROPRIATION FUNDS: None

Program Element: 0603215C
PE Title: Limited Defense System

Project Number: 1102
Budget Activity: 03
Strategic Programs
April 1993

I. INTERNATIONAL COOPERATIVE AGREEMENTS: None

J. MILESTONE SCHEDULE:

- Delivery of arbitrary coded waveform generator
- Fabrication of Real Time Waveform Processor (RTWP)
- Demonstration test for fiber optic beamforming components
- Perform Radar Waveform Processor Demonstration

Program Element: 0603215C
PE Title: Limited Defense System

Project Number: 1103
Budget Activity: 03
Strategic Programs
April 1993

A. RESOURCES ($ in Thousands)
Project Title: Laser Radar Technology

Program Name:	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	Total Program
LDS DEM/VAL	13,500	0	0	Completed

B. BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

This project develops and demonstrates the laser radar technologies capable of supporting system elements in the Strategic and Theater Missile Defense architectures. Laser radar technology includes development of components, systems, data bases of target measurements and supporting analysis. Laser transmitters, receivers, mechanisms for steering and directing beams, and signal processing are included in component development. Data base development includes both laboratory and field measurements, and developing simulations for calculating laser radar cross sections and evaluating system performance.

For many missions, laser radars are preferred over microwave radars due to smaller size and tighter beam divergence. Laser radars can provide the high spatial and velocity resolution for mid-course discrimination of Rvs from other objects and for designation and target localization as well. This technology can also be used in boost phase for active tracking of threat boosters and precision pointing of boost-phase weapons and terminal phase weapons, and in mid-course for designation. Specific technologies include lasers with high temporal and frequency stability and wide bandwidth waveforms, wide bandwidth detectors, optical beam steering and receiving systems for rapid retargeting, and signal processing and analytical tools required for implementation.

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

- o Completed tracking algorithms and testing of low power, transportable laser radar system.
- o Completed fabrication and testing of space traceable CO_2 laser radar, LOWKATER transmitter.
- o Continued conducting bistatic target measurement and validating the DELTAS code for this geometry.

Program Plan to Completion: This is not a continuing program.

D. WORK PERFORMED BY: No work performed under this project.

E. COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. TECHNICAL CHANGES: Program terminated in FY 1993.
2. SCHEDULE CHANGES: Program terminated in FY 1993.
3. COST CHANGES: Program terminated in FY 1993.

F. PROGRAM DOCUMENTATION: None

Program Element: 0603215C
PE Title: Limited Defense System

Project Number: 1103
Budget Activity: 03
Strategic Programs
April 1993

G. RELATED ACTIVITIES:

o	1208 - ATP/FC Laser Illuminator	PE No. 0603217C
o	3310 - T&E Facility and Launch Support	PE No. 0603215C
o	1110 - BE Sensor Integration/Validation	PE No. 0603215C
o	1105 - AMOR	PE No. 0603215C
o	1105 - FIREBIRD	PE No. 0603215C

There is no unnecessary duplication of effort within SDIO or the DoD.

H. OTHER APPROPRIATION FUNDS: None

I. INTERNATIONAL COOPERATIVE AGREEMENTS: None

J. MILESTONE SCHEDULE: None

Program Element: 0603215C
PE Title: Limited Defense System

Project Number: 1104
Budget Activity: 03
Strategic Programs
April 1993

A. RESOURCES: ($ in Thousands)
Project Title: Signal Processing

Program Name:	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	Total Program
LDS DEM/VAL	28,355	18,510	14,650	Continuing
SBI DEM/VAL	2,200	0	0	Continuing

B. BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

This project develops and demonstrates the technology, techniques and components to meet with stringent signal and data processing requirements in support of theater and national ballistic missile defense needs. It accomplishes this task by advancing the radiation hardened, high speed microelectronic, microprocessor, and analog circuit technology base. To meet ballistic missile mission objectives, on board processors must perform large numbers of computations to perform surveillance, acquisition, tracking, intercept, and kill assessment of missiles and reentry vehicles. These elements must survive and continue to perform in high levels of natural and man made nuclear radiation. Selected elements must continue to operate through very high flash levels of nuclear burst. High speed and low power Very Large Scale Integrated (VLSI) electronic circuits and memories with performance comparable to DoD Very High Speed Integrated Circuit (VHSIC) technology must be developed to achieve very high levels of performance and radiation hardening. Space borne electronics must use advanced packaging techniques to reduce satellite size, weight, power, and total system costs. Further development of these technologies are absolutely critical to lowering the risk and system costs involved with a deployment/full scale development decision. This project will produce two radiation hardened state-of-the-art 32 bit Reduced Instruction Set Computers (RISC) for space applications. The level of testability, fault tolerance and radiation immunity built into these processors distinguish the RH32 processors distinguish them from others available or planned, and enable the RH32 to operate through the harsh space radiation environment. A companion effort, the RISC Ada Environment (RISCAE), will develop the software environment for both processor designs. As full scale deployment decisions are postponed, this project must ensure advances realized in the commercial market are easily transferred to the radiation hardened technology base.

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

- Continued radiation hardened nonvolatile memory effort.
- Continued rad hard precision voltage reference efforts.
- Initiated Phase II, Advance Technology Insertion Module (ATIM), on the Advanced Spaceborne Computer Module (ASCM) effort.
- Developed 1 Mbit SOI SRAM prototypes.

- o Continued radiation hardened 32 bit (RH32) scalar processor development.
- o Continued RISCAE effort to develop an Ada software environment for the RH32 processor.
- o Delivered a space qualified, RAD hard control processor module (CPM) on the ASCM effort.
- o Continued rad hard 256K SOI SRAM efforts.
- o Continued rad hard 1 Mbit bulk SRAM efforts.
- o Continued rad hard nonvolatile memory efforts in battery backed 256K SOI SRAMS and ferroelectric technology.
- o Continued the rad hard precision voltage reference effort.
- o Continued the Advanced Spaceborne Computer Module (ASCM).
- o Delivered a space qualified, RAD hard CPM on the ASCM effort.
- o Continued rad hard 1MHz, 10 bit monolithic A/D converter.
- o Initiated rad hard 10 Mhz, 12-bit monolithic A/D converter.
- o Continued rad hard 32-bit (RH-32) scalar microprocessor development effort.
- o Continued RISCAE effort to develop an Ada software environment for the RH-32 microprocessor.
- o Continued the Associative String Signal Processor effort.
- o Deliver the radiation hardened precision voltage reference.
- o Deliver the rad hard 1MHz, 10 bit monolithic A/D converter.
- o Continue rad hard 10 Mhz, 12-bit monolithic A/D converter.
- o Deliver two radiation hardened 32-bit processors (RH32), one from each contractor.
- o Integrate and deliver the Ada environment required by the RH32.
- o Continue the radiation hardened 1 Mbit Static Random Access Memory (SRAM).
- o Continue the ferroelectric non-volatile memory.
- o Continue the radiation hardened DC-to-DC (28v to 5v) power converter.
- o Continue the automated radiation hardened circuit design.
- o Continue the Wafer scale Associative String Processor (WASP).

Program Plan to Completion: This is a continuing program.

D. WORK PERFORMED BY:

In House:

- o Phillips Laboratory
- o Naval Research Laboratory
- o Naval Ocean Systems Center
- o Naval Weapons Support Center
- o Rome Laboratory
- o Rome Laboratory

- Harry Diamond Laboratory
- USASSDC

Major Contractors:
- Analog Devices
- Boeing
- Harris
- IBM
- Raytheon
- Texas Instruments
- Honeywell
- General Electric
- TRW

E. COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. TECHNICAL CHANGES: None
2. SCHEDULE CHANGES: ATIM and non-volatile memory effort slips about 12 months. 12 bit, 10 Mhz analog to digital converter delayed. Innovative work and wafer scale signal processing deferred. One contractor on RH32 program may be dropped.
3. COST CHANGES: None

F. PROGRAM DOCUMENTATION:

G. RELATED ACTIVITIES:

This project provides radiation hardened microelectronics technology for all other space based and interceptor elements including Brilliant Pebbles (BP), Brilliant Eyes (BE), Early Warning System (EWS), Endoatmospheric and future endo interceptors, Ground Surveillance and Tracking System (GSTS), and Ground-Based Interceptor (GBI) programs (PE No. 0603215C). The radiation tolerance and survivability goals programs are coordinated with the Survivability program. This project operates in coordination with the Defense Nuclear Agency and service radiation hardened microelectronics technology efforts. There is no unnecessary duplication of effort within SDIO or the DoD.

H. OTHER APPROPRIATION FUNDS: None

I. INTERNATIONAL COOPERATIVE AGREEMENTS: None

J. MILESTONE SCHEDULE:

- Space qualified control processing module (CPM) delivery
- Radiation hardened 1 Mhz, 10 bit monolithic A/D converter
- Radiation hardened 10 Mhz, 12-bit monolithic A/D converter
- Radiation hardened 32-bit processor (RH32)

Program Element: 0603215C
PE Title: Limited Defense System

Project Number: 1104
Budget Activity: 03
Strategic Programs
April 1993

- Voltage reference
- Software to operate the RH32 (RISCAE)
- RH32/RISCAE integration
- Radiation hardened precision voltage reference A/D converter
- Radiation hardened 1 Mbit SRAM
- Analog-to-Digital converter 12-bit 10 MSPS
- 1 Mbit SRAM
- Rad Hard DC to DC converter
- Automated rad hard circuit design

FY 1994-95 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: 0603215C
PE Title: Limited Defense System (U)

Project Number: 1105
Budget Activity: 03
Strategic Programs (U)
March 1993

A. RESOURCES: ($ in Thousands)
Project Title: Discrimination

Program Name:	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	Total Program
LDS DEM/VAL	85,066	84,409	68,368	Continuing
LDS D/V MILCON	0	5,400	0	Continuing

B. BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

This task area is responsible for characterizing the optical and radar signatures of threat objects (e.g. penaids and Rvs) and backgrounds for development of effective target acquisition and discrimination techniques for NMD efforts related to systems funded under the LDS program element. Emphasis is placed on the midcourse and terminal phases of ballistic missile flight.

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

- o Conducted SPIRIT II sounding rocket experiment and initiated data analysis.
- o Completed Firebird 1B experiment and began data analysis.
- o Completed analysis of SRMP (7F/G) missions.
- o Started analysis of IBSS plume data.
- o Demonstrated radar discrimination architecture on LDS test bed.
- o Completed integrating ARGUS new airframe and sensor system upgrade.
- o Finished upgrading laser radar testing system at AMOR facility.
- o Continued ARGUS/HALO plume data collection to include Titan II, Delta II, Peacekeeper, Minuteman and Red Gemini.
- o Performed ground observations of Lance with U.K.
- o Continued Cobra Judy and Cobra Eye data collections and analysis.
- o Continued refinement/upgrade of target, plumes, and background signature models and codes.
- o Completed data analysis of plume chamber tests to support plume models and codes.
- o Continued to evaluate midcourse discrimination algorithms using collected data sets (CE, CJ).
- o Continue to upgrade natural backgrounds models and codes.
- o Continued plume data collection on strategic-class missile systems with ARGUS and other ground-based assets.
- o Initiated plume data collection on theater-class missile systems with ARGUS.
- o Demonstrated active/passive discrimination algorithm architecture (1 target) on LDS test bed.
- o Assessed GBI discrimination algorithm performance.
- o Released final SSGM baseline code and began development of operational version of SSGM.
- o Completed data analysis of Firebird 1B mission.
- o Cobra Eye aircraft was mothballed and went into inactive phase.
- o Continue analysis of SPIRIT II and CIRRIS 1A mission.

Program Element: 0603215C
PE Title: Limited Defense System (U)

Project Number: 1105
Budget Activity: 03
Strategic Programs (U)
March 1993

- Continue radar data acquisition of domestic/foreign reentry vehicle and missile targets.
- Continue optical and infrared measurements of U.S. and foreign RV, post-boost vehicle and missile targets.
- Continue development of radar and optical discrimination algorithms/ architecture at LDS for system elements.
- Continue data analysis of atmospheric and celestial background phenomenology to upgrade codes/models.
- Continue development of TMD discrimination algorithms.
- Continue developing the operational Strategic Scene Generation Model.

Program Plan to Completion: This is a continuing program.

D. WORK PERFORMED BY:

Major Contractors:

- Phillips Laboratory (Geophysics Directorate)
- Naval Research Laboratory
- USAF Space Systems Division
- USA Strategic Defense Command
- Institute for Defense Analysis
- MIT Lincoln Laboratory
- Boeing Aerospace Corporation
- Utah State University
- Physical Research Inc.
- Mission Research Corporation
- Teledyne Brown Engineering
- E-Systems
- Sandia National Laboratory
- Photon Research Associates, Inc
- Arnold Eng. Dev. Center
- Nichols Research Corporation
- USAF Space and Missile Center

E. COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. TECHNICAL CHANGES: None
2. SCHEDULE CHANGES: None
3. COST CHANGES: (1) FY93 funding for the Optical Aircraft Measurement Program (Cobra Eye) was reduced dramatically, forcing it to be moth-balled beginning 2Q/FY93. There will be no funding for CE in FY94. (2) The HALO aircraft was transferred out of this project and into another project PMA 3311 funded by the TNE office. (3) The program sustaining cost for the ARGUS aircraft will be transferred to the AF and become a Phillips Lab's asset as of FY94.

F. PROGRAM DOCUMENTATION:

FY 1994-95 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: 0603215C
PE Title: Limited Defense System (U)

Project Number: 1105
Budget Activity: 03
Strategic Programs (U)
March 1993

G. RELATED ACTIVITIES:

- 1106, "Midcourse Space Experiment", "Visible/Ultraviolet Experiment", and IBSS PE No. 0603214C and 0603215C.

There is no unnecessary duplication of effort within SDIO or the DoD

H. OTHER APPROPRIATION FUNDS:

1. PROCUREMENT: None
2. MILITARY CONSTRUCTION: None in FY94

I. INTERNATIONAL COOPERATIVE AGREEMENTS: Yes

J. MILESTONE SCHEDULE:

- Deliver prototype optical discrimination algorithms to GBI & THAAD
- Conduct Firefly 3 mission
- Complete operational SSGM Model v. 1
- Release background code SHARC v. 4.1
- Release celestial background code CBSD v. 4
- Conduct Firebird 2 mission
- Release UV background code AURIC v. 2.0
- Demonstrate real-time active/passive discrimination architecture for 40 targets
- Complete operational SSGM Model v. 2

Program Element: 0603215C
PE Title: Limited Defense System

Project Number: 1106
Budget Activity: 03
Strategic Programs
April 1993

A. RESOURCES: ($ in Thousands)
Project Title: Sensor Studies and Experiments

Program Name:	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	Total Program
LDS DEM/VAL	165,049	141,788	83,021	Continuing

B. BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

This project conducts space and suborbital "tech-demo" experiments to integrate and assess newly developed sensor technologies in as realistic an operational environment as possible before they are transferred to the NMD systems elements. Data collected within this project are critical to the design of all surveillance and weapon sensors and sensor processing algorithms in the Strategic Defense System. The Midcourse Space Experiment (MSX) also supports NMD elements funded under Limited Defense System (PE No. 0603215C) and Advanced Electro-optics under Theater Missile Defenses (PE No. 0603216C).

The Shuttle Pallet Satellite (SPAS III) is a follow-on mission to IBSS. SPAS III will provide multi-spectral (ultra violet, visible and infrared) and radiometric measurements of liquid plume generator and orbital plumes, earth backgrounds, orbital environment and calibration sources. The principal sensors are cryogenically cooled radiometer and spectrometer with scanning mirror, high off-axis rejection optics, INSB and MCT detectors, and 65K mechanical cryocooler. Mission operations onboard the Space Shuttle are planned for CY94.

The Midcourse Space Experiment (MSX) will provide the system functional demonstration, target and background data, and the technology demonstrations necessary for the midcourse sensor platforms to meet Milestone II. MSX launch is planned for CY95. The principal sensor is a cryogenic MWIR/LWIR/VLWIR radiometer and spectrometer system with high off-axis rejection optics. MSX will provide data on real midcourse targets against real backgrounds at realistic system ranges for use in system ground demonstrations; provide high quality target and background phenomenology data for further development of robust models of representative scenes; demonstrate key functions such as acquisition, tracking, handoff and bulk filtering; provide multi-wavelength target phenomenology data for assessing optical discrimination algorithms; and demonstrate the capability to integrate key technologies into a working platform similar to proposed operational midcourse sensor designs.

Unconventional Passive Discrimination (UPD) is an evaluation and development task for optical discrimination techniques that make use of target signature time history information to perform target classification. Tests have been performed to investigate and quantify the interactions of an aerospace vehicle with the ambient space environment and implications to discrimination. The feasibility of these techniques and quantification was demonstrated with previous optical target observations and measurements (e.g., Malabar, Firebird, Have Jeep, Starmate,

D180/181, DOT, HOE). The techniques are applicable to both surveillance and interceptor system elements.

The optical collection facility at Malabar, Florida performs observations of missiles and other targets within its detection range to support the development of Strategic Defense System elements. This is an ongoing measurements program.

The Red Tigress program consists of a series of sounding rocket launches to measure the signatures of advanced penetration aids. Data collected during these launches will be used to validate discrimination algorithms for NMD and TMD sensor and interceptor system elements.

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

- o Completed MSX LWIR sensor (SPIRIT III) integration.
- o Completed final analysis and assessment of data from IBSS.
- o Delivered IBSS final report.
- o SPAS III objectives and requirements defined and payload definition finalized.
- o SPAS III organizations and contractors selected.
- o Initiated MSX instrument integration.
- o Continued optical measurements at Malabar.
- o Performed VIP Environment Monitor Package piggyback flight.
- o Initiated UPD program.
- o Demonstrated UPD flight test data.
- o Successfully launched Red Tigress 1B vehicle and performed data analysis.
- o Finalized detailed MSX & SPAS III Mission and Experiment Plans.
- o Finalized MSX & SPAS III data processing and analysis plans.
- o Completed MSX & SPAS III spacecraft subsystem and instrument testing and calibration.
- o MSX SPIRIT III sensor delivered to Johns Hopkins University/Applied Physics Lab (JHU/APL).
- o Completed MSX integration and begin environmental testing.
- o MSX spacecraft Flight Acceptance Tests.
- o Conducted MSX & SPAS III Mission and Experiment Simulations.
- o Exercised MSX data processing system.
- o Completed SPAS III Critical Design Reviews.
- o Fabricated LWIR CMOS Focal Plane Array.
- o Performed ground based UPD demonstrations.
- o Continued optical measurements from Malabar.
- o Launched of Red Tigress II.
- o Distributed VIP Environment Monitor Package mission report.
- o Complete MSX ground system tests.
- o Results of MSX engineering and system tests to SDI Elements.
- o Perform airborne UPD demonstration.
- o Fabricate radiation hardened ultraviolet CCD.
- o Update signal processing and data processing technology.
- o Complete SPAS III system integration.

Program Element: 0603215C
PE Title: Limited Defense System

Project Number: 1106
Budget Activity: 03
Strategic Programs
April 1993

- o Perform SPAS III experiment.
- o Complete SPAS III quicklook data assessment.
- o Red Tigress III launch of targets for observation by MSX and other ground-based, air-based and space-based platforms.
- o Continue optical measurements from Malabar.

Program Plan to Completion: This is a continuing program.

D. WORK PERFORMED BY:

- o Phillips Laboratory
- o USA Space Defense Command
- o USAF Space & Missile Systems Center
- o Sandia National Laboratory
- o Vandenburg Air Force Base
- o NASA

Major Contractors:

- o Johns Hopkins University, Applied Physics Laboratory
- o Utah State University, Space Dynamics Laboratory
- o MIT Lincoln Laboratory
- o Lockheed Missile Systems Corporation
- o Teledyne Brown Engineering
- o Aerospace Corporation
- o SRS Technologies
- o Rocketdyne
- o Honeywell
- o Jet Propulsion Laboratory
- o Hughes
- o Photon Research Associates
- o Fairchild Space

E. COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. TECHNICAL CHANGES: None.
2. SCHEDULE CHANGES: Due to funding cuts MSX launch has slipped to.
3. COST CHANGES: None

Program Element: 0603215C
PE Title: Limited Defense System

Project Number: 1106
Budget Activity: 03
Strategic Programs
April 1993

F. PROGRAM DOCUMENTATION:

G. RELATED ACTIVITIES:

- There is no unnecessary duplication of effort within SDIO or the DoD.

H. OTHER APPROPRIATION FUNDS: None

I. INTERNATIONAL COOPERATIVE AGREEMENTS: None

J. MILESTONE SCHEDULE:

- Red Tigress II launch
- MSX Integration Complete
- MSX Acceptance Tests Complete
- SPAS III mission operations
- Ground based UPD demonstrations
- SPAS III detailed data analysis
- MSX launch
- UPD algorithm set delivered
- MSX target flights
- Red Tigress III launch
- SPAS III final report
- MSX SPIRIT III EOL

FY1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: 0603217C
PE Title: Follow-On Technologies

Project Number: 1110
Budget Activity: 02
Advanced Technology Development
April 1993

A. Resources: ($ in Thousands)
Project Title: Sensor Integration

Program Name:	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	Total Program
LDS DEM/VAL	20,900	48,670	0	Continuing
FOT DEM/VAL	0	0	29,301	Continuing

B. BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

This program is divided in three parts. The first part of the program is used to develop advanced miniature components for surveillance, acquisition, tracking, navigation, and image processing for space systems. The second part integrates the lightweight components in a spacecraft payload. Finally, the third part includes the launching, mission operations, and data processing required to understand the performance of these assemblies in a long life space environmental mission.

This project is designed to integrate and perform flight qualification of some of the most advanced SDIO lightweight technologies being developed as part of the Global Protection Against Limited Strikes (GPALS). Two lightweight spacecraft are being designed in the sensor integration program, usually referred to as the Clementine spacecraft. These spacecraft will be flown in deep space to fully characterize the effects of a radiation stressed environment on the lightweight technologies. The first spacecraft will have a lightweight suite of sensors (Ultraviolet/Visible, Near-Infrared, Long Wave Infrared, Lidar, and Star Trackers), lightweight attitude control systems (Inertial Measurement Units and Reaction Wheels), a 32-bit parallel computer processor architecture, high-energy storage batteries, and high power density solar cells. The first spacecraft will be flown in January 1994 using the Moon and a near-earth-asteroid as natural targets to measure the sensor performance. The second spacecraft will be flown in September 1995 and will incorporate improved sensors including a spectrometer, an advanced liquid axial stage propulsion system, a radiation hardened 32 bit processor, a full advanced composite structure, and light exoatmosphere advanced projectile (LEAP) technology. These spacecraft are being developed under a cooperative agreement with NASA to transfer DoD developed technologies to the civilian scientific sector.

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

- Developed a detailed design of the sensor integration mission.
- Designed the first payload to be used to prove the technologies required for the mission.

Program Element: 0603217C
PE Title: Follow-On Technologies

Project Number: 1110
Budget Activity: 02
Advanced Technology Development
April 1993

- o Developed a master plan with a delivery schedule for each lightweight subassembly in the sensor integration payload.
- o Finalized a contract for each required subassembly.
- o Conducted a successful Preliminary Design Review (PDR) for the payload system.
- o Conduct a Critical Design Review (CDR) for the payload system.
- o Integrate all the subsystems into a bus/payload interface.
- o Conduct a technical panel with NASA leadership to enhance the scientific contribution of the program.
- o Test the performance of a fully integrated payload for a deep space mission.
- o Final checkout of payload and launch vehicle.
- o Deep space flight of the first sensor integration mission (Clementine -1).
- o Distribution of the data obtained from the flight.
- o Complete the design for second deep space mission.

Program Plan to Completion: Program completed in FY 1995.

D. WORK PERFORMED BY:

- o Naval Research Lab
- o Lawrence Livermore National Lab
- o Jet Propulsion Laboratory
- o Raytheon, Amber Engineer Division
- o NASA Goddard Space Center
- o McDonnell Douglas
- o Martin Marietta
- o Bendix Field Operations
- o Fairchild

E. COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. TECHNICAL CHANGES: None
2. SCHEDULE CHANGES: None
3. COST CHANGES: None

F. PROGRAM DOCUMENTATION:

Program Element: 0603217C
PE Title: Follow-On Technologies

Project Number: 1110
Budget Activity: 02
Advanced Technology Development
April 1993

G. RELATED ACTIVITIES:

- 2102 Brilliant Eyes PE 0603215C
- 1106 Sensor Studies PE 0603214C/0603215C.
- 1504 Material and Structure PE 0603218C

There is no unnecessary duplication of effort within SDIO or the DoD.

H. OTHER APPROPRIATE FUNDS: None

I. INTERNATIONAL COOPERATIVE AGREEMENTS: None

J. MILESTONE SCHEDULE:

- Launch Vehicle PDR
- Systems Integration CDR
- Test Readiness Review
- First Launch

FY1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: 0603215C
PE Title: Limited Defense System

Project Number: 1201
Budget Activity: 03
Strategic Programs
April 1993

A. RESOURCES: ($ In Thousands)
Project Title: Interceptor Component Technology

Program Name:	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	Total Program
LDS DEM/VAL	35,818	15,235	14,651	Continuing
FOT DEM/VAL	0	2,500	0	Continuing

B. BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

This project is developing advanced components for lightweight, low cost interceptors for global, national, and theater missile defense. The technologies provide a basis for highly effective ground- and space-based interceptor systems that are deployable through the year 2000 and beyond, with follow-on efforts. Technology development efforts focus on addressing the more stringent requirements, such as on-board discrimination, greater kinematic capability, enhanced autonomy, and increased threat complexity. Component performance will be demonstrated through ground testing of hardware and software at contractor's facilities, the KKV Hardware-in-the-Loop Simulation (KHILS) facility, the National Hover Test Facility (NHTF), and through flight testing.

Funding reductions made it necessary to cancel most of the work in this project in FY93. The Pilotline Experiment was one program that was continued. PET is developing producibility techniques for hardened LWIR HgCdTe focal plane arrays. Seeker components that were being developed ranged from the UV through the VLWIR. Recently initiated efforts in multicolor operation to aid in discrimination will all be terminated. Miniature ladar with agile beam steering is continuing for robust discrimination capability. A small effort will continue to develop accurate, miniature fiber optic inertial measurement units.

C. PROGRAM ACCOMPLISHMENT AND PLANS:

- o Fabricated and tested quantum well (MQW) focal plane arrays.
- o Delivered 3 (per contractor) hardened LWIR 128x128 HgCdTe focal plane array prototypes for evaluation.
- o Performed end-to-end artificial neural network signal processor demonstration.
- o Delivered breadboard 1-axis gyro for micromechanical IMU.
- o Completed solid axial stage flight weight development.
- o Awarded agile beam director contract for beam steering for advanced laser radars.
- o Continue PET program.
- o Continue LATS program.
- o Continue FOG IMUs.
- o Continue Miniature Ladar.
- o Continue Rapid Beam Steering.
- o Continue PET program.
- o Continue LATS program.

- o Continue fog IMUs.
- o Continue Miniature Ladar.
- o Continue Rapid Beam Steering.

Program Plan to Completion: This is a continuing program.

D. WORK PERFORMED BY:

- o Loral
- o Hughes/SBRC
- o Lockheed
- o Honeywell
- o Fiberteck
- o Raytheon
- o TDC

E. COMPARISON WITH FY 1993 DESCRIPTION SUMMARY:

1. TECHNICAL CHANGES: None
2. SCHEDULE CHANGES: None
3. COST CHANGES: None

F. PROGRAM DOCUMENTATION:

G. RELATED ACTIVITIES:

All SDIO Interceptors benefit from technologies developed in this Project.

The Advanced Discrimination Technology effort PE No. 0603215C (Limited Defense System) Project 1208 will take over discrimination technologies developed in this project.

H. OTHER APPROPRIATION FUNDS: None

I. INTERNATIONAL COOPERATIVE AGREEMENTS: Yes

J. MILESTONE SCHEDULE:

- o Deliver 300 PET FPAs at 1000/yr
- o Deliver LATS TSBU
- o Demo Agile Beam Director
- o Demo Modular Solid St Ladar

FY1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: 0603217C
PE Title: Follow-On Technologies

Project Number: 1202
Budget Activity: 02
Advanced Technology Development
April 1993

A. RESOURCES: ($ in Thousands)
Project Title: EXO Integration Technology

Program Name:	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	Total Program
LDS DEM/VAL	78,000	140,392	0	Continuing
FOT DEM/VAL	47,035	44,023	48,835	Continuing

B. BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

This project provides funding of the Miniature Sensor Technology Integration (MSTI) technology development program. The overall objectives of this program are to provide for the development, independent government testing, and integration of state-of-art advanced technology demonstrations (ATDs) to provide risk reduction for systems that could be deployed prior to the beginning of the twenty-first century. Specifically, MSTI develops, integrates and tests low-cost, modular satellite busses and conducts on-orbit functional demonstrations of advanced technology integrated sensors that support boost phase missile tracking. The standard MSTI spacecraft bus will support simplified, rapid integration and testing of multiple technology payloads. The MSTI bus also performs orbital tests of interceptor seekers, processors, propulsion systems, communications systems, and other components in a long-duration space exposure environment which will provide performance data in support of interceptor EMD decisions. The various MSTI satellites will be used to collect optical phenomenology in multiple wavebands and performance information on LEAP flight tests, dedicated targets, and targets of opportunity. Incremental testing approach will be taken to eventually evolve a MSTI plume tracking, cuing, and handover capability which can be utilized on advanced LEAP interceptor flight tests. In addition, this project funds the integration of interceptor technologies with dual-use or civil applications into near term demonstrations.

Other LEAP technology development efforts under Project 1202 have been transitioned to Project 1210 beginning in FY1994.

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

- o Demonstrated fully integrated miniature solid divert propulsion system during static test fire simulating realistic mission scenario.
- o Attempted free flight, suborbital space intercept of cold body target at WSMR. Validated projectile performance in space.
- o Continued planning for and began first phase of LEAP technology demonstration experiments.
- o Performed free flight hover tests of LEAP projectiles with improved advanced technology components.
- o Continued planning for LEAP technology experiments which will further prove out LEAP technologies in support of EMD decisions.

Program Element: 0603217C
PE Title: Follow-On Technologies

Project Number: 1202
Budget Activity: 02
Advanced Technology Development
April 1993

- Continued development of axial kick stages to support high speed LEAP intercepts. Refocused program to support LEAP technology demonstration.
- Completed the LENS Tunnel construction and initial aero-optic instrumentation calibration.
- Conducted facility ground validation tests in the LENS Tunnel.
- Completed design, fabrication, testing of first MSTI spacecraft.
- Initiated design for MSTI-2 mission.
- Provide advanced payloads for future MSTI missions.
- Demonstrated first (pathfinder) Miniature Seeker Technology Integration (MSTI) satellite in orbital launch from Vandenberg on SCOUT launch vehicle. Collected MWIR background data for future mission planning.
- Incorporate advanced SWIR and MWIR seeker technologies into MSTI-SCOUT 2 and perform tracking of LEAP targets and targets of opportunity in two wavebands.
- Complete design of MSTI-3 satellite. MSTI-3 to utilize multiple waveband sensors to track targets, collect phenomenology and to compute on-board limited track files for handoff to ground control assets.
- Complete design for orbital cross-link and distributed sensor processing using multiple MSTI satellites.
- Develop system requirements for MSTI-4 satellites.
- Assess feasibility of conducting joint technology cooperation projects with Russians and dual use of missile tracking space-based sensors.
- Initiate design efforts for long-duration, stressing space environment mission (MSTI-5).
- Complete development and testing of MSTI-3 and -4. Execute on-orbit operations of MSTI-2,-3, and -4 missions, including tracking of interceptor targets trajectories. Continue development and testing of MSTI-5
- Continue development for advanced technology flight tests.
- Demonstrate advanced sensors in flight experiments on MSTI satellites.
- Demonstrate advanced technology communications payloads and downlink capabilities.
- Perform closed loop tracking of theater ballistic missile-class targets and targets of opportunity in multiple wavebands. Collect background phenomenology data as secondary objective.
- Begin integration of LEAP derived components into the Deep Space Program Science Experiment missions.

Program Plan to Completion: This is a continuing program.

D. WORK PERFORMED BY:

In-House:
- Air Force Phillips Laboratory

Program Element: 0603217C
PE Title: Follow-On Technologies

Project Number: 1202
Budget Activity: 02
Advanced Technology Development
April 1993

- Jet Propulsion Laboratory
- AF Phillips Laboratory
- AF Phillips Laboratory
- Lawrence Livermore National Laboratory
- US Army Space and Strategic Defense Command

Contractor:
- Spectrum Astro, Inc.
- Rocketdyne Div, Rockwell Corp.
- ANSER Corp.
- Loral EOS
- Wyle Laboratories
- SPARTA Inc.
- ISI
- SEMCO
- Hughes Missile Systems Company

E. COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. TECHNICAL CHANGES: Moved all LEAP activities to Project 1210. Add phenomenology data collection as secondary objective.
2. SCHEDULE CHANGES: Moved MSTI-2 to 4Q/FY93. Moved MSTI-3 to 2Q/FY94. Moved MSTI-5 to 4Q/FY95.
3. COST CHANGES: None

F. PROGRAM DOCUMENTATION:

G. RELATED ACTIVITIES:

o 1210 LEAP Tech Demo Program	PE No. 0603215C
o 1504 Materials and Structures Technology	PE No. 0603218C
o 1201, 2201, 2202, 2203, and 2205 Miniaturized Integration Technology and Validation	PE No. 0603216C PE No. 0603215C
Facilities Support	PE No. 0603214C

There is no unnecessary duplication of effort within SDIO or the DoD.

H. OTHER APPROPRIATION FUNDS: None

I. INTERNATIONAL COOPERATIVE AGREEMENTS: None

J. MILESTONE SCHEDULE:

- MSTI SCOUT- 1 Launch
- MSTI SCOUT- 2 Launch
- MSTI - 3 Launch
- MSTI - 4 Launch
- DSPSE - EDR
- MSTI - 5 Launch
- DSPSE - Launch

FY1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: 0603217C
PE Title: Follow-On Technologies

Project Number: 1203
Budget Activity: 02
Advanced Technology Development
April 1993

A. RESOURCES: ($ in Thousands)
Project Title: Hypervelocity Technology

Program Name:	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	Total Program
FOT DEM/VAL	6,166	0	0	Continuing

B. BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

This project will develop a hypervelocity gun (HVG) with associated fire control to demonstrate the potential of a HVG system as a candidate weapon system for Theater Missile Defense (TMD) in the mid-term and other longer range applications in the far-term. To launch a 5-7 kg projectile with velocities greater than 3 km/sec, and a rep rate of 2Hz, the High Energy Railgun Integrated Demonstration (HERID) electromagnetic launcher and Eglin battery upgrade supply (BUS) system is being developed as a test bed for pre-DEM/VAL demonstrations. A 1/4 and 1/2 scale model experiment is being performed to reduce the risk of the HERID demonstration.

HVGs feature very high acceleration and minimum dead zone intercepts, potential for low marginal costs per round for large required inventories, practicality of quickly switching loads, reduced weight and volume of ammunition and potential for very high velocities with very high acceleration.

Cooperative HVL experimental and applied research efforts will be conducted with approved foreign organizations in accordance with SDIO memoranda of understanding.

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

- o HERID 1/4 scale experiments begun.
- o HERID thermal validation experiments begun.
- o Hypervelocity experiments (5-6 km/s) begun.
- o Solid state opening switch (100/200 KA) static load testing.
- o No FY 1993 funding planned.
- o No FY 1994 funding planned.

Program Plan to Completion: This is a continuing program.

Program Element: 0603217C
PE Title: Follow-On Technologies

Project Number: 1203
Budget Activity: 02
Advanced Technology Development
April 1993

D. WORK PERFORMED BY:

- o Sparta, Inc.
- o PKD, Inc.
- o General Atomics
- o SAIC

E. COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. TECHNICAL CHANGES: Facility Terminated.
2. SCHEDULE CHANGES: None
3. COST CHANGES: None

F. PROGRAM DOCUMENTATION:

G. RELATED ACTIVITIES:

Innovative Science Technology Directorate's Thunderbolt program (PE No. 0603218C, Project 1601) will add to credibility of this program to achieve high muzzle velocities (greater than 7 km/sec) for electromagnetically launched projectiles. There is no unnecessary duplication of effort within SDIO or the DoD.

H. OTHER APPROPRIATION FUNDS: None

I. INTERNATIONAL COOPERATIVE AGREEMENTS: None

J. MILESTONE SCHEDULE:

- o 1/4 Scale HERID Tests
- o Hypervelocity Experiments (5-6 km/s)

FY1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: 0603215C/0603217C
PE Title: Limited Defense System / Follow-On Technologies

Project Number: 1204
Budget Activity: 02/03
Advanced Technology Development / Strategic Programs
April 1993

A. RESOURCES: ($ in Thousands)
Project Title: Interceptor Studies and Analysis

Program Name:	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	Total Program
LDS DEM/VAL	0	7,500	4,884	Continuing
FOT DEM/VAL	10,993	0	5,861	Continuing

B. BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

This project funds scientific, technical support to government program managers in the technology directorate. Types of studies include special projects for advanced technologies, program planning and analysis, and aerodynamic studies and analysis. Additional efforts include analysis, research and development on interceptor components, and planning and risk mitigation for interceptor flight tests.

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

- Awarded the new Scientific and Engineering Technical Assistance Contract.
- Continued analysis and coordination necessary to accomplish efficient program management by Government program managers.
- Continued with technology feasibility studies related to testing and traceability into element programs.
- Continued support of the technical feasibility decision through the use of engineering analysis and simulation of the interceptor component and integration technologies.
- Continued support to LEAP, ENDO LEAP, MSTI, Navy LEAP, and Advanced LEAP Technology Programs.
- Perform technology trade-off analysis.
- Perform aerodynamic modeling and analysis of ENDO LEAP concepts.
- Provide in-depth technical comparisons of emerging technologies.
- Analyze architectural changes and determine interceptor technology development requirements.
- Plan, in detail, demonstration flight experiments.

Program Plan to Completion: This is a continuing program.

Program Element: 0603215C/0603217C
PE Title: Limited Defense System / Follow-On Technologies

Project Number: 1204
Budget Activity: 02/03 Advanced Technology Development / Strategic Programs
April 1993

D. WORK PERFORMED BY:

- o ANSER Corp.

E. COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. TECHNICAL CHANGES: Concentrate technical support on the more complex flight tests and demonstrations emerging in the interceptor technology directorate.
2. SCHEDULE CHANGES: None
3. COST CHANGES: None

F. PROGRAM DOCUMENTATION: None

G. RELATED ACTIVITIES:

o	1201	Interceptor Component Tech	PE No. 0603215C
o	1202	Interceptor Integration Tech	PE No. 0603217C
o	1209	ENDO Atmospheric Interceptor Tech	PE No. 0603215C
o	1210	Navy Leap Tech Demo	PE No. 0603217C
o	2202	GBI	PE No. 0603215C

There is no unnecessary duplication of effort within SDIO or the DoD.

H. OTHER APPROPRIATION FUNDS: None

I. INTERNATIONAL COOPERATIVE AGREEMENTS: None

J. MILESTONE SCHEDULE:

- o Exercise Contract Option
- o Exercise Contract Option

FY1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: 0603215C
PE Title: Limited Defense System

Project Number: 1208
Budget Activity: 03
Strategic Programs
April 1993

A. RESOURCES: ($ In Thousands)
Project Title: Discriminating Interceptor

Program Name:	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	Total Program
LDS DEM/VAL	475	200	0	Completed

B. BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

To achieve a high probability of kill of midcourse targets, interceptors must be capable of discriminating between real targets, decoys and debris during the exo-atmospheric portion of flight. The interceptor must be lightweight and must be able to kinematically engage a full range of threats. To acquire midcourse targets and perform discrimination at sufficient range to implement guidance commands requires fusion of multispectral passive and ladar data to capitalize on available discriminants. Processors able to support the large computational demand, and high thrust divert are needed while staying within cost and weight constraints. The DI was once beyond the limit of technology, but recent advances in interceptor signal and data processor development (PE No. 0603217C, Project 1201), have now made it feasible.

Discriminating interceptors with increased autonomy will simplify the overall architecture. Discriminating seekers are now feasible with higher resolution and signal-to-noise ratios than current state-of-the art technology can provide. Discrimination technology will allow interceptors to take advantage of not only temperature and emissivity, but of other discriminants as well, including spectral, temporal, and spatial characteristics.

The Advanced Discrimination Interceptor (ADI) program will design, fabricate, and test a technology test vehicle (TTV) traceable to an advanced vehicle concept (AVC) design, demonstrating technology for a block upgrade option for Ground Based Interceptors which are to be deployed at the initial NMD site. Seeker components will be developed that utilize the latest in active and passive technology to do discrimination on-board the interceptor. Critical components will be fabricated and tested. The TTV will be designed, fabricated, and tested to prove the technology. The program will culminate with the completion of a validated AVC design.

C. PROGRAM ACCOMPLISHMENT AND PLANS:

- Initiated ADI program.
- Initiated Discriminating Electronics Development.
- Performed trade studies and analyses.

Program Element: 0603215C
PE Title: Limited Defense System

Project Number: 1208
Budget Activity: 03
Strategic Programs
April 1993

- o Complete AVC and TTV Preliminary Design.
- o Design Breadboard Discriminating Seeker.
- o Formulate Critical Technology Demonstration Plan.

D. WORK PERFORMED BY:

- o Rockwell
- o Hughes MSG
- o Martin Marietta

E. COMPARISON WITH FY 1993 DESCRIPTION SUMMARY:

1. TECHNICAL CHANGES: None
2. SCHEDULE CHANGES: None
3. COST CHANGES: None

F. PROGRAM DOCUMENTATION:

G. RELATED ACTIVITIES:

The ADI effort PE No. 0603215C (Limited Defense System) Project 1208 will benefit from developments in Interceptor Component Technology (PE No. 0603217C, Project 1201). The discriminating interceptor will incorporate any of the following technologies that prove to be useful to an NMD Block Upgrade: focal plane array and readout electronics, ladars, beam steering, optics, signal processors, sensor/data fusion algorithms, discriminating algorithms, inertial measurement units, and propulsion. The Interceptor Integration PE No. 0603217C, (Other Follow-On Systems) Project 1202, effort is closely tied to component development and is currently scheduling HWIL evaluation and flight test validation of the emerging technology components of promise. As the component technologies mature to the point of flight readiness, they are demonstrated in realistic scenarios and environments to assess their true payoff. There is no unnecessary duplication of effort within SDIO or the DoD.

H. OTHER APPROPRIATION FUNDS: None

I. INTERNATIONAL COOPERATIVE AGREEMENTS: Yes

J. MILESTONE SCHEDULE:

- o Initiate Discriminating Electronics Development
- o Begin Basic ADI Phase (Concept Definition)
- o Perform Subsystem Trades and Requirements Flowdown
- o Complete ADI AVC and TTV Preliminary Design
- o Complete Design of Breadboard Discriminating Seeker
- o Formulate Critical Technology Demonstration Plan
- o Complete ADI TTV Critical Component Design
- o Perform Contractor Downselect and Begin Phase 2 (Seeker Brassboard Fab and Test)

Program Element: 0603215C
PE Title: Limited Defense System

Project Number: 1208
Budget Activity: 03
Strategic Programs
April 1993

- Develop and Verify Discriminating Algorithms
- Conduct first early component demos on PMBs
- Complete breadboard seeker
- First breadboard seeker test at KHILS/AMOR
- TTV CDR (complete Phase II, begin Phase III)

FY1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: 0603215C
PE Title: Limited Defense System

Project Number: 1209
Budget Activity: 03
Strategic Programs
April 1993

A. RESOURCES: ($ In Thousands)
Project Title: Endo-Atmospheric Interceptor Technologies

Program Name:	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	Total Program
LDS DEM/VAL	24,500	18,910	0	Completed
FOT DEM/VAL	25,530	0	0	Completed

B. BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

Current PB has no funding programmed for this program. If not restored program will be cancelled.

The Endo-Atmospheric Interceptor Technologies Program is a comprehensive approach to coordinate the development and demonstration of advanced components critical for small, lightweight (<17KG) high velocity (4km/s) interceptors. These technologies will provide the basis for strategic and tactical ballistic missile interceptors operating within the atmosphere.

The project includes the development, evaluation and test of innovative active and passive seeker concepts and aperture concepts through Broad Agency Announcements (BAA). The BAA effort is managed for SDIO by the US Army Strategic and Space Defense Command, Huntsville, AL, and the Naval Air Warfare Center, China Lake, CA. These seeker and aperture concepts will be tested in the Aero Optical Evaluation Center (AOEC) being developed by SDIO for this purpose.

Through the efforts of two prime contractors, using appropriate component technology from the BAAs and other sources, this project will develop and demonstrate miniaturized endoatmospheric interceptor testbed vehicles for strategic and tactical missile defense. The miniaturized experimental vehicle will have self-contained autonomous guidance, jet reaction or aerodynamic control, optical or radar seekers and will be capable of hit-to-kill (HTK) accuracy, not requiring a warhead or kill enhancement device.

The component technologies developed will provide block upgrade to current ERINT or Patriot concepts, enhanced THAAD performance capabilities, and enabling technologies for CORPS SAM and Navy TMD. Aimpoint selection and minimum seeker response time will provide assured endoatmospheric Hit-to-Kill performance, making the interceptor more responsive to advanced threats. RF components developed within this effort will replace current TWT technologies with high power solid state devices, significantly reducing interceptor size and weight.

This project will provide endoatmospheric technologies for the Ground Based Interceptors which are to be deployed at the initial NMD site. The aero-thermal and aero-optical issues associated with hyper velocity flight in the atmosphere will be resolved. Advanced window materials and cooling techniques will be developed and tested. This will

allow interceptor velocities and performances that exceed the current low velocity interceptor flight capability.

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

- Completed the design of seeker and aperture components.
- Conducted ENDO LEAP Preliminary Design Review and selected Phase II contractors.
- Defined Flight Test Options and Booster Candidates.
- Begin fabrication of ENDO LEAP aperture components for two EO and one RF seeker.
- Test aperture components at AOEC.
- Begin ENDO LEAP Target Design.
- Begin ENDO LEAP flight test planning.
- Begin fabrication of ENDO-LEAP seekers.
- Test ENDO LEAP Seekers at AOEC.
- Complete aero-optical/aero-thermal testing of numerous advanced IR windows.
- Begin fabrication of ENDO LEAP experimental subsystems.
- Test ENDO LEAP prime IR seeker heads in the Eglin AFB Hardware-in-the-Loop facility with the form, fit, and function seeker heads delivered during Phase II.

D. WORK PERFORMED BY:

ENDO LEAP
- Lockheed Missile and Space Company
- McDonnell Douglas Space Systems Company

E/O and MMW Seeker/Aperture Technology
- Applied Research Associates
- Aerojet
- BDM
- Irvine Sensors
- Loral
- LTV
- Raytheon
- Rockwell
- Textron
- Westinghouse

Dual Mode (MMW/IR)
- Aero Thermal Systems & Structures
- Rockwell

E. COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. TECHNICAL CHANGES: None
2. SCHEDULE CHANGES: None

Program Element: 0603215C
PE Title: Limited Defense System

Project Number: 1209
Budget Activity: 03
Strategic Programs
April 1993

3. COST CHANGES: Fourteen month delay due to reduced FY92 Phase II funding. Approximately $5M increase due to delay. Cancel program if FY94 funding not restored.

F. PROGRAM DOCUMENTATION:

G. RELATED ACTIVITIES:

This project is closely related to Project 3310 which is supplying the ground test facilities for test of the seekers/apertures, and experimental vehicles. As the components and experimental vehicles are ready for flight test, they will use the flight test services project for boosters, targets, and range operations. Projects 2203 (Strategic Ground Based Interceptor) and 2210 (Theater Defense Interceptor) will benefit from the development and test of the endo-atmospheric interceptor technology. There is no unnecessary duplication of effort within SDIO or the DOD.

H. OTHER APPROPRIATION FUNDS: None

I. INTERNATIONAL COOPERATIVE AGREEMENTS: None

J. MILESTONE SCHEDULE:

- Fish Eye Variant Window/Aperture Design
- SMART Window Microoptics Fabrication Eval Complete
- Internally Cooled Window Detailed Design Completed
- Microlens Window Detail Design Completed
- Multifaceted Dome, Facet Coupon Tests
- Multifaceted Dome #1 Fabricated
- Enhanced Aperture Model Delivered to AEDC
- Thin Window Concept Selection
- Fast Framing IC, 64 Channel, Output at 1KHz
- Recessed Window Design Completed
- ENDO LEAP PDR (Select Phase II Contractor[s])
- MOSAIC Window Conical Design Complete
- Multifaceted Dome AEDC Arc Jet Tests
- Enhanced Aperture Model Delivered to Lens
- Diamond Window Optimum Deposition Process Selection
- Microlens Window Fabrication Completed
- Internally Cooled Window Test Article Complete
- Diamond Window Optimum Coating Process Selection
- Thin Window Model Fabrication Completed
- Recessed Window ARCJET Testing Completed
- Fast Frame Seeker Testing Completed
- Complete E/O and MMW Seeker/Aperture ARCJET Experiments
- Complete ENDO LEAP Seeker Tests
- IR window materials evaluation flight test
- IR window cooling evaluation flight test
- MMW radome evaluation flight test

FY1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: 0603217C
PE Title: Follow-On Technologies

Project Number: 1210
Budget Activity: 02
Advanced Technology Development
April 1993

A. RESOURCES: ($ in Thousands)
Project Title: LEAP Tech Demo Program

Program Name:	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	Total Program
FOT DEM/VAL	6,550	0	0	Continuing

B. BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

Funding under this program provides for the planning and testing which could provide a low-cost, low-risk, demonstrated technology insertion option, based on LEAP interceptor technologies, for national and global missile defense. The program identifies and demonstrates high payoff advanced technology for integration into state of the art interceptors.

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

- o Developed detailed flight test plans and mission scenarios.
- o Initiated kick stage motor development and flight qualification program. Static fired first reduced diameter LEAP configuration successfully.
- o Successfully performed 1 Terrier missile suborbital kinematic and controllability flight test demonstration of exoatmospheric capability.
- o Demonstrated fire control upgrades for exoatmospheric flight.
- o None. Continuing efforts are funded through the TMD program element.

Program Plan to Completion: This is a continuing program.

D. WORK PERFORMED BY:

In-House:
- o AF Phillips Laboratory
- o US Army Space and Strategic Defense Command
- o Naval Research Laboratory
- o AF Space and Missile Systems Center
- o US STRATCOM
- o Air Combat Command

Program Element: 0603217C
PE Title: Follow-On Technologies

Project Number: 1210
Budget Activity: 02
Advanced Technology Development
April 1993

Contractor:
- Missile Systems Group, Hughes Aircraft Company
- Boeing Aircraft Company
- Rockwell International, Rocketdyne Division
- ANSER Corp.
- Thiokol Corp.
- Hughes Missile Systems Company
- Raytheon Corp.

E. COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. TECHNICAL CHANGES: None
2. SCHEDULE CHANGES: None
3. COST CHANGES: None

F. PROGRAM DOCUMENTATION:

G. RELATED ACTIVITIES:

o 1202 EXO Integration Technology	PE No. 0603215C
o 1504 Materials and Structures Technology	PE No. 0603218C
o 2201, 2202, 2203, and 2205, 1202, 1211	PE No. 0603216C/
Miniaturized Integration Technology and	PE No. 0603215C/
Validation Facilities Support	PE No. 0603214C
o 2213 Naval and Marine Corps TMD	PE No. 0603216C

There is no unnecessary duplication of effort within SDIO or the DoD.

H. OTHER APPROPRIATION FUNDS: None

I. INTERNATIONAL COOPERATIVE AGREEMENTS: Yes

J. MILESTONE SCHEDULE:

- FTV 1

FY1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: 0603215C
PE Title: Limited Defense Systems

Project Number: 1211
Budget Activity: 03
Strategic Programs
April 1993

A. RESOURCES: ($ in Thousands)
Project Title: Interceptor Facilities

Program Name:	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	Total Program
LDS DEM/VAL	16,525	0	0	Transferred

B. BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

Funding provided for the development of technology and facilities for independent government testing of state-of-the-art component technology to provide risk reduction for systems that could be deployed prior to the beginning of the twenty-first century. Through FY 1992, efforts in this project were funded in project 1202. In FY 1993, and afterwards, funding will be provided within project 3310.

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

- Hardware in the loop testing of the advanced long wavelength infrared and ultraviolet wavelength seekers.
- Hover tests and support for Air Force LEAP (second test), SBI, GBI and Brilliant Pebbles.
- Completion of 800 meter target test stand for more realistic hover testing.
- LENS Tunnel upgrades which include a high pressure, high volume compressor, and additional hydrogen/helium tankage.
- Air Force LEAP software final verification and preflight testing at KHILS.
- KHILS Phase II IOC.
- KHILS hardware-in-the-loop testing for Discriminating Interceptor, ULTRASEEK, GBI and SPPD.
- Installation of the Flickerless Scene Projector prototype, the Wideband IR Array prototype and the Advanced Flight Motion Simulator prototype enhancements to the KHILS facility.

Program Plan to Completion: This is a continuing program

D. WORK PERFORMED BY:

In-House
- Wright Laboratory
- Air Force Phillips Laboratory
- Air Force Office of Scientific Research (AFOSR)

Program Element: 0603215C
PE Title: Limited Defense Systems

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Contractor:

- o Aura Systems, Inc.
- o CALSPAN University of Buffalo Research Center (CUBRC)
- o Contraves, Inc.
- o Electro-Optek, Corp.
- o Martin Marietta
- o University of Alabama at Huntsville (UAH)
- o STA
- o Sparta Inc.
- o Stratonics, Inc.

E. COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. TECHNICAL CHANGE: None
2. SCHEDULE CHANGES: None
3. COST CHANGES: None

F. PROGRAM DOCUMENTATION:

G. RELATED ACTIVITIES:

- o 1202 EXO Integration Technology — PE No. 0603217C
- o 1209 ENDO LEAP — PE No. 0603215C
- o 1210 LEAP Tech Demo Program — PE No. 0603217C

There is no unnecessary duplication of effort within SDIO or the DoD.

H. OTHER APPROPRIATION FUNDS: None

I. INTERNATIONAL COOPERATIVE AGREEMENTS: None

J. MILESTONE SCHEDULE:

- o Deliver Air Force LEAP, Ground Test Projectile (GTP) to NHTF
- o Deliver SBI Ground Test Projectile (GTP) to NHTF
- o Advanced Flight Motion Simulator prototype IOC in KHILS
- o Wide Spectral IR Scene Projector IOC (KHILS)
- o 800 meter target test stand for NHTF complete

FY1994 RDT&E DESCRIPTIVE SUMMARY

0603217C
w-On Technologies

Project Number: 1212
Budget Activity: 02
Advanced Technology Development
April 1993

ESOURCES: ($ In Thousands)
Project Title: D-2 Program

me:	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	Total Program
AL	5,768	9,800	4,884	Continuing

BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

This project will develop and demonstrate the launch of a guided projectile (D-2) from a hypervelocity gun (HVG) with associated fire control to prove the potential of a HVG system as a candidate weapon system for Theater Missile Defense (TMD) and other longer range applications. This involves the development of the Gee-hardened D-2 projectile including avionics which is command or autonomously guided.

PROGRAM ACCOMPLISHMENT AND PLANS:

- o Fully Integrated Thruster System (FITS) hot fire tested.
- o IMU assembled and hi-gee tested.
- o Sabot successfully launched at 66 Kgees at 2.1 km/sec.
- o Structural materials tested.
- o Continue D-2 development and field tests.
- o Continue HVG technology development in the areas of miniature IMU, Processing, Passive seeker, and active adjunct.

Program Plan to Completion: This is a continuing program

D. WORK PERFORMED BY:

- o General Electric

E. COMPARISON WITH FY 1993 DESCRIPTION SUMMARY:

1. TECHNICAL CHANGES: None
2. SCHEDULE CHANGES: None
3. COST CHANGES: None

F. PROGRAM DOCUMENTATION:

G. RELATED ACTIVITIES: A1206.5 Adv TMD Weapons. There is no unnecessary duplication of effort within SDIO or the DoD.

H. OTHER APPROPRIATION FUNDS: None

I. INTERNATIONAL COOPERATIVE AGREEMENTS: Yes

J. MILESTONE SCHEDULE:

- o FITS hot fire tests

FY1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: 0603217C
PE Title: Follow-On Technologies

Project Number: 1212
Budget Activity: 02
Advanced Technology
Development
April 1993

FY1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: 0603217C
PE Title: Follow-On Technologies

Project Number: 1301
Budget Activity: 02
Advanced Technology Development
April 1993

A. RESOURCES: ($ in Thousands)
Project Title: Radio Frequency Free Electron Laser (RFFEL) Technology

Program Name:	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	Total Program
FOT DEM/VAL	22,269	14,232	0	Transferred

B. BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

The goal of the RFFEL program is to demonstrate the capability of a high power FEL to perform boost phase and post-boost phase intercept of ballistic missiles or theater missiles from earth orbiting platforms. Midcourse interactive discrimination is also possible by destroying simple decoys and thermally tagging or imparting velocity change to sophisticated decoys. Additional Space Based (SB) FEL missions include self defense, defense of other platforms in the strategic defense constellation, and the suppression of tactical aircraft. The laser also has dual-use capabilities for research in materials science, advanced ultraviolet photo-lithography, medical treatments, and other industry applications.

The primary thrust of the current program is the design and fabrication of a proof-of-principle FEL device to validate FEL technology and prove power scaling capability for ballistic and theater missile defense requirements. This effort is called the Average Power Laser Experiment (APLE). The APLE is a tunable (9-11 micron) 100kW average power FEL using a Single Accelerator Master Oscillator-Power Amplifier (SAMOPA) design.

FEL technology development is planned in parallel with the APLE device fabrication, concentrating on advancing and tailoring technology required for FEL operation in space, on a ship, or on a mobile ground-based platform. This technology includes improved system efficiency, and the development of superconducting and cryogenic accelerators. The technology development strategy leverages a large amount of beam control, optics and acquisition, tracking, pointing, and power technologies from other directed energy weapon projects.

In response to the FY93 Defense Authorization Act, the entire FEL program, including all out year TOA, was transferred to the Army under PE602609A.

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

- Completed construction of the superconducting radio-frequency accelerator module.
- Completed fabrication and tested APLE photoinjector at full design power.
- Demonstrated the SAMOPA design in the APLE Prototype Experiment (APEX) at Los Alamos, NM.
- Completed design and construction of cryogenic RF accelerator module

Program Element: 0603217C
PE Title: Follow-On Technologies

Project Number: 1301
Budget Activity: 02
Advanced Technology Development
April 1993

- Fully benchmarked FEL computer design codes with APEX and APLE photoinjector test data.
- Conducted high power oscillator final design review.
- Completed APEX tests.
- Started APLE accelerator test at full klystron RF power.
- Completed construction of 5-cell accelerator module.
- TBD

Program Plan to Completion: NA

D. WORK PERFORMED BY:

Major Contractors:
- APLE - Boeing Aerospace and Electronics - with technical support from Los Alamos National Laboratory

E. COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. TECHNICAL CHANGES: None
2. SCHEDULE CHANGES: None
3. COST CHANGES: None

F. PROGRAM DOCUMENTATION:

G. RELATED ACTIVITIES:

o 1302 Chemical Laser	PE No.0603217C
o 1303 Neutral Particle Beam	PE No.0603217C
o 1305 ATP/FC	PE No.0603217C
o 1503 Power & Power Conditioning	PE No.0603217C
o 2204 DEW	PE No.0603217C

There is no unnecessary duplication of effort within SDIO or the DoD.

H. OTHER APPROPRIATION FUNDS:

1. PROCUREMENT: None
2. MILITARY CONSTRUCTION: None

I. INTERNATIONAL COOPERATIVE AGREEMENTS: Yes

J. MILESTONE SCHEDULE:

- APLE Photoinjector completed
- Los Alamos APLE Prototype Experiment Completed
- APLE Accelerator Test at full klystron power complete
- APLE Electron Beam Accelerator Test Complete
- High Power Oscillator Laser Test

FY1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: 0603217C
PE Title: Follow-On Technologies

Project Number: 1302
Budget Activity: 02
Advanced Technology Development
April 1993

A. RESOURCES: ($ in Thousands)
Project Title: Chemical Laser Technology

Program Name:	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	Total Program
FOT DEM/VAL	99,158	69,464	59,100	Continuing

B. BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

The Chemical Laser (CL) program is developing high leverage high energy laser (HEL) technologies for the future defense of the nation. The program is composed of a ground integration/demonstration of HEL components developed by SDIO over the past decade as well as the development of advanced HEL technologies. Since the formation of SDIO, the CL program has served as a national focal point for the development of HEL technologies, currently serving as a springboard for emerging Service programs for air (USAF), ground (USA), and sea (USN) based HEL programs. However, the highest leverage basing of this technology, under development since the formation of SDIO, is the space-based laser.

The space-based laser (SBL) is the only major U.S. technology under development that can provide for global, 24 hour, early boost phase intercept (BPI) of both theater and strategic ballistic missiles. This capability will undoubtedly prove critical in a future world held hostage to the almost certain proliferation of ballistic missile technology. In addition to early BPI, the SBL can provide for increased capability for hard kill of missile payloads in the bus phase, additional robust passive and active midcourse discrimination against simple decoys, interactive discrimination against more sophisticated decoys, and negation of long range strategic bombers and cruise missiles. Boost phase kill of tactical or strategic ballistic missiles provides very high leverage to the defense by negating missiles before they can deploy multiple warheads, decoys, chemicals, or submunitions. In all cases, debris will fall far from protected territory, often onto the territory of the aggressor. Early boost phase kill also provides effective defense against threats which are most difficult for purely kinetic energy based architectures, namely low apogee trajectory and high traffic threats.

Critical technical issues for the SBL element can be grouped into five areas: the laser device; beam control; optics; acquisition, tracking, pointing and fire control (ATP/FC); and high power integration. The laser or beam generating device is a hydrogen fluoride chemical laser which produces the high power laser beam by photon extraction from excited HF molecules, generated by the energetic reaction of hydrogen and fluorine. In multiple tests from 1990 to 1992, the Alpha HF laser demonstrated near-weapon-level continuous-wave operation. The Alpha design is space compatible and directly scalable to weapon-level power requirements. Required beam control technology was demonstrated by the LODE program in 1987. Required optical technology can be subdivided into two classes: small high-incident-power optics for handling the high power beam within

the SBL and large moderate-incident-power optics for directing the expanded high power beam toward the target. Required small high-power optics have been demonstrated in a number of SBL programs, including Alpha. The LAMP program, completed in 1989, demonstrated a 4-meter diameter beam director primary mirror whose design is space compatible and directly scalable to weapon size. ATP/FC technology is being developed in project 1305 and has made excellent progress toward developing the technology to meet SBL ATP/FC requirements. High power integration is being demonstrated in the Alpha & LAMP Integration (ALI) program. In ALI, the Alpha, LODE, and LAMP hardware and technologies are being integrated for an end-to-end (save ATP/FC) ground demonstration of an SBL in FY96. In parallel, a number of laboratory efforts are developing additional promising technologies for defense against robust far-term threats. These efforts include shorter wavelength lasers that may achieve equivalent range performance with a smaller diameter beam director mirror, molecular (rather than mechanical) methods for compensation of beam aberrations to produce the required beam quality, and manufacturing techniques for improving the producibility and decreasing the cost of large optics.

Upon completion of ALI, the ALI hardware and designs may be repackaged for a SBL ATD. A conceptual design and program plan for this ATD, named Star LITE, has already been developed. In Star LITE, ALI hardware and designs are repackaged for spaceflight, mated with an ATP suite and spacecraft, and ground tested to insure operability. Upon completion, an option can be executed to mate Star LITE with a launch vehicle for a space demonstration of the weapon scalable Star LITE SBL against simulated ballistic missiles targets. The Star LITE space experiment has already been reviewed and judged ABM treaty compliant by the DoD Compliance Review Group. The Star LITE experiment will demonstrate the readiness of the SBL to enter into EMD. With additional Chemical Laser funding, an initial operational capability for the SBL could be achieved by the middle of the next decade.

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

- o Demonstrated high power performance of an uncooled optic in an Alpha high power experiment.
- o Completed the final design review and began hardware fabrication of nearly all the Alpha & LAMP Integration (ALI) Experiment components.

Program Element: 0603217C
PE Title: Follow-On Technologies

Project Number: 1302
Budget Activity: 02
Advanced Technology Development
April 1993

- o Completed the conceptual design for the Star LITE SBL space demonstration.
- o Completed the site selection survey for the Star LITE Space Test Facility (STF).
- o Completed subscale advanced nozzle performance demonstration for HF fundamental/overtone chemical laser.
- o Completed dynamic demonstration of wide-field-of-view optical retargeting using the integrated Beam Control System/Three Mirror Telescope (BCS/TMT) brassboard.
- o Began optical finishing of the LOS 4-meter mirror facesheets.
- o Began fabrication of a proof-of-concept subscale model of the Thermally Controlled Tertiary Mirror (TCTM).
- o Demonstrate high power performance of an uncooled optic in the Alpha resonator
- o Continue fabrication and delivery of ALI experiment hardware and facility.
- o Complete fabrication and testing of first full-scale advanced HF-overtone laser nozzle module
- o Complete fabrication of SBS non-linear optics demonstration cell.
- o Complete fabrication of first LOS 4-meter mirror facesheet.
- o Demonstrate the fabrication of annular optic for uncooled resonator.
- o Continue fabrication and delivery of ALI experiment hardware and facility.
- o Complete fabrication of remaining advanced HF-overtone laser nozzle modules. Begin integration.
- o Test SBS cell. Design, fab, and begin installation of demonstration optics.
- o Complete fabrication of second LOS 4-meter mirror facesheet.

Program to Completion: This is a continuing program.

D. WORK PERFORMED BY:

- o Hughes Danbury Optical Systems
- o Litton-Itek
- o Martin Marietta
- o Lockheed Missiles & Space Corp.
- o TRW

E. COMPARISON WITH FY 1992 DESCRIPTIVE SUMMARY

1. TECHNICAL CHANGES: A recent breakthrough and extensive engineering development on ultra-high performance high power mirror technology has allowed SDIO to confidently baseline uncooled high power mirrors for both near term demonstration and first generation operational chemical laser systems. This development has significant beneficial impacts on the cost, weight, complexity, and reliability of high energy chemical laser systems.
2. SCHEDULE CHANGES: None

Program Element: 0603217C
PE Title: Follow-On Technologies

Project Number: 1302
Budget Activity: 02
Advanced Technology Development
April 1993

3. COST CHANGES: Massive funding reductions in FY93 and FY94 have resulted in extensive schedule stretching in all chemical laser programs. Schedule impacts will be significant, but are as yet not fully determined.

F. PROGRAM DOCUMENTATION:

G. RELATED ACTIVITIES:

o	1301 Free Electron Laser	PE No. 0603217C
o	1303 Neutral Particle Beam	PE No. 0603217C
o	1305 Target Acquisition, Tracking and Pointing	PE No. 0603217C
o	1307 Directed Energy Demonstrations	PE No. 0603217C
o	2204 Directed Energy Weapons Concept Definition	PE No. 0603217C

There is no unnecessary duplication of effort within SDIO or the DoD.

H. OTHER APPROPRIATION FUNDS: None

I. INTERNATIONAL COOPERATIVE AGREEMENTS: None

J. MILESTONE SCHEDULE:

- o Continuous wave SBS Demonstration
- o Autonomous Beam Train Alignment Demonstration
- o ALI Facility Complete
- o High Power HF-Overtone Demonstration
- o ALI High Power Demonstration
- o High Power HF-Overtone Demonstration

FY1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: 0603217C
PE Title: Follow-On Technologies

Project Number: 1303
Budget Activity: 02
Advanced Technology Development
April 1993

A. RESOURCES: ($ in Thousands)
Project Title: Neutral Particle Beam Technology

Program Name:	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	Total Program
FOT DEM/VAL	75,020	39,226	25,577	Continuing

B. BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

The Neutral Particle Beam (NPB) project exploits the capability of a stream of atomic particles to penetrate into a target (1) to provide lethal energies and/or (2) to induce signatures that permit discrimination. Such a beam is capable of effecting kill of ballistic missiles in the boost, post-boost, and midcourse phases. The NPB project has a technology development segment, a ground-based technology integration segment, and a space experiments segment. Together, these segments address the key technical and system issues associated with the feasibility of deploying an NPB system capable of lethal intercept as well as midcourse discrimination. The technology development segment concentrates on developing enabling technologies for the ground and space experiments and initially deployable NPB systems. In the ground-based integration experiments, the Accelerator Test Stand (ATS) was used to integrate and test low energy components; the Ground Test Accelerator (GTA) is the primary test bed for initial NPB system development and also for advanced technologies such as high brightness ion sources, advanced neutralizer development, and Acquisition, Tracking, Pointing and Fire Control (ATP/FC); and the Continuous Wave Deuterium Demonstrator (CWDD) examines high duty factor and deuterium operation at low energies. The NPB space experiments addressing key issues not possible to resolve on the ground include Beam Experiments Aboard a Rocket (BEAR, flown in July 1989), which addressed basic space operability questions, and an orbital NPB space experiment (NPBSE), which will demonstrate integrated performance against a distant target using innovative approaches to lower cost and enhanced performance.

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

- Conducted initial operation of GTA DTL accelerator.
- Demonstrated CWDD ion source operation.
- Conducted PDR on space-qualified ion source and NPBSE.
- Conducted neutralizer foil space experiment.
- Assemble GTA 24-MeV accelerator; complete advanced optics design.
- Demonstrate initial operation of high duty factor RFQ on CWDD.
- Continue NPBSE design.

- Conduct CDR on solid state RF amplifier design.
- Conduct visits in Russia and US for planning a joint NPBSE.
- Complete CWDD through the RFQ; decision on termination of DTL.
- Commission GTA 24-MeV accelerator.
- Conduct revised PDR on NPBSE, possibly with Russian participation.

Program Plan to Completion: This is a continuing program.

D. WORK PERFORMED BY:

Major Contractors:
- Argonne National Laboratory
- Culham Laboratory
- Grumman
- Hanford Engineering Development Laboratory
- Lawrence-Berkeley Laboratory
- Los Alamos National Laboratory
- McDonnell Douglas

E. COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. TECHNICAL CHANGES: None
2. SCHEDULE CHANGES: None
3. COST CHANGES: CWDD RFQ slip 1 year; CWDD DTL indefinite hold; NPBSE launch slip 2 years; GTA optics slip 3 years

F. PROGRAM DOCUMENTATION:

G. RELATED ACTIVITIES:

- 1305 Acquisition, Tracking, and Pointing — PE No. 0603217C
- 2204 DEW Concept Definition — PE No. 0603217C

Activities in this program element are closely coordinated with activities in the other SDIO program elements. There is no unnecessary duplication of effort within SDIO or the DoD.

H. OTHER APPROPRIATION FUNDS: None

I. INTERNATIONAL COOPERATIVE AGREEMENTS: Yes

J. MILESTONE SCHEDULE:

- CWDD RFQ Operational
- GTA 24 Accelerator Operational
- Revised NPBSE PDR
- Power module tests complete

FY1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: 0603217C
PE Title: Follow-On Technologies

Project Number: 1304
Budget Activity: 02
Advanced Technology Development
April 1993

A. RESOURCES: ($ in Thousands)
Project Title: Nuclear Directed Energy Technology

Program Name:	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	Total Program
FOT DEM/VAL	4,817	0	0	Completed

B. BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

Nuclear Directed Energy Weapon (NDEW) concepts offer the promise of fundamental improvements in defense technology, including high brightness, large lethal volume, multiple simultaneous target engagement, and alternative lethality mechanisms. Development of NDEWs was pursued to provide a base of knowledge concerning such weaponry that would permit the U.S. to better judge potential Soviet capabilities, and to provide the basis for a ground based or pop-up U.S. NDEW capability should it be needed at some point for Strategic Defense System (SDS) follow-on phases. The NDEW research path was focussed on a program of theoretical and computational development in concert with underground nuclear tests and related laboratory experiments. A DoD and DOE cooperative program conducted mission analyses and explored systems engineering concerns.

Technical capabilities were developed within this project to enable extremely precise measurements of high performance coatings on mirrors employed in high-energy laser weapon systems. This work supports development and validation of hardened coatings for space laser systems.

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

- Prepared for Underground Test (UGT) of NDEW physics.
- Demonstrated dielectric coating measurement capability.

Program Plan to Completion: SDIO participation ended in FY 1992.

D. WORK PERFORMED BY:

Major Contributors:
- Lawrence Livermore National Laboratories
- Naval Research Laboratory

E. COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. TECHNICAL CHANGES: None
2. SCHEDULE CHANGES: The planned UGT will not occur due to a change in US UGT testing policy.
3. COST CHANGES: None

F. PROGRAM DOCUMENTATION:

G. RELATED ACTIVITIES:

- 1502 Lethality and Target Hardening PE No. 0603217C

There is no unnecessary duplication of effort within SDIO or the DoD.

H. OTHER APPROPRIATION FUNDS: None

I. INTERNATIONAL COOPERATIVE AGREEMENTS: None

J. MILESTONE SCHEDULE:

- Prepared for UGT of NDEW physics
- Demonstrated Precision Multilayer Dielectric Coating Measurement capability

FY1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: 0603217C
PE Title: Follow-On Technologies

Project Number: 1305
Budget Activity: 02
Advanced Technology Development
April 1993

A. RESOURCES: ($ in Thousands)
Project Title: Acquisition, Tracking, Pointing and Fire Control Technology

Program Name:	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	Total Program
FOT DEM/VAL	60,106	20,867	10,597	Continuing

B. BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

Acquisition, tracking, pointing and fire control (ATP/FC) efforts will advance the technologies required to perform critical functions for all candidate DEW concepts to be used in GPALS and TMD follow-on architectures. These functions include acquiring, identifying, and prioritizing the targets to be engaged, precision tracking of each target, selecting and establishing the line-of-sight to the target aimpoint, holding the beam on the aimpoint, assessing the results, and reinitiating the sequence to engage a new target. ATP/FC technologies are required for both boost-phase destruction and midcourse interactive discrimination missions. Efforts within the ATP/FC technology base address major tracking/pointing component performance issues, and the development of technologies for advanced ATP/FC experiments through the Advanced DEW Active Precision Tracker (ADAPT) program. Studies are in progress to define experiments that integrate ATP/FC with weapon concept experiments in the space-based and airborne laser and NPB projects. A series of field experiments with payloads on high altitude balloon platforms will obtain critically needed phenomenology data and build upon technology base products to demonstrate all the tracking and functional integration needed to control single target engagements.

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

- Completed special study within ADAPT effort, identifying potential ATP upgrades for the StarLITE space experiment.
- Completed collection of UV phenomenology data using the UVPI sensor on the LACE spacecraft.
- Completed Preliminary Design Reviews of balloon-borne tracking experiments and platform development (HABE/KESTREL).
- Delivered two solid state illuminator laser laboratory brassboards for performance testing.
- Issued final report for the Relay Mirror Experiment (RME)
- Completed CDR and began fabrication of developmental 3 axis inertial referenced unit (IPSRU).
- Complete Critical Design Review for HABE.

Program Element: 0603217C
PE Title: Follow-On Technologies

Project Number: 1305
Budget Activity: 02
Advanced Technology Development
April 1993

- o Complete LACE spacecraft operations; issue a final report.
- o Conduct first field tests with high altitude balloon-borne payloads (HABE/KESTREL). (KESTREL terminated after first field test due to funding). Perform first passive data collection test with HABE.
- o Complete fabrication, assembly and test of first 2 AXIS IPSRU. Start modifications for 3 AXIS flight qualifiable IPSRU.
- o Complete a limited performance, closed loop demonstration of active control of structural disturbances on the SPICE test bed. Terminate project due to funding.
- o Complete ADAPT Ops Requirements Review.
- o Complete ADAPT special study and lab experiments on High Power Shared Optics.
- o Continue HABE balloon-borne ATP experiments program.
- o Deliver first IPSRU unit to balloon-borne ATP experiments program.
- o Complete development of flight illuminator for HABE balloon experiments.

Program Plan to Completion: This is a continuing program.

D. WORK PERFORMED BY:

Government:
- o Phillips Laboratory
- o Lawrence Livermore National Laboratory

Major Contractors:
- o LMSC
- o Martin Marietta
- o GRC
- o TASC
- o Logicon/RDA
- o CS Draper Laboratory

E. COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. TECHNICAL CHANGES: None
2. SCHEDULE CHANGES: None
3. COST CHANGES:
   - o R2P2 retargeting experiments and simulator operation drastically curtailed.

Program Element: 0603217C
PE Title: Follow-On Technologies

Project Number: 1305
Budget Activity: 02
Advanced Technology Development
April 1993

- o ALTAIR space experiment project terminated; replaced with HABE balloon experiment program. ATP/FC functions to be tested at reduced performance levels and fidelity.
- o SPICE structural control project technical goals reduced from 100:1 disturbance attenuation to 40:1. Project terminated after closed loop tests.
- o KESTREL project terminated.
- o HABE project schedule slipped approximately 9 months for first hardbody handover.
- o ADAPT study schedule stretched, prematurely reduced to one contractor.

F. PROGRAM DOCUMENTATION:

G. RELATED ACTIVITIES:

o 1206 Advanced DE Weapons	PE No. 0603217C
o 1301 Free Electron Laser	PE No. 0603217C
o 1302 Chemical Laser	PE No. 0603217C
o 1303 Neutral Particle Beam	PE No. 0603217C
o 1307 DEW Demonstration	PE No. 0603217C
o 2204 DEW Concept Definition	PE No. 0603217C
o 3302 National Test Bed	PE No. 0603218C

There is no unnecessary duplication of effort within SDIO or DoD.

H. OTHER APPROPRIATION FUNDS: None

I. INTERNATIONAL COOPERATIVE AGREEMENTS: None

J. MILESTONE SCHEDULE:

- o Complete Test Solid State Laser illuminator brassboards
- o Complete Low Authority Control (LAC) SPICE test/ issue report
- o Complete LACE satellite operations
- o Complete fabrication of 1st 2 AXIS IPSRU
- o Begin High Altitude Balloon Experiments (HABE)
- o Complete modification for 1st 3 AXIS IPSRU

FY1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: 0603217C
PE Title: Other Follow-on Systems

Project Number: 1307
Budget Activity: 02
Advanced Technology Development
April 1993

A. RESOURCES: ($ in Thousands)
Project Title: DE Demonstrations

Program Name:	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	Total Program
FOT DEM/VAL	0	18,188	4,862	Continuing

B. BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

The Aircraft Based Laser (ABL) is a directed energy weapon concept for theater missile defense. The speed of light capability of the laser weapon may allow the ABL to destroy theater missiles during boost phase at long range, providing a boost phase defense layer that does not require overflight of enemy territory. Destroying theater missiles during boost phase provides many advantages. The missile is most vulnerable during this phase of flight. It is easy to detect and track the plume from the burning rocket engine. The defense system only has to deal with a single target during boost phase since it is not practical to deploy decoys or submunitions during this phase of flight. Experiments and analysis leading to an understanding of the operational effectiveness of this concept are performed.

A second effort within this program is studying the feasibility of scaling the diode-pumped solid state laser (DPSSL) to levels adequate for airborne weapon applications. Russian technology is being evaluated to assess the possibility of a joint program to exploit their past investments in directed energy weaponry.

A new start is also included here. It is a series of antiship missile defense tests using the MidInfrared Advance Chemical Laser (MIRACL) and SeaLite Beam Director (SLBD) at White Sands. This is a jointly funded SDIO/US Navy/United Kingdom Royal Navy effort.

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

- Analysis of the technologies required for the airborne laser as well as mission analysis for the concept were performed under PE No. 0603216C (Theater Missile Defense). Measurements to characterize the upper atmosphere turbulence effects on the laser beam were started from both aircraft and balloon platforms. Ground based atmospheric compensation experiments were begun using adaptive optics hardware developed under both the SDIO and Air Force ground based laser technology programs.

Program Element: 0603217C
PE Title: Other Follow-on Systems

Project Number: 1307
Budget Activity: 02
Advanced Technology Development
April 1993

- Examination of ground and ship-based theater DEW concepts continued, and plans for implementing programs leading to their evaluation and weaponization were refined.
- Continue atmospheric measurements from aircraft and balloons begun in FY 1992.
- Continue mission analysis, performance analysis, and engineering trade studies for theater DEW concepts.
- Continue ground based atmospheric compensation experiments.
- Initiate Airborne Atmospheric Compensation and Tracking (AACT) program.
- Complete cooperative beacon ground based atmospheric compensation experiments.
- Conduct planning for joint solid state laser development effort with Russia.
- Conduct cooling experiments for diode pumps and glass laser slabs.
- Initiate phase conjugation experiments at high power levels.
- Initiate static lethality tests on selected missiles at WSMR.
- Conduct safety assessments, and develop test plans, for selected missile targets at WSMR.
- Continue atmospheric measurements.
- Complete uncooperative beacon ground based atmospheric compensation experiments.
- Begin airborne atmospheric compensation and tracking experiments using cooperative beacon.
- Complete demonstration of mist cooling.
- Complete one of six glass slabs for scaleup demonstration.
- Initiate fabrication of diode pump arrays.
- Initiate high-energy laser missile intercept testing at WSMR.

Program Plan to Completion: This is a continuing program.

D. WORK PERFORMED BY:

- Air Force Phillips Laboratory
- Lincoln Laboratory
- Livermore National Laboratory
- Various Contractors

E. COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. TECHNICAL CHANGES: None
2. SCHEDULE CHANGES: None

Program Element: 0603217C
PE Title: Other Follow-on Systems

Project Number: 1307
Budget Activity: 02
Advanced Technology Development
April 1993

3. COST CHANGES:
   - o Postpone airborne atmospheric measurements
   - o Delay AACT program 1 yr - delays airborne compensated imaging experiment 1 yr
   - o Delay concept development contracts 1 yr
   - o Fewer balloon measurements
   - o Slowed ground experiments
   - o Slowed analysis & modeling

F. PROGRAM DOCUMENTATION:

G. RELATED ACTIVITIES:

o	1301	Free Electron Laser	PE No. 0603217C
o	1302	Chemical Laser	PE No. 0603217C
o	1305	ATP/FC	PE No. 0603217C
o	1206	Advanced TMD Weapons	PE No. 0603216C
o	3647	High Energy Laser Technology	PE No. 0603605F

There is no unnecessary duplication of effort within SDIO or the DoD.

H. OTHER APPROPRIATION FUNDS: None.

I. INTERNATIONAL COOPERATIVE AGREEMENTS: None.

J. MILESTONE SCHEDULE:

- o Complete cooperative beacon ground experiments
- o Install wavefront sensor on aircraft
- o Complete design for diode-pumped scale-up demo.
- o Complete uncooperative beacon ground experiments
- o Airborne cooperative beacon experiments
- o Complete phase conjugation tests
- o Complete test of first module for DPSSL scale-up
- o Complete missile intercept testing at WSMR
- o Aircraft based wavefront sensor measurements
- o Laser scaling demonstrated
- o Airborne uncooperative beacon experiments
- o Complete fabrication and test of scale-up solid state device
- o Worldwide atmospheric database completed
- o Airborne atm comp & tracking experiments complete

FY1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: 0603215C
PE Title: Limited Defense System

Project Number: 1403
Budget Activity: 03
Strategic Programs
April 1993

A. RESOURCES: ($ in Thousands)
Project Title: Computer Engineering

Program Name:	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	Total Program
LDS DEM/VAL	704	3,600	0	Continuing

B. BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

This effort provides support and technologies required for advanced Command, Control and Communication (C3) concepts. Three distinct efforts are defined. The first develops a highly reliable space borne multiprocessor computer architecture by concentrating on the ways processors can be connected together, rather than on developing the processors themselves. This first effort consists of two technology tasks: an Advanced Information Processing Systems (AIPS) able to meet reliability requirements; and a Very High Speed Integrated Circuit (VHSIC) multiprocessor development effort. This effort results in a technology base for connecting radiation hardened 32-bit computers into a multiprocessor configuration, and for efficient configuraton of generic VHSIC Spaceborne Computers (GVSC). The second effort demonstrates and baselines current national command and control capabilities available with missile early warning radars. It does this by observing a tactical missile launch at White Sands Missile Range, NM. An early warning radar is cued to a search area by a satellite early warning system. Once the early warning radar tracks the target vehicle, it cues a surrogate tactical fire control radar. All tracking information will be made available to the National Test Facility for simulation. The last task supports new command and control architectures and multilateral experiments necessary for a proposed joint U.S.-Russian ballistic missile defense program. This task is accomplished by confidence building tests and experiments, emphasizing computer simulation of possible command arrangements.

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

- o Completed AIPS Proof of Concept.
- o Completed authenticated protocol development for distributed fault tolerant systems.
- o Initiated development of fault tolerant network protocols for optical systems.
- o Implemented ATAMM on advanced SDIO multiprocessors (e.g., GVSC).
- o Demonstrate fault tolerant architecture.
- o Conduct PAVE PAWS early warning radar tracking experiment.
- o Hold U.S.-Russian computer simulation workshop.
- o Begin procurement of RH-32 computers for multiprocessor configuration.
- o Procure 2 - RH32 Processors for multiprocessor implementation.

Program Plan to Completion: This is a continuing program.

Program Element: 0603215C
PE Title: Limited Defense System

Project Number: 1403
Budget Activity: 03
Strategic Programs
April 1993

D. WORK PERFORMED BY:

- o NASA, Langley Research Center
- o Draper Laboratories
- o Old Dominion University
- o IBM Federal Systems
- o Xontech Inc.
- o Defense Technology Institute
- o Los Alamos National Laboratory

E. COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. TECHNICAL CHANGES: Termination of funding precludes adaptation of AMOS to the RH-32 multiprocessor and completion of a 4 processor architecture
2. SCHEDULE CHANGES: None
3. COST CHANGES: None

F. PROGRAM DOCUMENTATION:

G. RELATED ACTIVITIES: Supports all SDI projects employing space-based and ground-based processors. There is no unnecessary duplication of effort within SDIO or DoD.

H. OTHER APPROPRIATION FUNDS: None

I. INTERNATIONAL COOPERATIVE AGREEMENTS: None

J. MILESTONE SCHEDULE:

- o Implement ATAMM on GVSC architecture
- o Develop authenticated protocol for distributed fault tolerant systems
- o Demonstrate high throughput/high reliability mode
- o Complete AIPS Proof of Concept Demo

FY1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: 0603215C
PE Title: Limited Defense System

Project Number: 1405
Budget Activity: 03
Strategic Programs
April 1993

A. RESOURCES: ($ in Thousands)
Project Title: Communications Engineering

Program Name:	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	Total Program
LDS DEM/VAL	10,322	12,205	10,037	Continuing

B. BRIEF DESCRIPTION OF MISSION REQUIREMENTS AND SYSTEM CAPABILITIES:

Develop communications technology to support operational requirements for defensive systems. Develop communications components, both radio frequency (RF) and laser communications, for space-to-space, space-to-ground, and ground-to-space links. Efforts to define requirements for space qualification and radiation hardness of extremely high frequency (EHF) components needed for robust communications are included.

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

- Demonstrated 60 GHz Phase Array Subarray.
- Demonstrated radiation hardened 60 Ghz transmitter and receiver components in rigorous radiation tests.
- Initiated reliability testing of 60 Ghz power amplifier devices.
- Completed 60 Ghz synthesizer program.
- Initiated development of 20/44 GHZ Phased Array for ground station insertion.
- Initiated development of digitally programmable modem to implement waveforms and interoperate with existing military communications systems.
- Completed lightweight Lidar/Comm dual mode laser breadboard.
- Completed high power broad area MOPA laser diode.
- Delivered liquid crystal lens and open loop lasercomm receiver components to Rome Labs for testing.
- Awarded advanced adaptive networking contract.
- Deliver 5-Watt, 60 Ghz Solid State Power Amplifier.
- Deliver integrated EHF transceiver brassboard.
- Integrate radiation hardened 60 Ghz transceiver and test for radiation survivability.
- Demonstrate power and modulation of MAG-MOPA laser diode.
- Delivered radiation hardened CCD design rules and Acousto-Optic beam steerer.
- Completed advanced adaptive networking development.
- Complete seeker data compression breadboard.
- Initiate BAA aimed at advanced 60 Ghz power amplifier and agile aperture technologies.
- Complete design of miniature high data rate telemetry system for KKV testing.
- Initiated design of EHF communications flight test package.
- Increase power output from broad area MOPA laser diode.
- Complete space qualifiable 20 Ghz SSPA procurement.
- Complete second integrated 20/44/60 Ghz transceiver breadboard.
- Deliver 20 and 44 Ghz ground based phased array antenna ADMs.

Program Element: 0603215C
PE Title: Limited Defense System

Project Number: 1405
Budget Activity: 03
Strategic Programs
April 1993

- o Deliver programmable digital modem brassboard.
- o Demonstrate radiation hardened integrated 60 Ghz transceiver in radiation tests.
- o Demonstrate composite high speed, high power, long lifetime MAG-MOPA laser diode.
- o Continue development of 60 Ghz agile aperture/advanced solid state power amplifier concepts.
- o Complete life testing of 60 Ghz MMIC power amplifiers.
- o Integrate EHF components for flight test of EHF crosslinks.
- o Continue networking design for large satellite constellations.
- o Complete and flight test miniaturized telemetry breadboard for high data rate seeker applications.

Program Plan to Completion: This is a continuing program.

D. WORK PERFORMED BY:

- o NASA, Langley Research Center
- o USAF Rome Laboratories
- o Spectra Diode Laboratories
- o Sandia National Laboratories
- o MIT/Lincoln Laboratories
- o Thermo Electron Technologies Corporation
- o Harris Corporation
- o TRW
- o MITRE
- o Stanford Telecom
- o Kodak

E. COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. TECHNICAL CHANGES: None
2. SCHEDULE CHANGES: None
3. COST CHANGES: 50% reduction of FY94 budget precludes some advanced technology starts and reduces amount of effort which can be applied to integrating and testing components into a flight test package.

F. PROGRAM DOCUMENTATION:

G. RELATED ACTIVITIES: This project supports all SDI projects requiring advanced communications component technologies for space communications. There is no unnecessary duplication of effort within SDIO or the DoD.

H. OTHER APPROPRIATION FUNDS: None

I. INTERNATIONAL COOPERATIVE AGREEMENTS: None

J. MILESTONE SCHEDULE:

Program Element: 0603215C
PE Title: Limited Defense System

Project Number: 1405
Budget Activity: 03
Strategic Programs
April 1993

- High Power MOPA Laser Diode Demo
- 60 Ghz solid state amplifier ADM
- Acousto Optic Transceiver Breadboard
- MMIC EHF Transceiver Brassboard
- EHF Transceiver Radiation Testing
- MMIC EHF Transceiver Brassboard #2
- 5W 60 Ghz SSPA
- Programmable Flexible MODEM PDM Demo
- 44/20 Ghz Ground Entry Point Antenna Complete
- Subminiature Telemetry Phototype
- 60 Ghz Component Flight Test
- EHF Flight experiment

FY1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: 0603215C
PE Title: Limited Defense System

Project Number: 1501
Budget Activity: 03
Strategic Programs
April 1993

A. RESOURCES: ($ in Thousands)
Project Title: Survivability Engineering & Demonstrations Project

Program Name:	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	Total Program
LDS DEM/VAL	57,292	25,367	19,533	Continuing
SBI DEM/VAL	4,700	0	0	Continuing

B. BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

Develops and demonstrates survivability technologies to ensure that National Missile Defense (NMD) elements can perform their mission in all expected environments. Approaches include: studies/ analyses; Above-Ground and Under-Ground Effects Testing (AGT/UGET); Survivability Enhancement Option (SEO) Development; and operability demonstrations. Technologies will be available for incorporation into NMD elements at EMD. Demonstrations will provide necessary risk reduction evidence to support milestone decisions.

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

- Designed and fielded Hunters Trophy (HT) UGET (electronics piece-parts, baffle materials, lens/filters materials, FPA/Dewar assembly, cryogenic and room temperature materials).
- Conducted AGTs (hardened electronics, baffle materials, integrated 60GHz transceiver).
- Established initial electromagnetic environmental effects (E3) criteria for all LDS ground based elements.
- Developed and tested GSTS Operation in a Nuclear Environment (OPINE) track and discrimination algorithms.
- Evaluated emerging RF mitigation material for optical sensors.
- Completed concept development of high fidelity RF channel emulator.
- Completed initial integration of environment and response models into Level 2 System Simulation (L2SS) and Surveillance Test Bed (STB).
- Developed initial Electronic Data/Guidelines for Element Survivability (EDGES) for Exoatmospheric interceptors.
- Completed design and partial fabrication of hardened data processor test article (AHAT).
- Assessed threat and SEOs on BE mission accomplishment.
- Planned hardware/software preplanned survivability improvements that facilitate growth to GPALS.
- Complete EDGES Version 1.0 for interceptor contractors.
- Identify candidate RF-hardening technology for sensors and communications.
- Demonstrate no-upset computer technology for interceptors.
- Complete IR Filter Radiation Hardness Technology Tests.
- Develop and demonstrate High Altitude Electromagnetic Pulse (HEMP) hardening technology for the GBR transmit/receive modules.
- Identify and test RF/HPM sensor Proof-of-Principle SEOs.

Program Element: 0603215C
PE Title: Limited Defense System

Project Number: 1501
Budget Activity: 03
Strategic Programs
April 1993

- o Perform IMU and UV/VIS detector susceptibility measurements and provide RF mitigation technologies and laser technologies.
- o Analyze data from the Hunters Trophy UGT seeker component tests and provided nuclear survivability design guidelines to system designers.
- o Define near/far term survivability technology goals as a function of LDS element program plans.
- o Develop SEO goals as a function of LDS threat evolution and introduction.
- o Use PORTS/INETS/KHILS to conduct HWIL assessments of survivable optics designs, debris-mitigation, and background mitigation.
- o Conduct INETS operation in a nuclear environment SEO demonstrations for GBR, ROC-COMM, and GBI.
- o Complete analysis of baffle response data and FPA response experiments from Hunters Trophy UGET.
- o Complete a GBI specific version of Electronic Data/Guidelines for Element Survivability (EDGES) to transfer SEOs to interceptor contractors.
- o Develop Unified Electromagnetic Effects (UEME) guidelines for fixed facilities, joint project with DNA.
- o Verify no-upset radiation-hardened computer designs using AGTs.
- o Conduct soft x-ray assessments to technology telescopes (LATS).
- o Deliver preliminary BE assessments of RF, laser, and nuclear susceptibility.
- o Develop nuclear and laser hardening technologies in concert with Brilliant Eyes Prime contractors.
- o Develop Radar Environments Status Assessment (RESA) model.
- o Develop/upgrade propagation effects and GBI link response models for ground entry point (GEP).
- o Provide E3 Requirements Board support to all NMD elements; includes criteria development.
- o Develop low noise FPA test fixture tech/test emerging FPAs.
- o Assess and validate radar track, discrimination, and kill assessment performance SEOs in hostile (Nuclear and RF) environments.
- o Develop radar SEOs to mitigate hostile environments.
- o Provide survivability experts to the concurrent engineering process to assist NMD prime contractors with SEO design implementation and hardened parts selection for GBR, BE, ROC-COMM, and GBI.
- o Provide completed RF survivability design guidelines to system elements.

Program Plan to Completion: This is a continuing program.

D. WORK PERFORMED BY:

- o Air Force Space and Missile Systems Center, Phillips Laboratory, Wright Laboratory
- o United States Army Space and Strategic Defense Command
- o United States Army Research Laboratories
- o Defense Nuclear Agency

Program Element: 0603215C
PE Title: Limited Defense System

Project Number: 1501
Budget Activity: 03
Strategic Programs
April 1993

E. COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. TECHNICAL CHANGES: Program revised because of schedules and funding.
2. SCHEDULE CHANGES: Work delayed by funding constraints.
3. COST CHANGES: With a 70% reduction in FY 94 funding as compared to FY 92 funding, this project has had severe technical and schedule changes. Technical changes include: significant reduction in verification testing of hardening concepts and technologies including elimination of all participation in the next underground nuclear effects test, elimination of significant portions of the Laser hardening, RF hardening and camouflage, concealment and deception technologies programs, significant reduction in nuclear hardening efforts, and no efforts pursuing quantification and mitigation of the space debris problem. Schedule changes include: most efforts delayed 1-2 fiscal years, potential serious disconnects with survivability technology transition to element developers for candidate TMD systems, inefficient coupling of survivability risk mitigation and P^3I, reduced support to NMD elements' design and development programs.

F. PROGRAM DOCUMENTATION:

G. RELATED ACTIVITIES:

- Defense Nuclear Agency PE No. 0602715H

The DNA generic research and development program supports efforts to provide the technology base for the nuclear survivability of all U.S. weapons systems. It supports UGETs, high fidelity calculation of nuclear environments, and system hardness validation methodologies. Technology programs are coordinated with SDIO and a memorandum of understanding executed to preclude duplication of effort and provide best leverage of DNA generic efforts.

- Air Force Satellite Systems Survivability PE No. 0603438F

The Air Force Satellite Systems Survivability Program directs research and development studies, analyses, planning and demonstrations for technologies to improve the survivability of US military space systems against current and future threats.

H. OTHER APPROPRIATION FUNDS: None

I. INTERNATIONAL COOPERATIVE AGREEMENTS: Yes

J. MILESTONE SCHEDULE:

- Complete traceable, fast running algorithms for environments/effects simulations (L2SS and STB)
- Complete EDGES 1.0 for generic exo-interceptor
- Demonstrate no-upset computer technology
- Provide unified EME guidelines for fixed ground facilities

Program Element: 0603215C
PE Title: Limited Defense System

Project Number: 1501
Budget Activity: 03
Strategic Programs
April 1993

- Complete INETS monopulse upgrade, KHILS demo and track discrimination, OPINE, and Acquisition SEO evaluations
- Complete AGT characterization of electronics, mirrors, baffles, and filters tested in HT UGETs and AGTs
- Complete prototype LATS telescope AGT testing in PORTS
- Complete initial EDGES interceptor version
- Demonstrate seeker operability using PORTS/ INETS/KHILS
- Complete RF hardening design guidelines
- Complete GBI and ROC/COMM Annual E3 Assessments
- Complete Integration of AGT/UGET data into EDGES

Program Element: 0603215C
PE Title: Limited Defense System

Project Number: 1502
Budget Activity: 03
Strategic Programs
April 1993

A. RESOURCES: ($ in Thousands)
Project Title: Lethality and Target Hardening

Program Name:	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	Total Program
LDS DEM/VAL	0	4,725	4,884	Continuing
SBI DEM/VAL	5,600	1,390	0	Continuing
FOT DEM/VAL	25,127	1,551	0	Continuing

B. BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

The Lethality of SDI weapons is a measure of SDI systems effectiveness in fulfilling defense mission requirements. The Lethality and Target Hardening program is developing a necessary and sufficient understanding of physical principles involved in defensive weapon/target interaction, target response and kill modes, and impact signatures for discrimination and damage assessment.

This task provides supporting lethality technology for developmental SDI ground based kinetic energy weapons and directed energy weapons. This supporting lethality technology includes lethality phenomenology analyses and tests to evaluate kinetic energy warheads hit-to-kill interceptors, thermal lasers and neutral particle beam weapon effectiveness against simulated threat warheads.

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

- Modified Aerothermal Reentry Experiment (ARE) payload to represent current interceptor damage pattern hit-to-kill vs. fragment damage.
- Completed and validated high explosive initiation model for PBX 9404 and Comp B high explosives.
- Initiated multi-phenomenology SDI kill assessment program.
- Published updated lethality criteria for strategic RV targets.
- Execute ARE-2N (nose damage) flight test.
- Execute ARE-2HK (hit-to-kill damage) flight test.
- Conduct hit-to-kill vs. medium and large RV impact tests.
- Initiate GBI vs. SLBM lethality tests and analyses.
- Continue kill assessment tests and analyses focusing on radar and optical techniques.
- Reduce data from the two FY 1993 ARE flight tests and update criteria.
- Complete GBI vs. RV impact tests.
- Conduct scaled SLBM PBV impact tests.
- Develop kill assessment algorithms.
- Examine effects of hypervelocity impact (10 km/s) on lethality estimates.

Program Plan to Completion: This is a continuing program.

Program Element: 0603215C
PE Title: Limited Defense System

Project Number: 1502
Budget Activity: 03
Strategic Programs
April 1993

D. WORK PERFORMED BY:

In-house:
- Defense Nuclear Agency
- U.S. Air Force's Wright Labs
- U.S. Army Space and Strategic Defense Command

Major Contractors:
- Kaman Sciences Corp.
- Science Applications International Corp.
- Teledyne Brown Engineering
- Mevatec
- Ball Systems Engineering Division

E. COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. TECHNICAL CHANGES All Lethality Technology directly supporting Space Based Interceptor and Other Follow On Program Elements ceases due to lack of funding.
2. SCHEDULE CHANGES: None
3. COST CHANGES: None

F. PROGRAM DOCUMENTATION:

G. RELATED ACTIVITIES: None

H. OTHER APPROPRIATION FUNDS: None

I. INTERNATIONAL COOPERATIVE AGREEMENTS: None

J. MILESTONE SCHEDULE:

- Conduct scaled hit-to-kill impact tests
- Execute ARE-2N flight test
- Execute ARE 2HK flight test
- Conduct RV Donor/Acceptor test
- Conduct scaled GBI vs. SLBM impact tests
- Conduct scaled hit-to-kill impact tests
- Publish updated aerothermal demise criteria
- Publish kill assessment algorithms
- Publish revised strategic target lethality criteria

FY1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: 0603217C
PE Title: Follow-On Technologies

Project Number: 1503
Budget Activity: 02
Advanced Technology Development
April 1993

A. RESOURCES: ($ in Thousands)
Project Title: Power and Power Conditioning

Program Name:	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	Total Program
FOT DEM/VAL	23,795	22,879	9,767	Continuing
R&S DEM/VAL	505	21,600	0	Continuing

B. BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

This program was established to develop generation and conditioning technologies capable of producing required quantities of electrical power needed for advanced ground- and space- based kinetic/directed energy weapons and surveillance and BM/C^3 systems. Power requirements for the various payloads are divided into two broad categories: (1) continuous power for surveillance, communication and housekeeping applications; (2) intermittent or short-term power for interceptors, weapons and discrimination operations, and periodic testing. The major projects in the PE to satisfy program requirements include: TMD-GBR Generator, Interceptor Battery, Thermionic Fuel Element, Advanced Solar Power Technology, Thermionic System Evaluation Test (TSET), Tacitron, 40 kWe Thermionic Reactor, and NEP Space Flight Test.

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

- Completed Critical Design Review for high density Interceptor Battery
- Completed Trade study of TMD-GBR power supply requirements.
- Completed testing of high energy density rechargeable sodium sulfur batteries that satisfy GEO requirements.
- Initiated Thin Film Solar Array program to produce low cost, high power density arrays. Two contracts were awarded to Martin Marietta and Boeing.
- Completed pre-proposal efforts for new SUPER flight experiment to flight qualify the SLATS concentrator array concept.
- Initiated high efficiency solar cell program to produce small-size high efficiency multi-band gap solar cells. Four contracts were awarded to Washington State, Spectrolab, RTI, and Spire.
- Completed experiment integration into the STS for space flight validation of the oxygen heat pipe.
- Completed Common Pressure Vessel Nickel Hydrogen (CPV NiH2) Battery characterization study to recommend the best CPV NiH2 battery to be tested and evaluated that will meet the needs of the SDIO elements.
- Completed Smallsat Power System Controller design including breadboard.
- Awarded contracts for thermionic space reactor design. Two contracts were awarded to SPI and Rocketdyne.
- Evaluated results of thermionic components and continued cell testing.

Program Element: 0603217C
PE Title: Follow-On Technologies

Project Number: 1503
Budget Activity: 02
Advanced Technology Development
April 1993

- o Received delivery of two unfueled TOPAZ reactors and test stands from Russia.
- o Initiated Thermionic System Evaluation Test (TSET) set-up and preliminary systems tests
- o Initiated TSET series to include system level and component tests.
- o Completed PSA for NEP Space Flight Test and submitted to INSRP.
- o Livermore Lithium-Ion Battery.
- o Transfer TSET data to augment ongoing U.S. design work
- o Assemble and Deliver Russian Tacitron.
- o Initiated tacitron testing with TSET test.

Program Plan to Completion: This is a continuing program.

D. WORK PERFORMED BY:

- o Air Force Phillips Laboratory
- o Lawrence Livermore National Laboratory
- o Sandia National Laboratory
- o Los Alamos National Laboratory
- o Rocketdyne Division of Rockwell, Inc.
- o Space Power Inc. (SPI)
- o Hughes
- o Department of Energy
- o TETRA

E. COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. TECHNICAL CHANGES: In order to support the follow-on needs of SDIO, the NEP Space Test Program has been initiated. The NEP Space Test Program utilizes the Russian TOPAZ II Space Nuclear Power System, advanced thermionic space nuclear technology, to leapfrog the U.S. program and provide an immediate flight demonstration of thermionic space nuclear technology and advanced electric thrusters.
2. SCHEDULE CHANGES: None
3. COST CHANGES: In FY93, there was no follow-on program element funding available to support the development of LDS system solar technology, or Interceptor Battery. Funding for these programs has been requested from LDS and TMD program elements. Unless funding is secured in these program elements, the funding reductions result in no available advanced solar power technologies to Brilliant Eyes & Brilliant Pebbles in reducing life cycle costs, and no available high efficiency battery for E^2I and GBI. For FY94, the complete loss of funds in the R&S program element, and severe reductions in funding in the FOT PE, has decimated the program. A reduction in funding of over 85% has meant that only the TSET program can continue to be pursued after 1993. Advanced solar technology lithium battery development, and the 40kW thermionic space nuclear power development program must be abandoned at the current FY94 levels. NEP Space Test planning can continue, but only at a very low level.

Program Element: 0603217C
PE Title: Follow-On Technologies

Project Number: 1503
Budget Activity: 02
Advanced Technology Development
April 1993

F. PROGRAM DOCUMENTATION:

G. RELATED ACTIVITIES: Related activities include many projects within all Program Elements. There is no unnecessary duplication of effort within SDIO or the DoD.

H. OTHER APPROPRIATION FUNDS: None

I. INTERNATIONAL COOPERATIVE AGREEMENTS: None

J. MILESTONE SCHEDULE:

- o TSET:
  Initiate system and component testing
  Complete system and component testing

- o Tacitron:
  Initiate TSET testing of tacitron
  Complete TSET testing of tacitron

- o NEP Space Flight:
  Deliver TOPAZ reactors
  PSA to INSRP
  EIS issued

FY1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: 0603215C/0603217C
PE Title: Limited Defense System / Follow-On Technologies

Project Number: 1504
Budget Activity: 02/03 Advanced Technology Development/Strategic Programs
April 1993

A. RESOURCES: ($ in Thousands)
Project Title: Materials and Structures

Program Name:	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	Total Program
LDS DEM/VAL	0	11,065	1,172	Continuing
SBI DEM/VAL	2,766	0	0	Continuing
FOT DEM/VAL	24,705	2,600	4,828	Continuing
R&S DEM/VAL	250	10,150	0	Continuing

B. BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

The Materials and Structures (M&S) Project conducts research, development and flight and ground test demonstrations in lightweight structural materials, adaptive structures technology, propulsion/thermal/optical materials, tribomaterials, superconductor devices, and space environmental effects.

Limited Defense System

M&S supports Sensors and Interceptor activities through the application of advanced materials technologies to element designs, and orbital flight tests of advanced materials. These efforts will provide for low earth orbit exposure of critical material samples to the natural space environment. M&S technology will also be used to reduce vibration through the application of improved active and passive damping materials.

Other Follow-On Systems

Follow-On M&S projects focus on providing advance materials and structures technology demonstrations to meet the extreme pointing and tracking, secure communications and enhanced discrimination requirements of near and far term GPALS systems as they mature in development. To gain confidence in the ability of these systems to operate in the natural and threat environments, requires system selected materials evaluations and adaptive structure technologies. Superconducting devices will provide orders of magnitude increased capabilities in secure communications and target discrimination.

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

- Conducted passive panel Space Materials Experiment on EOIM-3.
- Completed fabrication of resin matrix composite GBI concept structure.
- Completed design and began fabrication of SAMMES modular hardware.
- Fabricated, optically and mechanically characterized, and delivered baffle samples and baffle structure for integration into AGT.
- Characterized Optical Properties of free standing Diamond Windows at Interceptor Operational Temperatures.
- Selected executing organizations for the TechSat A program.

Program Element: 0603215C/0603217C
PE Title: Limited Defense System / Follow-On Technologies

Project Number: 1504
Budget Activity: 02/03
Advanced Technology Development/Strategic Programs
April 1993

- o Delivered hardware for on-orbit demonstration of prototype HTS mmWave components (HTSSE) and adaptive structures (ACTEX).
- o Completed thermoplastic composite creep tests.
- o Designed and fabricated CC flex seal movable GBI C-C composite rocket nozzle.
- o Awarded 10K LTS Signal Processor Feasibility Contract.
- o Demonstrated 10K LTS multiplexer for FPA signal processing.
- o Completed Gr/Al radiator demonstration.
- o Continued joining and assembly technology for metal matrix composite structure.
- o Conducted stabilized solar array (AMASS) hardware ground test.
- o Initiated planning for ground based composite interceptor technology flight test (TECHSHOT).
- o Complete ground demonstration and deliver FLT hardware for the STEP III mission of a stabilized solar array using advanced materials and vibration suppression techniques.
- o Test fire movable C-C rocket nozzle for GBI interceptors.
- o Complete and deliver the first SAMMES materials experiment for the STEP III mission.
- o Fabricate, optically characterize, and deliver baffles for Clementine spacecraft.
- o Ground test and deliver flight hardware prototype satellite attack warning and assessment flight experiment (SAWAFE) to STEP III.
- o Initiate development of a modular, space qualified, integrated adaptive structure vibration control patch.
- o Conduct on orbit ACTEX experiment.
- o Integration of joint test of active vibration controlled cryocooler and micro-electronic space experiment on STRV-1B U.K. satellite.
- o Initiate development of multidiscipline technology satellite (TECHSAT).
- o Provide overall Space Environmental support to all SDIO programs.
- o Continued TECHSHOT Endo and Exo advance material and optics sounding rocket test planning.
- o Terminating all HTS 60 GHz communications applications efforts.
- o Restructuring all LTS efforts to delay end to end demo of on-FPA digital signal processing.
- o Initiate fabrication only of 10K LTS analog signal processor element for FPA sensor demo.
- o Rescoping advanced optical baffles program to delay demos of flight quality baffles for GBI and BE.
- o Modifying advanced composites program to delay demos of low cost fabrication of advanced composite structures for interceptors and satellites.
- o Reprogramming tribology program to delay completion of dry lubricant bearing tests.
- o Initiate planning for Multi-national Defense Research (MDR) satellite.
- o Conduct STEP III flight test.

Program Element: 0603215C/0603217C
PE Title: Limited Defense System / Follow-On Technologies

Project Number: 1504
Budget Activity: 02/03
Advanced Technology Development/Strategic Programs
April 1993

- Design and initiate fabrication of first TECHSHOT graphite/thermoplastic interceptor structure.
- Demonstrate ability of lightweight, lower power "smart patch" to control vibration and adjust on-orbit dynamic behavior of spacecraft.
- Provide overall space environmental effects support to all SDIO programs.
- Conduct STRV-1b flight experiment.
- Initiate development of advanced composite of GBI-X kill vehicle (KV) structure for delivery to flight integration contractor.
- Initiate development of BE and GBI flight test advanced optical baffles.
- Complete Space Environmental Effects Design Guide.
- Restart 10K low temperature superconductor (LTS) digital signal processor demonstration program for on-FPA processing for BE/BP.
- Initiate design and fabrication for US/Japan active vibration control flight test in line truss struts.
- Complete dry lubricant ultra-low friction bearing fatigue test ground demonstration.
- Continue development of TECHSAT satellite and defer transfer to project PMA 1703 until FY95.
- Continue development and initiate design for the MDR satellite.
- Initiate fabrication of second ship set for the Space Active Modular Materials Experiment.

Program Plan to Completion: This is a continuing program.

D. WORK PERFORMED BY:

- Los Alamos National Laboratory
- Oak Ridge National Laboratory
- Spire Corporation
- FMI
- Westinghouse
- Hughes
- Lockheed
- Martin-Marietta
- Physical Sciences Incorporated
- TRW
- SPARTA
- JET Propulsion Laboratory
- Boeing
- Sandia Lab
- Naval Research Laboratory

E. COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. TECHNICAL CHANGES: None
2. SCHEDULE CHANGES: None

Program Element: 0603215C/0603217C
PE Title: Limited Defense System / Follow-On Technologies

Project Number: 1504
Budget Activity: 02/03
Advanced Technology Development/Strategic Programs
April 1993

3. COST CHANGES: None

F. PROGRAM DOCUMENTATION:

G. RELATED ACTIVITIES:

The M&S Project draws upon the materials and structures technology base of the nation and conducts cooperative programs with the Services and Federal Agencies. Critical/enabling technology demonstrations are planned in support of projects within most program elements. There is no unnecessary duplication of effort within SDIO or the DoD.

H. OTHER APPROPRIATION FUNDS: None

I. INTERNATIONAL COOPERATIVE AGREEMENTS: Yes

J. MILESTONE SCHEDULE:

- o Sled test of two color GBI window
- o Deliver baffle components for AGTs
- o Fly passive materials panel (EOIM-3)
- o Complete tests of stabilized solar array
- o Demonstrate 10K LTS Multiplexer operation
- o Fabricate/test 10GHz HTS Cavity
- o Complete Optical/Thermal Tests on Diamond Window
- o Complete End-to-End LTS LWIR sensor demo
- o Flight test GrTp interstage structure
- o Demo LTS shift register at 10K
- o Complete Space Environmental Effects Design Guide
- o Ground demonstration of "smart patch" vibration/ structural control capability and durability
- o Fly the first SAMMES materials experiment
- o First TechShot flight (high speed endoatmospheric)
- o Flight test SAWAFE
- o On-orbit demonstration of adaptive in-line truss struts
- o Execute SAWAFE experiment
- o Test/demonstrate FPA/LTS signal processing electronics
- o First all composite interceptor structure manufactured by automated match metal molding
- o Space flight of second SAMMES experiment (MEO BE)
- o MDR Satellite
- o TechSat Class A-LEO/MEO
- o Second TechShot flight (low speed endoatmospheric)

FY1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: 0603218C
PE Title: Research & Support Activities

Project Number: 1601
Budget Activity: 03
Strategic Programs
April 1993

A. RESOURCES: ($ in Thousands)
Project Title: Innovative Science and Technology (IS&T)

Program Name:	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	Total Program
R&S DEM/VAL	62,259	85,205	50,409	Continuing

B. BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

Explore innovative science and engineering for several technologies of interest to SDIO.

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

- Table-top size free electron laser (FEL) generated 139 gigahertz radiation at greater than 10 watts peak power, a power density 100 times higher than previous FELS.
- IR sensor based on electron tunneling demonstrated broadband (1 to 1000 micrometer) detection 10 times more sensitive than a pyro-electric detector.
- Short-wavelength chemical laser gain demonstrated in laboratory using Sio/Na system.
- A continuous wave 727 nanometer diode laser for injection locking of a solid state lasers was demonstrated.
- Electrically driven light gas gun achieved 7.1 km/s with 2 gram projectile.
- Carbon-carbon complex structure fabrication processing steps and time reduce by 90% using rapid densification process.
- Ammonia dinitramine, the highest energy environmentally acceptable solid propellant oxidizer, is being produced in kilogram quantities. This oxidizer can reduce the interceptor mass by more than 40%.
- Laser Satellite Communication system capable of 1 gigabit over a distance of 40,000 km ready for space qualification.
- Launch SPEAR-3 to validate techniques for isolating high voltage and amperage under space conditions.
- Launch POAM onboard the French SPOT-4 satellite.
- Conduct 4000 hour life test on 1.3kW Stationary Plasma Thruster.
- Conduct rocket motor tests of propellants formulated using ammonia dinitramine.
- Demonstrate autodyne Doppler laser tracking system for missile plumes and hardbodies.
- Demonstrate the first gigabit per second optical fiber link between two remote massively parallel computers.
- Mountain-to-mountain test of the high data-rate laser satellite communication system.
- Demonstration of a new optoelectronic computer with 10,000 times faster throughput than its successor, heralding the age of general-purpose optical processing.
- Simultaneous observation of a dropped target by several optical and radar sensors to demonstrate sensor fusion.

- o Conduct Stereo Track of "Scud debris" in sensor fusion experiment at ISTEF.
- o Demonstrate the use of Golay cell detectors for low power, continuous, "sentry mode" operation at ambient temperature for bell-ringer surveillance missions.
- o Wafer integration of 3-dimensional neural network computer for a fast-frame seeker.
- o Demonstrate one order of magnitude reduction in spark plug control devices for divert propulsion systems.
- o Develop 2 x 200 mW diode laser for high-data-rate satellite laser communications system.
- o First integration of superconducting analog to digital converters, correlators, phase shifters, etc., for 60 GHz spread spectrum communications.
- o Demonstrate an inexpensive, high-resolution imaging 640 x 480 Silicon based LWIR focal plane array.
- o Demonstrate an uncooled ultraviolet focal plane array compatible with conventional IR readout technology using diamond and gallium detectors.

Program Plan to Completion: This is a continuing program.

D. WORK PERFORMED BY: Industry, academe, and government laboratories.

E. COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. TECHNICAL CHANGES: None
2. SCHEDULE CHANGES: None
3. COST CHANGES: None

F. PROGRAM DOCUMENTATION:

G. RELATED ACTIVITIES: Supports all SDI technologies. There is no unnecessary duplication of effort within SDIO or the DoD.

H. OTHER APPROPRIATION FUNDS: None

I. INTERNATIONAL COOPERATIVE AGREEMENTS: None

J. MILESTONE SCHEDULE: None

FY1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: 0602790C
PE Title: SBIR/STTR

Project Number: 1602
Budget Activity: 01
Technology Base
April 1993

A. RESOURCES: ($ in Thousands)
Project Title: New Concepts Development

Program Name:	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	Total Program
SBIR/STTR	0	0	42,552	Continuing
R&S DEM/VAL	37,145	41,513	0	Transferred

B. BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

Explore innovative concepts pursuant to PL102-564 which mandates a 2-phase R&S competition for small businesses with innovative technologies.

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

Explore innovative concepts in a variety of technologies with both military and commercial potential. Plans for FY94-FY95 include continuing to fund those innovative proposals that hold the greatest potential benefit for a future SDS.

Program Plan to Completion: This is a continuing program.

D. WORK PERFORMED BY: Various small business firms who compete for awards in 16 R&D topics.

E. COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. TECHNICAL CHANGES: None
2. SCHEDULE CHANGES: None
3. COST CHANGES: None

F. PROGRAM DOCUMENTATION:

G. RELATED ACTIVITIES:

- All technology programs within SDIO could potentially benefit from these projects. There is no unnecessary duplication of effort within SDIO or the DoD.

H. OTHER APPROPRIATION FUNDS: None

I. INTERNATIONAL COOPERATIVE AGREEMENTS: None

J. MILESTONE SCHEDULE:

- Products are delivered on a continuing basis as a result of funding various innovative concepts.

FY1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: 0603217C
PE Title: Follow-On Technologies

Project Number: 1701
Budget Activity: 02
Advanced Technology Development
April 1993

A. RESOURCES: ($ in Thousands)
Project Title: Launch Services

Program Name:	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	Total Program
LDS DEM/VAL	0	29,868	0	Continuing
FOT DEM/VAL	57,661	0	50,556	Continuing

B. BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

Other Follow-On Systems:
Define, develop, and conduct fast-response, ground-based preflight verification and ballistic or space flight testing of unique concepts and high yield approaches for SDI weapons, seekers, and targeting applications that might be deployed beyond the turn of the century in support of Other Follow-On systems. Provide experienced launch and flight test teams including: launch vehicle procurement; launch services; payload processing; payload integration; mission operations/planning; range operations/integration; mission analysis; and test operations. Four competitive contracts to provide commercial orbital launches exist: two each for 500 and 2500 lb payload classes.

Research and Support Activities:
Define, develop, and conduct fast-response, ground-based preflight verification and ballistic or space flight testing of unique concepts and high yield approaches for SDI weapons, seekers, and targeting applications that might be deployed beyond the turn of the century in support of Research and Support programs. Provide experienced launch and flight test teams including: launch vehicle procurement; launch services; payload processing; payload integration; mission operations/planning; range operations/integration; mission analysis; and test operations.

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

- (LCFTS) Conducted 2 suborbital flight experiments (LEAP No.-1,and No.-2). Begin mission planning and flight hardware procurement activities for 3 additional experiments (LEAP No. 3, 2A, and 4).
- Completed ZEST data reduction; published Final Report.
- (LOSAT) Completed data reduction and analysis. Published final report. Program complete.
- (LCFTS) Conducted 2 suborbital flight experiments (LEAP No.-2B, and No.-3). Began mission planning and flight hardware procurement activities for 4 additional experiments (Clementine I & II MSTI 3,4).
- Continue support to GPALS including launch services activities associated with technology developments in NMD, GMD, and TMD. Specific programs include Clementine I & II, Theater Discrimination, MSTI 3 & 4. Provide support to supporting technology activities such as LEAP. Provide follow-on and research and support activities as required.

Program Element: 0603217C
PE Title: Follow-On Technologies

Project Number: 1701
Budget Activity: 02
Advanced Technology Development
April 1993

Program Plan to Completion: This is a continuing program.

D. WORK PERFORMED BY:

Major Contractors:

- o Orbital Science Corporation, Space Data Division
- o NASA
- o International Microspace
- o Martin Marietta, Astronautics
- o EER

E. COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. TECHNICAL CHANGES: None
2. SCHEDULE CHANGES: None
3. COST CHANGES: None

F. PROGRAM DOCUMENTATION:

G. RELATED ACTIVITIES:

Technology programs are coordinated among DoD and other SDIO agencies to preclude duplication of effort and take advantage of jointly conducted missions wherever practical. SDIO program elements being supported by LCFTS include:

1101	Passive Sensors	PE No. 0603214C
1105	Discrimination	PE No. 0603215C
1109	TMD Discrimination	PE No. 0603216C
1110	Sensor Integration	PE No. 0603215C
1201	Interceptor Comp Tech	PE No. 0603217C
1202	Interceptor Integration	PE No. 0603217C
1501	Survivability	PE No. 0603215C/ PE No. 0603216C/
1702	Special Test Activity	PE No. 0603217C
2102	Space Based Interceptors	PE No. 0603215C
2202	GBI	PE No. 0603215C

There is no unnecessary duplication of effort within SDIO or the DoD.

H. OTHER APPROPRIATION FUNDS:

I. INTERNATIONAL COOPERATIVE AGREEMENTS: None.

J. MILESTONE SCHEDULE:

- o LEAP-3
- o LEAP-2B
- o MSTI 3
- o Project Clementine
- o MSTI 4

FY1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: 0603217C
PE Title: Follow-On Technologies

Project Number: 1701
Budget Activity: 02
Advanced Technology Development
April 1993

FY1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: 0603217C
PE Title: Follow-On Technologies

Project Number: 1702
Budget Activity: 02
Advanced Technology Development
April 1993

A. RESOURCES: ($ in Thousands)
Project Title: Special Test Activities

Program Name:	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	Total Program
FOT DEM/VAL	31,081	32,380	4,884	Completed

B. BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

Develop accelerated test programs for emerging special application technologies. Determine acquisition strategy. Acquire test systems and test equipment. Plan and execute test programs including on-orbit command, control, and validation of demonstration payloads and resulting data collection.

The program being accomplished under this effort is Single Stage Rocket Technology (SSRT) Program. The SSRT focuses on the development of technology for a reusable, suborbital launch vehicle. The SSRT program will design, develop, and fly an advanced technology demonstration vehicle that may lead to a reusable launch vehicle capable of aircraft-like operations to support SDIO System testing and experiments. The data from this program will be made available to other agencies interested in a spin-off single stage to orbit applications.

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

- o (SSRTP) Continued Phase II technology demonstrations and prototype design. Began engine module fabrication, demonstration, and test. Conducted preliminary Design Review for prototype, and completed final design review.
- o (SSRT) Continued Phase II technology demonstrations, design and test. Began engine module fabrication, demonstration, and test. Completed ATD fabrication and will initiate flight testing.
- o Complete DC-X Flight Test Program.

Program Plan to Completion:
- o Project funding terminates in FY 1994.

D. WORK PERFORMED BY: Special Test Activities are conducted by the USAF, USA, USN, other Government Agencies, National Laboratories, Colleges and Universities, and commercial contractors, including McDonnell Douglas Space Systems Division. Source selection is determined on a project/experiment by project/experiment basis and is based on performance requirements, scientific and technical capabilities, and cost.

E. COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. TECHNICAL CHANGES: None
2. SCHEDULE CHANGES: None

Program Element: 0603217C
PE Title: Follow-On Technologies

Project Number: 1702
Budget Activity: 02
Advanced Technology Development
April 1993

3. COST CHANGES: None

F. PROGRAM DOCUMENTATION:

G. RELATED ACTIVITIES:

Technology programs are coordinated among NASA, DoD, and other SDIO agencies to preclude duplication of effort. Within SDIO, the following SDIO programs are related to efforts conducted under this program:

1101	Passive Sensors	PE No. 0603214C/PE No. 0603215C
1105	Discrimination	PE No. 0603215C/PE No. 0603216C
1201	Interceptor Comp Tech	PE No. 0603217C
1202	Interceptor Integration	PE No. 0603217C
1501	Survivability	PE No. 0603214C/PE No. 0603216C

H. OTHER APPROPRIATION FUNDS: None.

I. INTERNATIONAL COOPERATIVE AGREEMENTS: None.

J. MILESTONE SCHEDULE:

- o SSRT begin Phase II prototype design
- o SSRT Preliminary Design Review
- o SSRT Critical Design Review(s)
- o SSRT Prototype Flight Testing Begins

FY1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: 0603215C
PE Title: Limited Defense System

Project Number: 2102
Budget Activity: 03
Strategic Programs
April 1993

A. RESOURCES: ($ in Thousands)
Project Title: Space-Based Sensor (Brilliant Eyes)

Program Name:	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	Total Program
LDS DEM/VAL	73,793	239,500	140,074	Continuing

B. BRIEF DESCRIPTION OF MISSION REQUIREMENTS AND SYSTEM CAPABILITIES:

The Brilliant Eyes (BE) element is a distributed space based surveillance satellite system that is designed to support both strategic and theater ballistic missile defense needs. A constellation of BE satellites provides global (below-the-horizon and above-the-horizon) access of strategic ballistic missiles in their boost, post-boost, and midcourse phases in response to directed tasking from the Command and Control Element (C2E). In addition, BE provides data on threat development, deployment, and testing. The data is used for sensor system optimization and block upgrade development for ballistic missile defense systems. A secondary mission is to perform space surveillance missions by monitoring satellites in near earth and geosynchronous orbit.

BE satellites carry a suite of passive sensors including short-, medium-, and long-wavelength infrared and visible sensors. These sensors acquire and track strategic ballistic missiles in the boost phase and continue to track and discriminate the reentry vehicles from debris and penetration aids throughout the midcourse flight of the missiles. The satellites are in low earth orbits which afford relatively short ranges to the missiles compared to early warning geosynchronous satellites and above-the-horizon (ATH) viewing in the midcourse phase of the missile's trajectory. These shorter ranges and ATH viewing allow the BE sensors to track strategic missiles below-the-horizon (BTH) and ATH and provide more accurate trajectory estimates throughout the missile's trajectory than the early warning systems. BE can either be cued by an early warning sensor such as DSP or FEWS or can be actively monitoring small areas of interest in anticipation of missile launches.

BE provides surveillance and track data to support overall command and control, active defense and passive defense. BE provides track data that allows the Ground Based Interceptors (GBI) to have the maximum time for flyout, generating the maximum possible defended footprint from each GBI site. BE cues Ground Based Radars (GBR), increasing their detection range by focusing their energy to acquire the reentry vehicles. The C2E commits GBI and sends course updates to the interceptors during flight based on BE track data. BE provides data that can be converted into accurate reentry vehicle impact point and time predictions enabling defensive measures to be taken. BE also is capable of peacetime monitoring of missile flights worldwide, providing important signature data to allow defenses to maintain their effectiveness as new threats appear, and supporting space surveillance as a secondary mission.

Program Element: 0603215C
PE Title: Limited Defense System

Project Number: 2102
Budget Activity: 03
Strategic Programs
April 1993

The major programmatic and technical objectives being addressed by this program include: (1) validation of LWIR and Advanced LWIR functional performance in the post-boost and midcourse phases measured against known threat representative targets; (2) demonstrate critical space vehicle system capabilities such as real-time interoperability with other sensors, interceptors, and C3 functions, extendibility of theater battle space, platform stability/ephemeris accuracy, and distributed hardware and software processing using known threat representative targets; (3) demonstrate noncritical space vehicle system capabilities by conducting analysis based upon validated end-to-end simulations; (4) substantiate affordability by validating cost models based on fabrication of critical technology components; (5) demonstrate cost effective supportability by validating maintenance and support concepts that integrate product development practices and procedures; (6) develop System Test Plans, by the contractor, that meet the System Testability Criteria; (7) demonstrate producibility of critical technologies utilizing engineering models and simulations of critical components; (8) demonstrate that the operational BE System Design satisfies the following Critical Operational Issues (COIs): operational performance, command, control, and communication, suitability, interoperability and positive control.

The test program for BE includes computer simulations, ground demonstrations, and flight demonstrations to collect data and demonstrate the technical maturity of the BE program for a Milestone II decision in late 1990s. Technology maturity can support an early 2000s BE deployment.

BE funding includes work being performed to develop SDIO sensor test capabilities at Arnold Engineering Development Center (AEDC). Two existing sensor test chambers at AEDC are being upgraded, the 7V chamber and the 10V chamber. The 7V chamber will be used principally for seeker testing (such as GBI), and for calibration of surveillance sensors (such as BE). The 10V chamber will be used to perform end-to-end functional and performance characterization and testing of surveillance sensors. These ground test capabilities are required for BE, as well as providing support for other SDIO programs.

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

- Completed BE Dem/Val Step 01 contracts.
- Completed integration of Proof of Principle experiments and conducted ground tests to provide early demonstration of critical BE functions.
- Initiated development of 10 Kelvin sorption cryocooler components.

Program Element: 0603215C
PE Title: Limited Defense System

Project Number: 2102
Budget Activity: 03
Strategic Programs
April 1993

- o Completed design of a three stage, 10 Kelvin sorption cryocooler brassboard system for spaceflight experiment.
- o Awarded two BE Dem/Val Step 02 prime contracts to: (1) Complete BE operational space and ground system designs through System Design Review (SDR); (2) conduct ground demonstrations of key technologies and producibility; and (3) launching and testing BE Flight Demonstration System satellites.
- o Demonstrate focal plane arrays, processors, and 60 GHz communication components functionality and key components at natural environments radiation levels.
- o Initiated long life testing of 65 Kelvin mechanical cryocooler.
- o Continue 10 Kelvin sorption cryocooler development and begin brassboard fabrication and assembly.
- o Deliver BE experiments to SPAS III experiment integrator.
- o AEDC 7V & 10V Sensor Test Capabilities Critical Design Reviews.
- o 7V Sensor Test Chamber IOC.
- o Complete BE Flight Demonstration Satellite System Design Review and initiate detailed design.
- o Begin BE operational system design following NMD Operational Requirements Document Validation and Acquisition Program Baseline approval.
- o Complete BE Flight Demonstration System Satellite Preliminary Design Review (PDR).
- o Purchase flight pacing hardware items for BE Flight Demonstration System satellites.
- o Demonstrate initial digital End-to-end Real-time Simulation (ETERTS) in support of Flight Demonstration System satellite design.
- o Continue BE operational system design.

Program Plan To Completion: This is a continuing program.

D. WORK PERFORMED BY:

Major Contractors:
- o Rockwell International, Space Systems Division
- o TRW, Inc./Hughes Aircraft

Developing Organization:
- o Air Force Space and Missile Systems Center/MGS

E. COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY

1. TECHNICAL CHANGES: None
2. SCHEDULE CHANGES: Stated below

Program Element: 0603215C
PE Title: Limited Defense System

Project Number: 2102
Budget Activity: 03
Strategic Programs
April 1993

3. COST CHANGES: Due to reductions in the SDIO FY94 budget the BE Dem/Val flights have been delayed one year from FY97 to FY98 and the initial National Missile Defense deployment has been delayed to the early 2000s.

F. PROGRAM DOCUMENTATION:

G. RELATED ACTIVITIES:

o	1101	Passive Sensors	PE No. 0603215C
o	1104	Signal Processing	PE No. 0603215C
o	1105	Discrimination	PE No. 0603215C
o	1106	Sensor Studies & Experiments	PE No. 0603215C
o	1405	Communication Engineering	PE No. 0603215C
o	1501	Survivability Tech	PE No. 0603215C
o	3102	Engineering & Integration	PE No. 0603215C
o	3307	Airborne Surveillance Test Bed	PE No. 0603215C
o	3308	System Simulation Level II	PE No. 0603215C

There is no unnecessary duplication of effort within SDIO or the DoD.

H. OTHER APPROPRIATION FUNDS: None

I. INTERNATIONAL COOPERATIVE AGREEMENTS: None

J. MILESTONE SCHEDULE:

- o BE Step 02 Contract Awards
- o 7V/10V Chamber Critical Design Review
- o BE Flight Demonstration System Design Review
- o 7V Chamber Initial Operational Capability
- o Flight Demonstration ABM Treaty Compliance Review
- o BE Formal Requirements Review
- o BE Flight Demonstration Preliminary Design Review
- o Execute contract option for Satellite fabrication

FY1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: 0603215C
PE Title: Limited Defense System

Project Number: 2103
Budget Activity 03
Strategic Programs
April 1993

A. RESOURCES: ($ in Thousands)
Project Title: Ground-Based Surveillance and Tracking System

Program Name:	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	Total Program
LDS DEM/VAL	118,186	11,500	0	Completed

B. BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

The primary role of the Ground-Based Surveillance and Tracking System (GSTS) was to provide tracking and discrimination data for the Ground Based Interceptor (GBI). Based upon the U.S. Space Command operational concepts, cost comparison, and coverage comparison, Brilliant Eyes (BE) was selected to provide tracking and discrimination to GBI. GSTS was then considered as an option for interim cueing of GBI at the initial site, prior to deployment of BE. In this case again an alternative source, Early Warning Radars, was found to be cheaper and have better coverage than GSTS. Therefore, the interim cueing of GBI will be done by upgrades to the Early Warning Radars. GSTS is no longer required to support National Missile Defense (NMD).

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

- Begin sensor fabrication.
- Ground Data Processor Preliminary Design Review (PDR) and Demonstration.
- AEDC 7V & 10V Sensor Test capabilities development:
  - System Requirements Review
  - System Design Review
  - Preliminary Design Review.
- Sensor Software PDR.
- Signal and Data Processor Algorithm Software Upgrades/Test Bed Evaluations.
- System PDR; Sensor Critical Design Review (CDR); System CDR.
- Prototype Ground Data Processor/Tests.
- Data Processor Algorithm Update #2 Completed.
- Termination of GSTS contract.
- Delivery of completed hardware and software.

Program Plan to Completion: None

D. WORK PERFORMED BY:

Major Contractors:
- McDonnell Douglas Space Systems Co.

Subcontractors:
- Hughes Aircraft Co.

- Honeywell, Inc.
- TRW, Inc.
- SPARTA, Inc.
- Space Data
- Rockwell

In-House Support:

- USASDC
- Teledyne Brown Engineering (SETA)
- Nichols Research (SETA)

E. COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. TECHNICAL CHANGES: None
2. SCHEDULE CHANGES: GSTS contract terminated
3. COST CHANGES: Funding deleted for GSTS contract

F. PROGRAM DOCUMENTATION:

G. RELATED ACTIVITIES:

o 1101	Passive Sensors	PE No. 0603215C
o 3103	Measurement Standards	PE No. 0603215C
o 3107	Siting and Facilities	PE No. 0603218C
o 3306	Advanced Research Center	PE No. 0603218C

There is no unnecessary duplication of effort within SDIO or the DoD.

H. OTHER APPROPRIATION FUNDS: None

I. INTERNATIONAL COOPERATIVE AGREEMENTS: None

J. MILESTONE SCHEDULE:

- System Preliminary Design Review
- Sensor Hardware and Software Critical Design Reviews
- System Critical Design Review
- Contract Completed

Program Element: 0603215C
PE Title: Limited Defense System

Project Number: 2104
Budget Activity: 03
Strategic Programs
April 1993

A. RESOURCES: ($ in thousands)
Project Title: Ground-based Radar

Program Name:	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	Total Program
LDS DEM/VAL	23,007	91,180	100,124	Continuing

B. BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

TMD-GBR is the theater radar supporting the Upper Tier Theater Missile Defense System (UTTMDS). NMD-GBR is the strategic radar of the initial deployment complying with the National Missile Defense Act of 1991 and eventually of the full Global Protection Against Limited Strikes System (GPALS) deployment. Both radars are similarly designed sharing co-development, co-production, and life-cycle cost savings. The NMD-GBR will have a bigger antenna and require a larger power supply than the TMD-GBR. These two systems are being procured as the strategic and theater members of the SDIO "Family of Radars."

The NMD-GBR is required to detect, acquire and track RVs from accidental or unauthorized limited strikes from ICBMS, SLBMs or MRBMs. The NMD-GBR provides support data to the Command and Control Element, which combines data from all available sensors, to the Ground Based Interceptor (GBI) in exoatmospheric engagements. The NMD-GBR can operate autonomously or can use range extending cuing support from other space and/or ground based sensors. The NMD-GBR provides data to support weapon target assignment (WTA), sensor fusion; kill assessment, and employment option support. The NMD-GBR will also provide data to support precision tracking, launch point prediction and signal/data processing for exoatmospheric discrimination and classification in support of the Ground Based Interceptor (GBI). The GBR-T, at USAKA national test range, Dem/Val radar will provide the Functional Test Validation (FTV) of the NMD-GBR.

Family of Radars Design Concept

The design and fabrication of the TMD-GBR and the NMD-GBR will be based upon the family of modular X-Band radars concept derived from the GBR-X radar program conducted 1986-1991. The transmitter (power) and aperture are sized to the radar range requirements. The radar antenna for the TMD-GBR Dem/Val radars will use solid state transceiver modules and the NMD-GBR Dem/Val radar will use traveling wave tubes with ferrite-phase shifters. Significant commonality exists between the TMD-GBR Dem/Val radars and the NMD-GBR Dem/Val radars in the areas of the radar receivers, signal processors, data processors, recorder subsystems, beam steering generation, and software. Issues concerning higher power rated solid state transceiver modules needed for EMD will be resolved by a parallel Solid State Demonstration Array contractual effort.

Program Element: 0603215C
PE Title: Limited Defense System

Project Number: 2104
Budget Activity: 03
Strategic Programs
April 1993

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

- o Family of Radars Dem/Val contract awarded.
- o Dem/Val engineering and development initiated.
- o NMD-GBR (LDS) Review completed.
- o Conducted GBR-T MILCON project solicitation.
- o Solid State Demonstration Array contract awarded.
- o Complete requirements definition and begin preliminary design for GBR-T.
- o Conduct GBR-T OPINE and Electronic Countermeasures (ECM)/Electronic Counter-Countermeasures (ECCM) performance analysis.
- o Continue GBR-T Dem/Val design and provide Systems Requirements/Design Reviews.
- o Complete USAKA siting construction plans for GBR-T and negotiate test facilities.
- o Continue Solid State Demonstration Array technology contract.
- o Award USAKA GBR-T MILCON contract.
- o Conduct GBR-T Dem/Val radar critical design review and begin fabrication.

Program Plan To Completion: These are continuing programs.

D. WORK PERFORMED BY:

- o U.S. Army PEO-GPALS
- o U.S. Army Space and Strategic Defense Command
- o U.S. Army Missile Command Redstone Arsenal
- o Family of Radars Dem/Val contract, Raytheon Equip. Div

E. COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. TECHNICAL CHANGES: 17 Sept 92 Family of Radars Dem/Val contract awarded. The GBR-T at USAKA was changed from a 24 meter squared antenna with a full field of view to a 89.4 meter squared antenna with a medium field of view.
2. SCHEDULE CHANGES: None.
3. COST CHANGES: The LDS FY92/FY93 funding was reduced by $15.4M / $38.0 M due to budget reprogramming. In FY94 $43.8M was transferred to the TMD PE to fund the Solid State Demonstration Array contract supporting risk reduction for the TMD-GBR EMD/Production phase.

Program Element: 0603215C
PE Title: Limited Defense System

Project Number: 2104
Budget Activity: 03
Strategic Programs
April 1993

F. PROGRAM DOCUMENTATION:

G. RELATED ACTIVITIES:

o	1102	Large Radar Technology	PE No. 0603215C
o	1105	Discrimination Technology	PE No. 0603215C
o	3304	Targets	PE No. 0603215C
o	4101	Support	PE No. 0603218C
o	1501	System Survivability	PE No. 0603743C

There is no unnecessary duplication of effort within SDIO or the DoD.

H. OTHER APPROPRIATION FUNDS: None

I. INTERNATIONAL COOPERATIVE AGREEMENTS: None

J. MILESTONE SCHEDULE:

- Strategic Radar Review
- Family of Radars Contract Award
- GBR-T Critical Design Review
- GBR-T I&T at factory
- GBR-T I&T at USAKA

FY1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: 0603217C
PE Title: Follow-On Technologies

Project Number: 2106
Budget Activity: 02
Advanced Technology Development
April 1993

A. RESOURCES: ($ in Thousands)
Project Title: KE Boost Phase Intercept

Program Name:	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	Total Program
FOT DEM/VAL	0	15,435	22,464	Continuing

B. BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

The purpose of this project is to demonstrate near term follow-on technology developments as it applies to Boost Phase Intercept (BPI) for Theater Missile Defense (TMD). Present TMD architectures focus on mid-course and terminal defenses which allow fragments of the missile body and/or warheads to inflict damage on friendly areas. By adding a boost phase defensive layer, called BPI, tremendous leverage can be brought to bear on the enemy and significantly reduce the utility of his theater ballistic missiles (TBMs). During a TBM's boost phase the missile is readily visible, slow moving and extremely vulnerable. Boost Phase Interception of TBMs can cause missile debris to fall on enemy territory or fall short of the intended target, while simultaneously reducing the burden on terminal defenses. A fast-paced BPI advanced technology demonstration (ATD) program will provide this nation an urgently needed warfighting option. The goal of this initiative is to demonstrate effective BPI capability, that can be tested, proven and fielded quickly.

This project includes advanced component development and test for the TALON interceptor and planned conceptual design for a hypervelocity (HVM) missile capable of "killing" a TBM up to 400KM distant.

Planning efforts for this project will become finalized in late FY93 to include transferring development of the RAPTOR/TALON (R/T) project from PE 0603216C to this project for FY94.

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

- o Demonstrate a TALON pumped propulsion system on ground.
- o Initiate conceptual design for an HVM
- o Demonstrate TALON seeker build up in lab
- o Begin flight test of electric UAV
- o Transfer RAPTOR/TALON development to this PE
- o Fly proof of principle High Altitude RAPTOR UAV
- o Demonstrate TALON propulsion via Ground Launched Rocket Tests
- o Demonstrate TALON seeker via field tests
- o Begin flight test of Solar Electric UAV

Program Plan to Completion: This is a continuing Program.

D. WORK PERFORMED BY:

- o Lawrence Livermore National Laboratory
- o Los Alamos National Laboratory

FY1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: 0603217C
PE Title: Follow-On Technologies

Project Number: 2106
Budget Activity: 02
Advanced Technology Development
April 1993

Major Contractors:
- Hughes Aircraft
- Rocket Research

E. COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. TECHNICAL CHANGES: RAPTOR/TALON and HVM development transferred to this PE
2. SCHEDULE CHANGES: None
3. COST CHANGES: None

F. PROGRAM DOCUMENTATION:

G. RELATED ACTIVITIES:

o 1501 Survivability	PE No. 0603216C
o 1502 Lethality	PE No. 0603216C
o 2104 Ground Based Radar	PE No. 0603216C
o 2207 Patriot	PE No. 0603216C
o 2208 ERINT	PE No. 0603216C
o 2210 THAAD	PE No. 0603216C
o 2212 Corps SAM	PE No. 0603216C
o 3205 TMD Special Studies	PE No. 0603216C
o 3210 Counterforce	PE No. 0603216C

There is no unnecessary duplication of effort within SDIO or the DoD.

H. OTHER APPROPRIATION FUNDS: None

I. INTERNATIONAL COOPERATIVE AGREEMENTS: None

J. MILESTONE SCHEDULE:
- HVM Workshop
- TALON cold gas test
- RAPTOR/TALON flight tests conducted
- RAPTOR/TALON non-lethal flyby intercept test initiated
- RAPTOR/TALON TBM engagement

FY1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: 0603215C
PE Title: Limited Defense System

Project Number: 2201
Budget Activity: 03
Strategic Programs
April 1993

A. RESOURCES: ($ in Thousands)
Project Title: Space-Based Interceptor

Program Name:	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	Total Program
LDS DEM/VAL	9,000	0	0	Completed

B. BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

The earlier Space-Based Interceptor (SBI) program, under the old Phase I architecture, was directed at resolving the technical issues for various space-based interceptor concepts. Brilliant Pebbles (BP) replaced SBI as the space-based tier of the Global Protection Against Limited Strikes (GPALS) system, and SBI was terminated when Martin Marietta completed its hardware development and integration and hover testing. Certain previously planned SBI tests were continued because they had the potential to provide components for the Ground-Based Interceptor (GBI), reducing overall GBI risk.

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

- o Completed the Martin Marietta hardware and software integration.
- o Performed pre-flight certification.
- o Conducted a hover test of the Martin vehicle and documented the test results.

Program Plan to Completion: The program ended in FY92.

D. WORK PERFORMED BY:

- o Rockwell International
- o Martin Marietta Corporation (MMC)

E. COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. TECHNICAL CHANGES: None
2. SCHEDULE CHANGES: None
3. COST CHANGES: None

F. PROGRAM DOCUMENTATION:

G. RELATED ACTIVITIES:

- o 2205 BP — PE No. 0603214C
- o 2202 (GBI), 2101, 2102, 2103, Lightweight Exoatmospheric Projectile (LEAP), Surveillance, Acquisition, Tracking and Kill Assessment — PE No. 0603215C
- o 1501, 1502, Survivability, Lethality, and Key Technologies — PE No. 0603218C

There is no unnecessary duplication of effort within SDIO or the DoD.

Program Element: 0603215C
PE Title: Limited Defense System

Project Number: 2201
Budget Activity: 03
Strategic Programs
April 1993

H. OTHER APPROPRIATION FUNDS: None

I. INTERNATIONAL COOPERATIVE AGREEMENTS: None

J. MILESTONE SCHEDULE:

- Hover Test (MMC)

FY1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: 0603215C
PE Title: Limited Defense System

Project Number: 2202
Budget Activity: 03
Strategic Programs
April 1993

A. RESOURCES: ($ in Thousands)
Project Title: Ground-Based Exoatmospheric Interceptor Development

Program Name:	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	Total Program
LDS DEM/VAL	182,730	90,000	238,176	Continuing

B. BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

The objective of the Ground-Based Interceptor (GBI) development effort is to develop and deploy a ground-launched exoatmospheric interceptor designed for hit-to-kill (non-nuclear) intercepts of Intercontinental Ballistic Missile (ICBM) and Submarine Launched Ballistic Missile reentry vehicles (RVs) in the midcourse of their trajectories. Midcourse sensors will acquire, track, and pass threat cluster information to the Command and Control Element, which will cue the interceptors and provide updates if they are available. Using onboard sensors, the interceptors will acquire the threat cluster and select the RV, and kinetically destroy it.

The GBI was selected as the interceptor for a National Missile Defense (NMD) deployment because of the advanced state of the GBI technology and testing. That testing included the successful Exoatmospheric Re-entry Vehicle Interceptor Subsystem (ERIS) program. The GBI Dem/Val effort began with the GBI Experiment (GBI-X) contracts awarded in FY91. These contracts were reoriented towards risk reduction and Preplanned Product Improvements (P^3I) as the GBI program was redirected towards the NMD. Following the completion of Development Options Assessment contracts that were awarded in FY92, a request for proposals (RFP) was released for the NMD GBI. The procurement was placed on hold indefinitely by OSD pending a Strategic Systems Committee review of the SDI program and NMD acquisition strategy.

The NMD GBI Dem/Val contract will be awarded to a single prime contractor. The prime will use appropriate technology to develop an interceptor for NMD deployment. The NMD GBI may be fielded in FY04 if the Government directs. SDIO technology is responsible for pursuing performance upgrades.

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

- Conducted ERIS Functional Technology Validation- (FTV) 2 flight test in 2Q/FY92.
- Transitioned active sensor work and technology efforts to SDIO/TN.
- Wrote solicitation for 4-month GBI Development Options Assessment.
- Completed GBI Development Options Assessment Phase in 4Q/FY92.
- Wrote solicitation for the NMD GBI.
- Modified GBI-X contracts to support NMD risk reduction and P^3I.
- Released NMD GBI RFP to industry.
- Conduct limited hardware/software systems engineering.

Program Element: 0603215C
PE Title: Limited Defense System

Project Number: 2202
Budget Activity: 03
Strategic Programs
April 1993

- o Conduct risk reduction activities on seeker hardware under GBI-X contracts.
- o Support NMD GBI procurement activities after OSD Strategic Review.
- o Award contract for NMD GBI.
- o Conduct Preliminary Design Review (PDR).
- o Begin kill vehicle brassboard hardware/software development and ground test.
- o Procure long-lead items for GBI element tests.
- o Initiate booster development.
- o Begin prototype KV hardware fabrication.
- o Conduct hardware/software systems engineering.

Program Plan to Completion: This is a continuing program.

D. WORK PERFORMED BY:

- o Lockheed Missile and Space Company
- o Martin Marietta Corporation
- o Hughes Aircraft Company
- o Rockwell International
- o McDonnell Douglas Space Systems Corp.
- o TBD for new procurement

E. COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. TECHNICAL CHANGES: The ERIS program and the Development Options Assessment phase have been completed.
2. SCHEDULE CHANGES: Contract award, PDR, and CDR have been delayed pending OSD Strategic Review.
3. COST CHANGES: None

F. PROGRAM DOCUMENTATION:

G. RELATED ACTIVITIES:

o 3304 T&E Resources	PE No. 0603218C
o 1201 Interceptor Components	PE No. 0603217C
o 1202 Interceptor Integration	PE No. 0603214C
o 1208 Discriminating Interceptor	PE No. 0603215C
o 1209 Endo-LEAP	PE No. 0603215C
o 3102 Systems Engineering	PE No. 0603215C
o 3309 Test Planning	PE No. 0603215C

There is no unnecessary duplication of effort within SDIO or the DoD.

H. OTHER APPROPRIATION FUNDS: MILCON funding in FY95.

I. INTERNATIONAL COOPERATIVE AGREEMENTS: None

J. MILESTONE SCHEDULE:

- o Award NMD GBI contract

Program Element: 0603215C
PE Title: Limited Defense System

Project Number: 2202
Budget Activity: 03
Strategic Programs
April 1993

- Conduct GBI PDR
- Conduct GBI CDR
- Conduct KV Hardware-in-the-loop tests
- Begin KV flight tests
- Conduct subsystem/integration tests at USAKA

FY1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: 0603215C
PE Title: Limited Defense System

Project Number: 2203
Budget Activity: 03
Strategic Programs
April 1993

A. RESOURCES: ($ in Thousands)
Project Title: HEDI (High Endoatmospheric Defense Interceptor)

Program Name:	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	Total Program
LDS DEM/VAL	63,630	0	0	Completed

B. BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

The concept for performing the HEDI mission was the Endo-Exoatmospheric Interceptor (E^2I) which operates primarily during the reentry phase of attacking ballistic missile trajectories. It is designed to engage Intercontinental Ballistic Missile (ICBM) and depressed Submarine-Launched Ballistic Missile (SLBM) attacks.

While previously a separate program, in the future the E^2I effort will be developed as a potential Block upgrade to the Ground Based Interceptor (GBI) for inclusion in the ground based tier for GPALS. It was in competition with the GBI (midcourse option); the decision was made to select GBI for the initial NMD interceptor. Therefore, the E^2I Dem/Val contract awards will not be made. The endoatmospheric interceptor research efforts will continue under SDIO technology.

The primary E^2I activity is a technology demonstration effort called the KITE with the objective of contributing to the resolution of key technical issues through intensive ground and flight testing of a 300kg kill vehicle. KITE-1 was a moderately successful flight in January 1990 at White Sands Missile Range (WSMR). The KITE-2 flight in August 1991 at WSMR ended 0.2 seconds into flight when the self-destruct system engaged prematurely. In August 1992, KITE-2a successfully achieved all of its primary and secondary objectives. It provided critical aero-optic measurements of blur induced by the forebody and window coolant flow and measurements of the refraction caused by the hypersonic shock wave. These cannot be measured in ground testing. This data is critical to both antitactical ballistic missile (ATBM) as well as antiballistic missile (ABM) interceptors and has shared funding between the TMD and LDS line elements.

This effort is unfunded in FY93. If funded in FY93, a KITE-3 flight test would have attempted intercept of a representative reentry vehicle target.

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

- Built KITE-2a hardware.

Program Element: 0603215C
PE Title: Limited Defense System

Project Number: 2203
Budget Activity: 03
Strategic Programs
April 1993

- Conducted successful KITE-2a test against an air-dropped flare target to test the seeker acquisition and tracking functions. This flight also tested the optical window and the cooling subsystem under actual flight conditions to verify performance predictions.
- Completed KITE-2a mission results documentation.
- Performed ground tests and additional environmental tests to maintain option for follow-on KITE-3 test.
- Completed detailed mission planning for KITE-3.
- This program is unfunded in FY93. Endo interceptor research will continue under SDIO Technology.

Program Plan to Completion: This program was completed in FY92.

D. WORK PERFORMED BY:

- McDonnell Douglas Space Systems Corp (Prime), KITE System Integration, Kill Vehicle Airframe and Air Vehicle Integration
- Hughes Aircraft Company (Sub), KITE Kill Vehicle Seeker, Integration and Avionics
- Aerojet Tech Systems Company (Sub), KITE Propulsion Controls, Forebody and Window Cooling

E. COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. TECHNICAL CHANGES: None
2. SCHEDULE CHANGES: None
3. COST CHANGES: None

F. PROGRAM DOCUMENTATION:

G. RELATED ACTIVITIES:

o 2202	GBI	PE No. 0603215C
o 3304	Test and Evaluation Resources	PE No. 0603215C
o 2210	THAAD	PE No. 0603216C
o 1209	Endo Technology	PE No. 0603215C

There is no unnecessary duplication of effort within SDIO or the DoD.

H. OTHER APPROPRIATION FUNDS: None

I. INTERNATIONAL COOPERATIVE AGREEMENTS: None

J. MILESTONE SCHEDULE:

- WSMR KITE Flight 1
- WSMR KITE Flight 2a

FY1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: 0603217C
PE Title: Follow-On Technologies

Project Number: 2204
Budget Activity: 02
Advanced Technology Development
April 1993

A. RESOURCES: ($ in Thousands)
Project Title: DEW Concept Definition

Program Name:	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	Total Program
FOT DEM/VAL	1,478	0	0	Completed

B. BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

Directed Energy Weapons provide important options for enhancing the performance of defensive architectures for both theater and strategic missions. This work included development and analysis of alternate system designs, definition of weapon platform subsystem performance requirements, identification of critical technology issues and recommendations for their resolution, and theoretical analyses. In addition, a data base was developed to allow timely preparation and revision of System Concept Papers (SCPs)/Decision Coordinating Papers (DCPs) and Test and Evaluation Master Plans (TEMPs).

Due to a large decrease in support for directed energy research and development, this effort will not be continued.

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

- Continued system concept design for SBL and NPB.
- Supported Zenith Star and NPB space experiment concept definition and design.
- Refined DEW operations, support, and producibility analysis.
- Initiated study of ultra-light NPB pop-up system and advanced space-based platform.

Program Plan to Completion: None

D. WORK PERFORMED BY:

Major Contractors:
- SBL - Rockwell
  - Lockheed Missiles and Space Corporation
- NPB - Grumman

E. COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. TECHNICAL CHANGES: None
2. SCHEDULE CHANGES: None
3. COST CHANGES: None

F. PROGRAM DOCUMENTATION:

G. RELATED ACTIVITIES:

Program Element: 0603217C
PE Title: Follow-On Technologies

Project Number: 2204
Budget Activity: 02
Advanced Technology Development
April 1993

o	1301 Free Electron Laser	PE No. 0603217C
o	1302 Chemical Laser	PE No. 0603217C
o	1303 Neutral Particle Beam	PE No. 0603217C
o	1305 ATP/FC	PE No. 0603217C
o	1307 DE Demo	PE No. 0603217C
o	1504 Materials and Structures	PE No. 0603217C
o	3201 Architecture Studies	PE No. 0603218C

There is no unnecessary duplication of effort within SDIO or the DoD.

H. OTHER APPROPRIATION FUNDS: None

I. INTERNATIONAL COOPERATIVE AGREEMENTS: None

J. MILESTONE SCHEDULE:

Program Element: 0603217C
PE Title: Follow-On Technologies

Project Number: 2205
Budget Activity: 02
Advanced Technology Development
Date: April 1993

A. RESOURCES: ($ in Thousands)
Project Title: Advanced Interceptor Technology (AIT) Program (formerly Brilliant Pebbles (BP))

Program Name:	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	Total Program
SBI DEM/VAL	384,075	218,610	0	Continuing
FOT DEM/VAL	0	0	72,671	Continuing

B. BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

The Follow-On Technologies (FOT) Program Element (PE) is a research effort to develop promising follow-on anti-ballistic missile technologies. Project 2205 within this PE funds the Advanced Interceptor Technology (AIT) program directed towards evaluating candidate concepts to satisfy the Global Missile Defense (GMD) segment requirements of the Global Protection Against Limited Strikes (GPALS) ballistic missile defense system. The Brilliant Pebbles (BP) program, that had been funded in a distinct program element, "Space-Based Interceptor," is the main technology currently in the AIT program. This effort encompasses demonstrating key space interceptor and satellite technologies, based on system requirements and designs, and performing risk reduction.

The BP concept is versatile and can defeat both theater and strategic ballistic missiles with ranges greater than approximately 500 kilometers in normal flight trajectory--or about 800 km for depressed trajectories, whatever their source or destination on the globe, in their boost, post boost, and midcourse phases of flight. This capability must be developed to satisfy CINC desires for a flexible ballistic missile defense-in-depth capability to be able to respond to the widest range of future threats including nuclear, chemical, and biological warheads. Consequently, BP-like concepts are being developed to stop local bullies from becoming regional powers because they have a capability to hold European cities hostage. The designs under evaluation consist of space, ground, and launch components. The space component is comprised of singlet interceptors and their associated "life jacket" carrier vehicles. The interceptor is a lightweight, kinetic, hit-to-kill vehicle that incorporates sensors, computers, and avionic subsystems capable of providing guidance, control, and battle management, and an axial propulsion stage. Each life jacket includes technology capable of providing on-orbit power, low-rate attitude control, surveillance, communication, thermal control, navigation, and survivability. The ground component provides "man-in-the-loop," positive control of all on-orbit components. The launch component is used to place the deployment package of interceptors into operational space orbits. In addition, various operations and deployment modes, such as silo-based, space interceptors that could be launched in response to crises, are being explored.

Specific technical issues to be resolved during this evaluation include: target acquisition, discrimination, and tracking; flyout

guidance performance and end-game intercept performance; station keeping adequacy; singlet and life jacket performance; communication systems; computers and software; survivability; launch system/payload integration; and linkages with the element command center. Demonstration of the concept and the availability of critical technologies will be performed through a combination of: Treaty compliant flight testing, ground and underground testing, hover tests, hardware-in-the-loop testing, detailed associated simulations, and technical analyses. Overall risk assessment for the technology and the concept demonstration phase is low. The activity is funding constrained, not technology constrained.

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

- o Conducted system requirement reviews with each pre-EMD contractor.
- o Demonstrated optical and limited RF communications technology.
- o Conducted component ground tests.
- o Initiated contractor ground and flight testing.
- o Participated in HUNTERS TROPHY underground test.
- o Conducted contractor ground tests.
- o Demonstrated low cost satellite manufacturing work cell technologies.
- o Developed segment designs.
- o Manufactured and integrated the first kinetic kill vehicle for flight test.
- o Program replanned to focus on Advanced Interceptor Technologies.
- o Conduct Technical Review.
- o Conduct contractor ground and flight tests.
- o Conduct program to resolve critical technical issues and critical operational issues.
- o Component hardware/software tests

Program Plan to Completion: This is a continuing program.

D. WORK PERFORMED BY:

Lawrence Livermore National Laboratory (LLNL) developed the BP concept and accomplished initial component development. These results were passed to industry for technical advancement and testing. The Air Force AIT Program Office is currently executing the BP technology and concept demonstration with a two contractor team:

- o TRW; (subs) Hughes ; Sparta; Photon Research Assoc.; Mission Research Corp
- o Martin Marietta Corp; (subs) MMC; Aerojet; IBM; OCA

E. COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. TECHNICAL CHANGES: In response to SECDEF guidance, the Brilliant Pebbles Program has been restructured from a system development

program in the SBI Program Element to the AIT program in the Follow-On Technologies Program Element. This technology development program, which focuses on developing and demonstrating interceptor and space-related technologies, will compete with other kinetic and directed energy programs to satisfy user demands for a boost phase BMD negation capability.

2. SCHEDULE CHANGES:
   - o Entire program schedule under review
   - o FY96 MS II is replaced by an FY00 program decision to determine if the program should proceed.
   - o First Suborbital Flight Test is cancelled.

3. COST CHANGES: Because of major reductions to FY93 BP funding and the significant reduction of the present $72.6M FY94 budget from the FY93 request, the program has undergone major schedule and technical changes and the program is undergoing its second replan this year. Current program funding is a small fraction of what appeared in the FY93 CDS. The $72.6M contemplated for FY94 is a $197.4M reduction from the $270M appropriated FY93 funding.

F. PROGRAM DOCUMENTATION:

G. RELATED ACTIVITIES:

o	3304	Targets	PE No. 0603214C
o	4000	Segment Management/Operational Support	PE No. 0603214C/ PE No. 0603218C
o	2202	Ground Based Interceptor (GBI)	PE No. 0603215C
o	1210	Lightweight Exoatmospheric Projectile (LEAP)	PE No. 0603216C
o	1502	SBI Lethality	PE No. 0603214C
o	2102	Brilliant Eyes (BE)	PE No. 0603215C

There is no unnecessary duplication of effort within SDIO or the DoD.

H. OTHER APPROPRIATION FUNDS: None

I. INTERNATIONAL COOPERATIVE AGREEMENTS: None

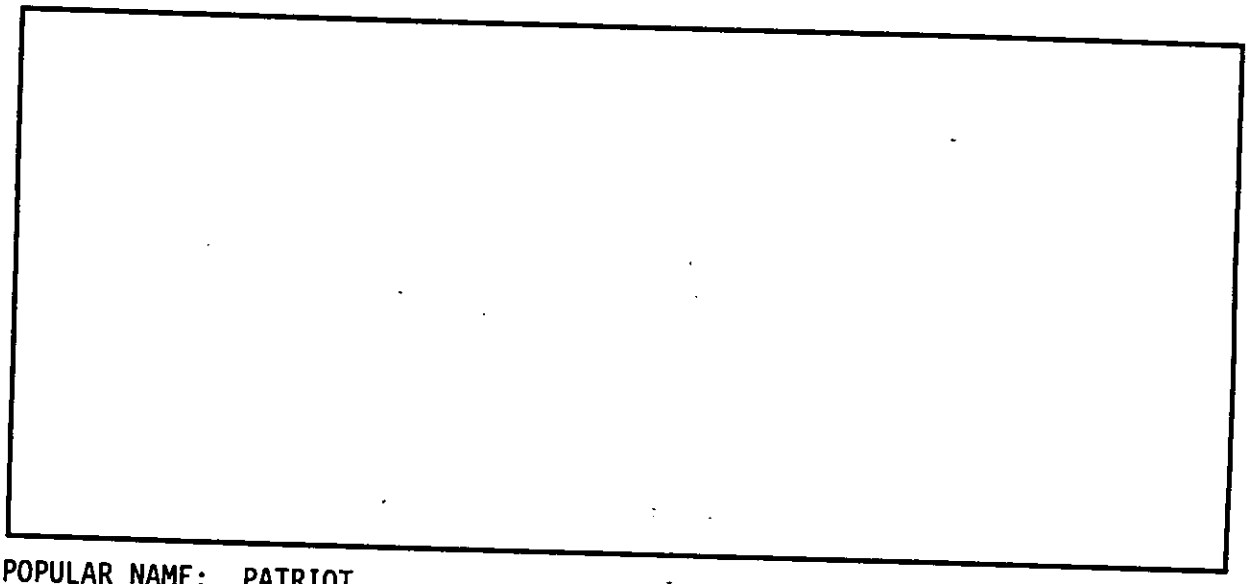
J. TEST AND EVALUATION DATA:

- o BP Flight Experiments
  - FE-1
  - FE-2
  - FE-3
- o HUNTER'S TROPHY Underground Test
- o BP Contractor Flight Experiments
- o MIGHTY UNCLE underground test

FY 1994-95 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: 0603216C/0604225C
PE Title: Theater Missile Defenses
Project Title: PATRIOT

Project: 2207
Budget Activity: 04
Tactical Programs
March 1993



POPULAR NAME: PATRIOT

A. SCHEDULE/BUDGET INFORMATION: ($ in Thousands)

BUDGET	FY 1992		FY 1993		FY 1994		Program Total (To Complete)
Major Contract	Dem/Val 123,550	EMD 11,500	Dem/Val 94,470	EMD 0	Dem/Val 80,684	EMD 48,457	Continuing
Support Contract	0		0		0		
In-House Support	0		0		0		
GFE/Other							
Total	123,550	11,500	94,470	0	80,684	48,457	Continuing*

* These figures do not include target monies (Project 3304); reference Section F, related activities for those amounts.

Program Element: 0603216C/0604225C
PE Title: Theater Missile Defenses
Project Title: PATRIOT

Project: 2207
Budget Activity: 04
Tactical Programs
March 1993

B. BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

PATRIOT is a long-range, mobile, field Army and Corps air defense system, which uses guided missiles to simultaneously engage and destroy multiple targets at varying ranges. Current threat theater ballistic missiles (TBMs) with significantly improved range and accuracy have increased the threat against PATRIOT air defense sites or defended assets. This could result in the destruction of air defense sites and provide the enemy air superiority once an attack is initiated. The current PATRIOT missile requires improved performance and increased accuracy to counter the evolving threat, and to increase its contribution to the lower tier of the theater segment of a Global Protection Against Limited Strikes (GPALS) system. The PATRIOT missile program which entered production in 1979, is a Major Defense Acquisition Program. It has successfully evolved through two major improvement programs, PATRIOT Anti-Tactical Missile (ATM) Capability (PAC) 1 and 2. Also, as a result of analysis of PATRIOT operations in Desert Storm, the Quick Response Program (QRP) was initiated to incorporate several near-term hardware/software changes to upgrade PATRIOT performance. The PAC-3 Growth Program is the latest evolution of phased material change improvement program to PATRIOT. The material changes represent capability improvements to address the PAC-3 Operational Requirements Document (ORD) and are planned over a multi-year period. Fielding will range from the already funded QRP beginning in FY 1993 for near-term deployment, to the Configuration 3 of the PAC-3 Program ending in FY 1999 for the far-term deployment. The program elements funded by SDIO for TMD improvements are: Radar Enhancements (QRP); Guidance Enhancement Missile (GEM); Multimode Missile or ERINT; Radar Enhancements Phase III; and Remote Launch Phase III.

The major technical issue associated with this program, as with other interceptor programs, is the lethality of the missile. ERINT, along with the Multimode variant of the PATRIOT missile, is being evaluated as a candidate missile for the PATRIOT system. A selection decision on the PAC-3 Missile is scheduled for early FY 1994. In the event that ERINT is selected as the PAC-3 Missile, integration studies are being conducted to develop a definitive concept for a fully integrated PATRIOT/ERINT system of sufficient depth to support program planning, cost estimating, development, and testing. Alternative acquisition concepts are being considered for ERINT integration which consider system maturity in relation to planned Post Deployment Build (PDB) software requirements.

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

- Completed the Remote Launch Phase I Program.
- Completed Multimode Seeker fabrication and integration.
- Completed 3 of 4 Multimode Seeker flight tests.
- Initiate Phase III Radar integration testing.
- Initiate Remote Launch Phase III development.
- Continue propellant formulation and characterization.
- Continue Improved Launcher prototype fabrication and assembly.

Program Element: 0603216C/0604225C
PE Title: Theater Missile Defenses
Project Title: PATRIOT

Project: 2207
Budget Activity: 04
Tactical Programs
March 1993

- o Continue Improved propulsion and multimode missile risk reduction.
- o Continue GEM flight tests.
- o Conduct analysis leading to a PAC-3 Missile Decision.
- o Complete 4th Multimode Seeker flight test.
- o Initiate PAC-3 Missile hardware and software development tests.
- o Complete propellant, case and motor development and tests.
- o Complete warhead development and test.
- o Initiate PAC-3 Missile system integration and testing.
- o Plan and schedule PAC-3 Missile Controlled Test Vehicle flights.
- o Initiate activities which will ensure successful transition from development to production including Producibility, Engineering and Planning (PEP).
- o Complete Radar Enhancements Phase III subsystem testing and integration.

Program Plan to Completion: This is a continuing program.

D. WORK PERFORMED BY:

The prime contractor for the ATM upgrade of Patriot is Raytheon Corp. Subcontractors include Martin Marietta, Thiokol, and Telefunken System Technik. Government agency in-house work will be performed by Program Executive Office GPALS, Project Manager Patriot, Product Manager Patriot ATM, US Army Missile Command Research, Development, and Engineering Center; US Army Armament Research and Development Center; Harry Diamond Laboratories; Ballistic Research Laboratory; US Army Air Defense School; and other Service/Government research activities.

The prime contractor for ERINT is Loral Vought Systems Corp. Subcontractors for ERINT are listed in Project 2208 CDS.

E. COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. TECHNICAL CHANGES: None
2. SCHEDULE CHANGES: None
3. COST CHANGES: None

F. PROGRAM DOCUMENTATION:

G. RELATED ACTIVITIES:

o NATO Cooperative Programs	PE No. 0603790D
o Joint Tactical Missile Defense Program	PE No. 0603302A
o Patriot Program No. D036	PE No. 0203801A
o 3304 Targets (PATRIOT/ERINT: FY93: $16.67M)	PE No. 0603216C
o 2208 ERINT (Project 2208) (FY94: $97.671M)	PE No. 0603216C
o 1502 Lethality	PE No. 0603216C

There is no unnecessary duplication of effort within the Army or DoD.

H. OTHER APPROPRIATION FUNDS: Procurement: FY92: $24.9M; FY93: $75.2M; FY94: $121.2M.

Program Element: 0603216C/0604225C
PE Title: Theater Missile Defenses
Project Title: PATRIOT

Project: 2207
Budget Activity: 04
Tactical Programs
March 1993

I. INTERNATIONAL COOPERATIVE AGREEMENTS: Yes

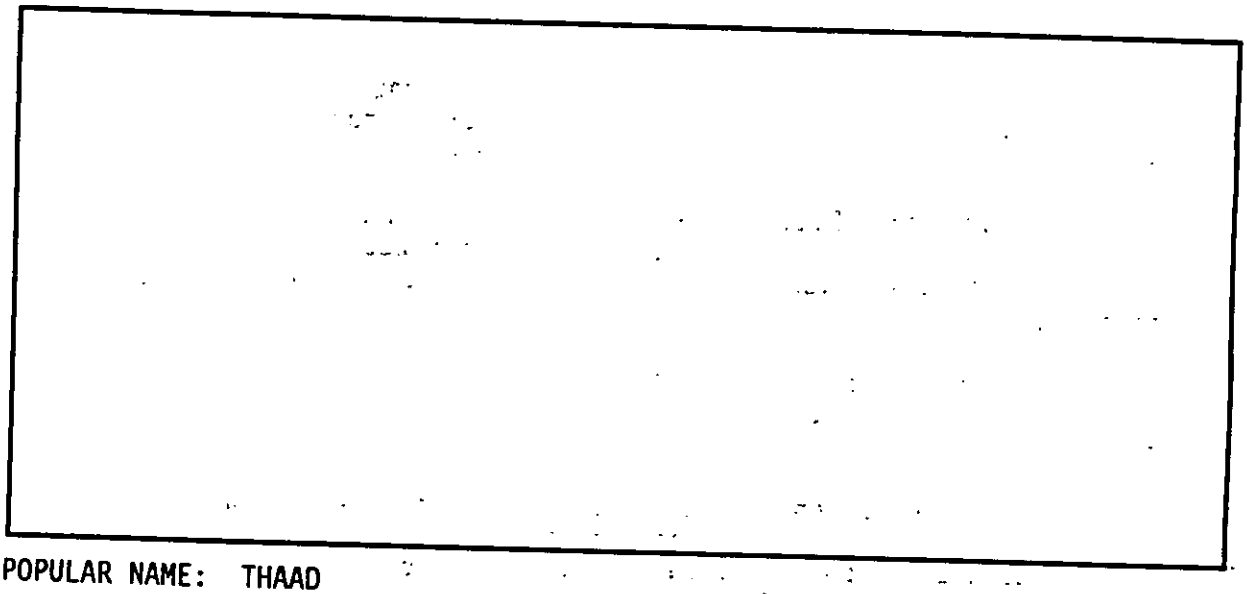
J. TEST AND EVALUATION DATA:

- Multimode seeker Dem/Val flight tests
- (Refer to Project 2208 for Advanced Interceptor/ERINT Milestone information)
- PAC-3 missile decision
- Conduct IPF/PEP production transition
- Initiate long lead procurement PAC-3 missile
- PAC-3 missile flight tests
- Post Deployment Build-4 (PDB-4) software system demonstration
- Design Phase III radar mod kit production
- Integrate remote launcher and PAC-3 missile components
- Perform PAC-3 missile system integration
- PDB-4 Software release
- Conduct PAC-3 missile Milestone III full rate production decision
- PDB-5 software system demonstration
- PDB-5 software release

FY 1994-95 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: 0603216C
PE Title: Theater Missile Defenses
Project Title: THAAD

Project: 2210
Budget Activity: 04
Tactical Programs
March 1993



POPULAR NAME: THAAD

A. SCHEDULE/BUDGET INFORMATION: ($ in Thousands)

BUDGET	FY 1992	FY 1993	FY 1994	Program Total (To Complete)
Major Contract	44,300	223,000	351,400	Continuing
Support Contract	21,800	37,400	33,000	Continuing
In-House Support	0	0	10,000	Continuing
GFE/Other	8,900	12,600	89,800	Continuing
Total	75,000	273,000	484,270	Continuing

B. BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

The THAAD system is a key element of the GPALS architecture and is being designed to negate Theater Ballistic Missile (TBMs) at long ranges and high altitudes. Its long-range intercept capability will make possible the protection of wide areas, dispersed assets, and population centers against TBM attacks. High altitude intercepts will allow an effective defense against maneuvering re-entry vehicles (MARVs) and greatly reduce the probability that debris and chemical or biological agents from a TBM warhead will reach the ground. The combination of high altitude and long-range intercept capability may also provide multiple engagement (shoot-look-shoot) opportunities. THAAD will be interoperable with both existing and future air defense systems and other external data sources (e.g., space based sensors). This netted and distributed BM/C^3I

architecture will provide robust protection against the entire TBM and air breathing threat spectrum.

The THAAD element includes missiles, launchers, BM/C^{3}I units and support equipment. The Theater Missile Defense Ground Based Radar (TMD-GBR) element will provide fire control and surveillance for THAAD as well as for other TMD systems. The THAAD element, combined with the TMD-GBR element, forms the THAAD System. The THAAD system will be C-130/C-141 transportable. Furthermore, the potential for adapting the THAAD system in a cost and operationally effective manner for a sea-based defense is being studied.

The THAAD Dem/Val program will include building a prototype "battery" called the User Operational Evaluation System (UOES). It will consist of 40 missiles with launchers, 2 BM/C^3 units, 2 TMD-GBRs and support equipment. The UOES will be used for early operational assessment but also has the potential to be deployed during a national emergency. This approach provides near term improved TMD capability and lowers the risk of subsequent phases of the acquisition cycle. The objective system will be fielded in the 2001 time frame.

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

- o Received ASARC approval in preparation for a Milestone I DAB.
- o MSI DAB approval.
- o Concluded CD phase.
- o Awarded the Demonstration/Validation competitive contract.
- o Continuation of the Demonstration/Validation and risk management effort for the THAAD system.
- o Conducted Initial Design Review.
- o Completed THAAD/Navy compatibility study.
- o Completed Nuclear Hardening Study.
- o Final Design Review.
- o Hardware-In-The-Loop Testing (HWIL).
- o Begin missile flight test program. Total of 10 flights.
  - -- Propulsion Testing
  - -- Guidance and Control Testing
- o Launcher and BM/C^3 Brassboard Testing.
- o Begin TMD-GBR Test Bed integration.

Program Plan to Completion: This is a continuing program.

D. WORK PERFORMED BY:

- o Demonstration/Validation: Lockheed Missiles and Space Company, Inc.

E. COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. TECHNICAL CHANGES: None
2. SCHEDULE CHANGES: None

Program Element: 0603216C
PE Title: Theater Missile Defenses
Project Title: THAAD

Project: 2210
Budget Activity: 04
Tactical Programs
March 1993

3. COST CHANGES: FY 94 costs adjusted from $541.8M to $495.82M due to DEM/VAL contract awarded one quarter later than originally planned. No change in overall DEM/VAL cost.

F. PROGRAM DOCUMENTATION:

G. RELATED ACTIVITIES:

o	1501	Survivability	PE No. 0603216C
o	1502	Lethality	PE No. 0603216C
o	2104	GBR	PE No. 0603216C
o	2207	Patriot	PE No. 0603216C
o	2208	ERINT	PE No. 0603216C
o	2209	Arrow/ACES	PE No. 0603216C
o	3205	Navy System Studies	PE No. 0603216C
o	3205	AF System Studies	PE No. 0603216C
o	3304	Targets (FY92: $8,450; FY93: $18,150; FY94: $32,100)	PE No. 0603216C
o	3305	Theater Test Beds	PE No. 0603216C
o	4101	Program Operational Support	PE No. 0603218C

There is no unnecessary duplication of effort within SDIO or the DoD.

H. OTHER APPROPRIATION FUNDS: None

I. INTERNATIONAL COOPERATIVE AGREEMENTS: None

J. TEST AND EVALUATION DATA:

- o Flight Test Start
- o System Test Start

FY 1994-95 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: 0603216C
PE Title: Theater Missile Defenses
Project Title: CORPS Surface-to-Air Missile

Project Number: 2212
Budget Activity: 04
Tactical Programs
March 1993

POPULAR NAME: CORPS SAM

A. SCHEDULE/BUDGET INFORMATION: ($ in Thousands)

BUDGET	FY 1992	FY 1993	FY 1994	Program Total (To Complete)
Major Contract	10,000	5,000	14,898	Continuing
Support Contract	6,600	8,000	4,400	Continuing
In-House Support	4,500	8,000	9,700	Continuing
GFE/Other	1,900	2,000	3,000	Continuing
Total	23,000	23,000	31,998	Continuing

B. BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

CORPS SAM is a GPALS Major Defense Acquisition Program (MDAP). The program will lead to the development of a strategically deployable, tactically mobile, low-to-medium altitude air and ballistic missile defense system that will support deployed Corps, contingency operations, and rapid reinforcing missions. The near-term effort is focused on Concept Definition activities directed towards establishment of a range of requirements for a CORPS SAM system and identification/evaluation of concepts that will most likely satisfy these requirements. CORPS SAM will be optimized for operation in the context of the Army's AirLand Operations doctrine as it applies in both mature and contingency theaters. Its distributed/netted architecture and modular components will allow the unit to be task-organized and the equipment configured according to the array of expected air and missile threats, available strategic lift, and acceptable level of risk and cost. The system will provide area and point

defense capabilities against both TBM and air-breathing threats compatible with strategic deployability and tactical mobility. CORPS SAM will be an integrated part of the overall Air Defense/Theater Missile Defenses architecture. As such, it will be compatible/interoperable with other Army air defense systems (i.e, THAAD, Patriot, FAAD) and will interface with joint and allied sensors and BM/C^{3}I networks.

The Program is also investigating possible international interest in the cooperative development of CORPS SAM.

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

- o Released of RFP to industry.
- o Awarded seven contracts for Concept Definition studies.
- o Continued Government Team Study - cost, schedule, and performance tradeoffs.
- o Pursued international cooperation.
- o Prepare ORD.
- o Complete COEA.
- o Complete contractor Concept Definition Studies.
- o Complete MSI.
- o Continue to pursue international cooperation.
- o Release draft RFP for contractor Dem/Val Program.
- o Conduct Source Selection evaluation for Dem/Val Contract.
- o Award Dem/Val Contract.
- o Conduct System Design Review.

Program Plan to Completion: This is a continuing program.

D. WORK PERFORMED BY:

- o CORP SAM Project Management Office
- o US Army Air Defense Artillery School
- o Government team led by MICOM RDEC
- o Contractors selected in FY92 for Concept Definition Studies
- o Contractors to be selected in FY94 for Dem/Val

E. COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. TECHNICAL CHANGES: None
2. SCHEDULE CHANGES: None
3. COST CHANGES: None

F. PROGRAM DOCUMENTATION:

G. RELATED ACTIVITIES:

o	1205	TMD Experiments	PE No. 0603216C
o	1502	TMD Lethality	PE No. 0603216C
o	2208	ERINT	PE No. 0603216C
o	3207	Architecture Integration	PE No. 0603216C
o	3211	C^{4}I and Operational Analysis	PE No. 0603216C
o	3304	Targets	PE No. 0603216C

Program Element: 0603216C
PE Title: Theater Missile Defenses
Project Title: CORPS Surface-to-Air Missile

Project Number: 2212
Budget Activity: 04
Tactical Programs
March 1993

o 3305 Theater Test Beds PE No. 0603216C

There is no unnecessary duplication of effort within SDIO or the DoD.

H. OTHER APPROPRIATION FUNDS: None

I. INTERNATIONAL COOPERATIVE AGREEMENTS: None.

J. MILESTONE SCHEDULE:

- o RFI to industry
- o Contract award - Concept Definition Studies
- o Complete Operational Requirements Document
- o Complete STAR Update
- o Complete COEA
- o Complete MICOM RDT&E Studies
- o Milestone I review
- o Contract Award-Dem/Val
- o Conduct System Design Review
- o Complete Initial Prototype Hardware
- o Initiate Development Tests

Program Element: 0603215C
PE Title: Limited Defense System

Project Number: 2300
Budget Activity: 03
Strategic Programs
April 1993

A. RESOURCES: ($ in Thousands)
Project Title: Command Center

Program Name:	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	Total Program
LDS DEM/VAL	71,943	51,220	76,318	Continuing
LDS D/V MILCON	0	0	30	Continuing

B. BRIEF DESCRIPTION OF MISSION REQUIREMENTS AND SYSTEM CAPABILITIES:

The Command and Control Element (C^2E) will develop the Battle Management, Command, Control and Communications (BMC3) functionality for operational deployment as part of an evolutionary acquisition approach to meet the requirements of the Global Protection Against Limited Strike (GPALS) System. The GPALS System consists of Theater Missile Defense (TMD) and the National Missile Defense (NMD) segments. Initially the C2E will provide the interface between the TMD segment and US Space Command (USSPACECOM), and will develop the BMC3 capability for NMD. The C2E critical design characteristics and operational capabilities will execute the USSPACECOM Ballistic Missile Defense (BMD) Concept of Operations (CONOPS) for centralized command and distributed execution. The C2E evolutionary process will demonstrate that critical BM/C^3 technologies can be incorporated into an open architecture; prove that critical BM/C^3 processes are understood and attainable; develop BM/C^3 information to support the GPALS BM/C^3 MDAP Milestone II documentation requirements; and establish the GPALS C^2E baseline cost, schedule and performance objectives.

The C^2E provides USCINCSPACE with the capability to plan, command and control BMD operations. The C^2E is a distributed, informed system consisting of processors, software, man-machine interfaces, and communications media.

The C^2E consists of three subelements that will be integrated to provide the GPALS System BM/C^3 capability. The Command and Control (C^2) subelement consists of human-in-control decision support processes that enable USCINCSPACE to select and issue the system control directives required to operate and maintain assured control over the GPALS System. The Engagement Planning (EP) subelement is a set of automated processes that respond to the C^2 system control directives; allow data from different sensors to be combined or fused; task the communications network, sensors and weapons; and provide real-time summary data to assess performance. The sensors provide the data needed to detect, track, and classify the threat, and perform kill assessment; the weapons engage and negate the threat. The Communications subelement provides the hardware and software resources, including network management necessary to securely send and receive information/data within the C^2E, and between the C^2E and other GPALS System elements.

The C^2E Program, in conjunction with the CINC Command Element (PMA F2307), which is responsible for C2E interface with Cheyenne Mountain Air

Force Base (CMAFB) systems, will develop BMC3 hardware and software to perform the following functions:

- o BMD Cell-Function: This function will be performed in the NORAD USCINCSPACE Command Center (NUCC) to support the Space Force Application mission area interface between the GPALS System and USSPACECOM. The BMD Cell-Function will provide command and decision support to USCINCSPACE.

- o Ballistic Missile Defense Operations Center (BMDOC)-Function: Initially located at the National Test Facility (NTF), and ultimately in the CMAFB, this function supports the BMD Cell-USSPACECOM information interface. The BMDOC-Function hosts a BM/C^3 processing suite and the operations personnel necessary to coordinate and integrate system-wide BMD activities and supports the USCINCSPACE planning and decision process.

- o Component Command Centers-Function: These functions (which will include Army and Air Force unique capabilities) will be capable of supporting the NUCC and distributed Operations Centers by functioning as "Hot Backups." The BMD Cell and BMDOC function will be replicated at the Component Command Centers-Function to provide for BM/C^3 availability and survivability. The Component Command Centers-Function will be capable of executing real-time control of BMD engagement operations.

- o Operations Centers-Function: The C^2E Program will deliver BM/C^3 functionality to both the Element Operations Center (EOC)-Function and Regional Operations Center (ROC)-Function to support their control of weapon/sensor elements. The EOC- and ROC-Functions will each host a BM/C^3 processing suite and the operations personnel required to support the real-time control of BMD engagement operations.

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

- o Published C^2E Card.
- o Published C^2E Program Plan (Draft).
- o Published C^2E Element Requirements Document (Draft).
- o Published C^2E Technical Requirements Document (Draft).
- o Published C^2E Test and Evaluation Master Plan (Draft).
- o Published GPALS Post Boost/Midcourse BM/C^3 Concept Description.
- o Delivered C^2E Block 0 to NTF.
- o Published System Behavior and Design Characteristics (Draft).
- o Published C^2E ILS Concept Plan.
- o Published Communications Sub-Element Program Plan.
- o Published EWR Upgrade Program Plan.
- o Published GPALS Post Boost/Midcourse BM/C^3 Concept Overview.
- o Complete IV&V Planning Process.
- o Complete Engagement Planning algorithm evaluation.
- o Award C^2E Approach Options Assessment contract(s).

Program Element: 0603215C
PE Title: Limited Defense System

Project Number: 2300
Budget Activity: 03
Strategic Programs
April 1993

- Continue BMC3 Information Architecture development.
- Continue communications development and test.
- Continue Communications Network Manager (CNM) testing.
- Award GEP contract.
- Develop EP Sub-Element Program Plan.
- Develop CCE Program Plan.
- Develop Project Plans (Communications).
- Conduct C2E Block 0 Enhancements, Integration and Test.
- Update C2E CARD.
- Update C2E Program Plan.
- Update Communications Sub-Element Program Plan.
- Complete C2E Block 1A Concept Definition (AOA).
- Award System Engineering Integration/BMC3 DEMVAL contract for Block 1B (functional) development.
- Refine C^2E Information Architecture.
- Develop initial GEP.
- Update C2E TRD.
- Develop C2 Sub-Element Program Plan.
- Update Communications Project Plans.
- Continue C2E Block 0 Enhancement, Integration and Test.
- Award Network Interface Terminal (NIT) Contract, Begin Development.
- Award CNM Contract, Begin Development.

Program Plan to Completion: This is a continuing program using an evolutionary acquisition strategy.

D. WORK PERFORMED BY:

- System Engineering and Integration Contractor (General Electric)
- US Army PEO GPALS ROC/COMM Project Office
- US Air Force Electronic Systems Center
- US Air Force Space and Missile Systems Center
- US Navy Research Laboratory
- Department of Energy (National Laboratories)
- National Security Agency
- MIT/Lincoln Laboratory
- National Test Facility

E. COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. TECHNICAL CHANGES: The C2E Program is now in the acquisition phase. A new PMA, F2307, was created for C2E interfaces with CMAFB. This PMA places responsibility for this effort directly with the Air Force PEO.
2. SCHEDULE CHANGES: Milestone II was slipped two years to. Milestone III was slipped five years.
3. COST CHANGES: Budget cuts have caused Milestone II to be moved (see Paragraph 2. above) and the UOES option to be deleted. Under these circumstances, the funding profile in Section A will provide development equipment for Milestone II.

Program Element: 0603215C
PE Title: Limited Defense System

Project Number: 2300
Budget Activity: 03
Strategic Programs
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F. PROGRAM DOCUMENTATION:

G. RELATED ACTIVITIES:

o	2304	System Software Engineering	PE No. 0603215C
o	2307	CINC Command Element	PE No. 0603215C
o	3102	Systems Engineering & Integration	PE No. 0603215C
o	3104	Integrated Logistics Support	PE No. 0603215C
o	3109	System Security	PE No. 0603215C
o	3112	National Test Bed	PE No. 0603215C
o	3308	System Simulation	PE No. 0603215C

There is no unnecessary duplication of effort within SDIO or the DoD.

H. OTHER APPROPRIATION FUNDS: MILCON: FY94: $.030M.

I. INTERNATIONAL COOPERATIVE AGREEMENTS: None

J. MILESTONE SCHEDULE:

- o Block 1B at NTF
- o BMC3 Validation Experiment
- o Milestone II
- o Block 2 at NTF
- o Block 2
- o Milestone III

FY1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: 0603215C
PE Title: Limited Defense System

Project Number: 2304
Budget Activity: 03
Strategic Programs
April 1993

A. RESOURCES: ($ in Thousands)
Project Title: System Software Engineering

Program Name:	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	Total Program
LDS DEM/VAL	7,981	6,625	4,980	Continuing

B. BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

GPALS will require adaptive, fault-tolerant, reliable, trusted software that must be developed, integrated, tested, deployed and maintained across multiple systems and developers. This project provides the capability to specify, develop, acquire, integrate, test, and maintain software for SDIO. Efforts underway to achieve these capabilities include development of a standardized software engineering environment; tools and methods analysis; software code prototyping; laboratory experiments; software contractor evaluations; review of SOWs, RFPs, and CRPs and other contractual documentation; review of technical documentation for software engineering issues; and development of SDIO Software Policy and standards necessary to implement a system-wide software engineering program. Build One of the SDI Software Engineering Support Environment (SESE) is scheduled for completion in FY95 with subsequent builds completed in FY96 and FY97. Efforts continue in the research, development and evaluation of emerging software engineering tools and technologies. System-level activities continue to provide basic infrastructure support for software engineering activities performed as part of other programs, such as Trusted Software Development experiments, training, and symposiums; CRLCMP and related system software engineering documentation development and maintenance; Element software development, integration, and testing; and NTB simulation, integration, testing and support efforts. Standards, products, tools and methodologies developed under this activity apply to all SDI Element software development efforts and will provide the basis for coordinated and successful SDI software development, integration, testing, deployment and maintenance.

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

- Provided software engineering inputs to GBI, GBR and BE contracts prior to award.
- Continued development of SDIO Software Engineering Support Environment (SESE).
- Continued Enhancements to Distributed Computing Design System (DCDS).
- Updated SDIO Software Policy, SDIO Directive 3405.
- Updated SDIO/GPALS, USASSDC, and USAF/SMC CRLCMPs and Annexes.
- Updated SDIO Software Engineering Acquisition Guidelines (SEAG) document.
- Provided technical support to Element contractors for Software parallel algorithm development.
- Supported USASSDC and USAF Computer Resources Working Group (CRWG) meetings and related Service software engineering activities.

Program Element: 0603215C
PE Title: Limited Defense System

Project Number: 2304
Budget Activity: 03
Strategic Programs
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- o Began Ada 9X compiler development.
- o Reviewed Element/contractor SOWs, CRPs, software engineering documentation, etc., for compliance with SDIO Software Policy and standards.
- o Restructured GPALS Computer Resources Working Group (CRWG) as an acquisition-oriented organization and coordinated CRWG Committee activities.
- o Began Software Key Topics Forum for SSR/SDR.
- o Began SESE/SLCSE harmonization effort.
- o Continued SEI Evaluations of Element Contractors and SEI training of government evaluation teams.
- o Perform SEI Evaluations of GBR, GBI, THAAD, C^2E, and NTB contractors.
- o Continue development of the SDIO Software Engineering Support Environment (SESE).
- o Continue enhancements to Distributed Computing Design System (DCDS).
- o Update SDIO/GPALS, USASSDC, and USAF/SSD CRLCMPs and Annexes.
- o Conduct Computer Resources Working Group (CRWG) meetings and coordinate CRWG committee activities.
- o Provide technical support to element contractors for SW Parallel Algorithm Development.
- o Support USASSDC and USAF Computer Resources Working Group (CRWG) meetings and related software engineering activities.
- o Continue Ada 9X compiler development.
- o Review Element/contractor SOWs, CRPs, SW engineering documentation, etc., for compliance with SDIO SW policy and standards.
- o Continue SESE/SLCSE harmonization efforts.
- o Participate in System and Element Program Design Reviews.
- o Continue development of the SDIO Software Engineering Support Environment (SESE).
- o Enhancements to Distributed Computing Design System (DCDS).
- o Update SDIO/GPALS, USASSDC, and USAF/SSD CRLCMPs and Annexes.
- o Development/integration of Software Life Cycle Support Environment (SLCSE) with SDIO SESE.
- o Perform Element contractor software capability evaluations.
- o Software Parallel Algorithm Implementation using Ada 9X.
- o Development of SW Formal Specification Model.
- o Provide technical support to Element contractors for SW Parallel Algorithm Development.
- o Conduct GPALS Computer Resources Working Group (CRWG) and committee meetings.
- o Support USASSDC and USAF Computer Resources Working Group (CRWG) meetings and related software engineering activities.
- o Continue Ada 9X compiler development.
- o Review Element/contractor SOWs, CRPs, SW engineering documentation, etc., for compliance with SDIO SW policy and standards.
- o Participate in System and Element Program Design Reviews.

Program Plan to Completion: This is a continuing program.

Program Element: 0603215C
PE Title: Limited Defense System

Project Number: 2304
Budget Activity: 03
Strategic Programs
April 1993

D. WORK PERFORMED BY:

- o USASSDC
- o USAF/SMC
- o Argonne National Laboratory (ANL)
- o Los Alamos National Laboratory (LANL)
- o Sandia National Laboratory (SNL)
- o BDM
- o Institute for Defense Analyses (IDA)
- o Naval Research Laboratory (NRL)
- o Rome Laboratory (RL)

E. COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. TECHNICAL CHANGES: None
2. SCHEDULE CHANGES: None
3. COST CHANGES: The 37 percent reduction in actual funding will impede the implementation of a standardized software engineering program throughout all SDIO Element software development activities. Continued development and implementation of emerging software development and testing tools and technologies have been restricted. In addition to across-the-board program cuts in the minimum required level-of-effort, development of formal methods technologies, necessary to meet GPALS software trust requirements, have been suspended. All SDIO Element programs are likely to incur increased software development, integration, testing, deployment, and maintenance costs if SDIO software engineering funding is not increased over current FY93 program levels.

F. PROGRAM DOCUMENTATION:

G. RELATED ACTIVITIES:

- o 2300 Command and Control Element — PE No. 0603215C
- o 3109 System Security — PE No. 0603215C
- o 3308 Level II System Simulator — PE No. 0603215C
- o 3312 NTB — PE No. 0603215C
- o 3102 Engineering and Integration — PE No. 0603215C

There is no unnecessary duplication of effort within SDIO or the DoD.

H. OTHER APPROPRIATION FUNDS: None

I. INTERNATIONAL COOPERATIVE AGREEMENTS: None

J. MILESTONE SCHEDULE:

- o CRWG Meetings
- o Yearly Element Contractor SEI Evaluations
- o DCDS Multi-User Database Enhancements
- o DCDS XWindows Environment Upgrade
- o Parallel Algorithms Using Ada83
- o C^2E Contractor SEI Capability Evaluations

Program Element: 0603215C
PE Title: Limited Defense System

Project Number: 2304
Budget Activity: 03
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- NTB Contractor SEI Capability Evaluations
- Elementary Functions Standard
- CEF System Specification
- Update CRLCMPs
- Ada Matrix-Vector Functions Package
- Complete Critical Resources Study
- DCDS ERA Graphics Upgrade
- CEF Demo/Delivery
- Primitive Functions Standard
- Update CRLCMPs
- Parallel Algorithms Using Ada9X
- CEF Demo/Delivery
- SESE Build One
- Complete EIV&V Formal Model
- Update CRLCMPs
- Ada9X Parallel Programming Guidelines
- SESE Build Two
- Deliver EIV&V Formal Specification
- SESE Build Three

FY1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: 0603215C
PE Title: Limited Defense System

Project Number: 2307
Budget Activity: 03
Strategic Programs
April 1993

A. RESOURCES: ($ in Thousands)
Project Title: CINC Command Element

Program Name:	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	Total Program
LDS DEM/VAL	0	1,128	1,757	Continuing

B. BRIEF DESCRIPTION OF MISSION REQUIREMENTS AND SYSTEM CAPABILITIES:

The objective of this project is to establish and implement an acquisition approach that minimizes the development risks and operational impacts of interfacing Ballistic Missile Defense (BMD) capabilities with the NORAD/USSPACECOM Command, Control, and Communications (C3) structure. The CINC Command Element (CCE) will be managed by SDIO/GMB as a part of the Command and Control Element (C^2E) program. The activities conducted under this project will focus upon interfacing the BMD Operation Facility (OPFAC) with the Cheyenne Mountain Air Force Base (CMAFB); interfacing BMD equipment with CMAFB systems; developing unique CINC C2 software; acquiring the OPFAC hardware; and, hosting BMC3 software acquired by the C^2E. The Director, SDIO stated that the crucial CMAFB/BMD interface activity warrants special management emphasis. This need is generated by the volatile nature of three parallel efforts: the CMAFB Upgrade program; the potential integration of the NORAD/ USSPACECOM C2 structure; and the evolving BMD development program. SDIO will use the Service Program Executive Officer (PEO) structure to implement this project. The USAF PEO is given lead responsibility, and the USA PEO will provide support. The current SDIO plan will require the CCE to provide support to the TMD Segment first followed by expansion to the NMD Segment requirements.

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

- Complete CCE Development Plan.
- Correlate SDIO interface requirements with CMAFB system documentation.
- Determine C^2E-CMAFB C2 display requirements.
- Develop BMD OPFAC Hardware Acquisition Plan.
- Begin planning for hosting of BMC3 software in BMD OPFAC.
- Develop BMD Mission Area Operations Plan.
- Begin development of a Combined Command Center Operational Cutover Plan.
- Acquire CMAFB-C^2E communications gateway.
- Develop SCIS Interface Technical and Operation Document.
- Begin development of unique CINC C2 software.
- Begin development of software certification procedures.

Program Plan to Completion: This is a continuing program using an evolutionary acquisition strategy.

D. WORK PERFORMED BY:

- System Engineering and Integration contractor

Program Element: 0603215C
PE Title: Limited Defense System

Project Number: 2307
Budget Activity: 03
Strategic Programs
April 1993

- o US Army PEO GPALS ROC/COMM Project Office
- o US Air Force Electronic Systems Center

E. COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. TECHNICAL CHANGES: None
2. SCHEDULE CHANGES None
3. COST CHANGES: None

F. PROGRAM DOCUMENTATION:

G. RELATED ACTIVITIES:

o	2304 System Software Engineering	PE No. 0603215C
o	2300 Command Center Element	PE No. 0603215C
o	3102 Systems Engineering & Integration	PE No. 0603215C
o	3104 Integrated Logistic Support	PE No. 0603215C
o	3109 System Security	PE No. 0603215C
o	3112 National Test Bed	PE No. 0603215C
o	3308 System Simulation	PE No. 0603215C

There is no unnecessary duplication of effort within SDIO or the DoD.

H. OTHER APPROPRIATION FUNDS: NONE

I. INTERNATIONAL COOPERATIVE AGREEMENTS: NONE

J. MILESTONE SCHEDULE:

- o C^2E Block 1B at NTF
- o BMC3 Validation Experiment
- o Milestone II
- o C^2E Block 2 at NTF
- o C^2E Block 2
- o Milestone III
- o BMD Cell and BMDOC installed in CMAFB

Program Element: 0603215C
PE Title: Limited Defense System

Project Number: 3102
Budget Activity: 03
Strategic Programs
April 1993

A. RESOURCES: ($ in Thousands)
Project Title: System Engineering

Program Name:	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	Total Program
LDS DEM/VAL	89,985	88,052	49,580	Continuing

B. BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

The Systems Engineering and Integration Contractor (SEIC) addresses architecture definition requirements analysis, and system definition of the GPALS system and elements that are within the system. The SEIC provides risk assessment and trade studies to optimize and balance the system. Trade studies will be performed for mission analysis, discrimination, technical performance, cost analyses and technology insertion. The systems engineering and integration task requires planning and participation in integrated testing and identification and resolution of key Demonstration/Validation (Dem/Val) issues. An important task of the SEIC is to ensure a rationale growth path exists for incremental deployment of the GPALS capability.

The SEIC is responsible for examination and analysis of the Threat, as derived from the current Systems Threat Assessment Report (STAR) as a basis for system definition and analysis. The SEIC identifies, defines, and decomposes the functions and inter-relationships of GPALS. The definition and decomposition process is developed to a level of detail permitting unique element function/performance requirements allocations, and the definition of the interfaces between individual elements. Key Dem/Val issues identified in the requirements definition process are allocated to data, demonstrations, and simulations are generated for areas identified as low confidence to facilitate an informed Milestone II decision. As part of the demonstrations during Dem/Val this project will support the design and development of the Command and Control Element. This includes designing the related functions including selection of algorithms, communication network concepts, processors and software. The SEIC also defines the interface to theater C3I assets.

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

- Began Integration Test Beds.
- Developed detailed interface definitions among GPALS Elements, Segments and external organizations.
- Continued development of GPALS system and element specifications.
- Began NMD Segment Requirements Review.
- Began NMD Segment Design Review.
- Supported GMD System Requirements Review.
- Completed C^2 Network and Communication Network management A level specification.
- Completed software development environment.
- Supported development of Integrated Systems Test capability.
- Began Communications Test Bed Development.

Program Element: 0603215C
PE Title: Limited Defense System

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Budget Activity: 03
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- o Establish GPALS Preliminary Functional Requirements Baseline.
- o Maintain structured Configuration Control/Management Process.
- o Continue Test Bed Integration.
- o Continue development of Integrated System Test Capability.
- o Develop coordinated Set of System Test Plans.
- o Maintain integrated Engineering Network of Key Milestones and events.
- o Maintain and update the requirements baseline.
- o Mature T&E System Test Plan.
- o Maintain Configuration/Management process.
- o Develop comprehensive Transitions plans to transfer requirements baseline to follow-on SE&I/BMC^3 Contractor

Program Plan to Completion: This is a continuing program. The current SE&I contract was awarded competitively in 1988 for five years through May 1993. The SE&I contractor has been developing the specifications, standards, and interfaces to ensure that all the elements will work together as a system. An open competition for a follow-on BMC^3/SE&I contractor will be held during FY93 with an award planned in the 4th Qtr FY94. The new contract will be for the duration of the DEM/VAL (approximately 5 years). The BMC^3/SE&I will be responsible for overall system engineering and integration, and the development of the BMC^3. The contractor will be required to accept Total System Performance Responsibility within one year of contract award. The current SE&I will be extended for two years (with two one-year options) to ensure the current specifications and data bases can be properly transferred to the winning contractor. The hand-off between the extended current SE&I contract and the completed BMC^3/SE&I contract ensures that previously developed requirements and interfaces will be incorporated/updated as part of the continuing development. The winning contractor will continue to refine these specifications and integrate all of the elements into a working system demonstrating this at increasing levels of maturity for DEM/VAL Milestone II and EMD Milestone III.

D. WORK PERFORMED BY:

System Engineering and Integration:
- o General Electric
- o TQM: TASC

E. COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. TECHNICAL CHANGES: None
2. SCHEDULE CHANGES: Basic contract extended into FY94.
3. COST CHANGES: The level of effort for this fiscal year reduced 64 percent compared to what the SE&I effort had been budgeted for. This decrease substantially delays SE&I growth path for incremental deployment of GPALS.

F. PROGRAM DOCUMENTATION:

Program Element: 0603215C
PE Title: Limited Defense System

Project Number: 3102
Budget Activity: 03
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G. RELATED ACTIVITIES:

- o 2304 System Software Engineering PE No. 0603214C/0603215C
- o 3308 System Simulator PE No. 0603214C/0603215C
- o 3111 Surveillance Engineering PE No. 0603214C/0603215C
- o 3109 System Security Engineering PE No. 0603214C/0603215C

There is no unnecessary duplication of effort within SDIO or the DoD.

H. OTHER APPROPRIATION FUNDS: None

I. INTERNATIONAL COOPERATIVE AGREEMENTS: None

J. MILESTONE SCHEDULE:

- o NMD IN Process Review
- o GPALS System Requirements Review
- o NMD Design Review
- o GPALS System Design Review

FY1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: 0603215C
PE Title: Limited Defense System

Project Number: 3103
Budget Activity: 03
Strategic Programs
April 1993

A. RESOURCES: ($ in Thousands)
Project Title: SDIO Metrology

Program Name:	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	Total Program
LDS DEM/VAL	2,105	2,350	1,451	Continuing

B. BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

The Metrology effort is performed at the National Institute of Standards and Technology facilities in Gaithersburg, MD and Boulder, CO. This project addresses the identification and development of critical measurement standards, unique to SDIO requirements, which are inadequate or non-existent at the U.S. National level. These standards will provide the legal and scientific basis for measurement of performance of SDIO system parameters. This effort also integrates and manages the SDIO software producibility Manufacturing Operations, Development and Integration Laboratory (MODIL) network.

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

- Developed a standards grade superconducting radiometer for Long Wave Infrared measurements.
- Provided calibration support to SDIO Argus aircraft, various SDIO experimental programs, and IR sensor test facilities.
- Demonstrated improvements in precision optical grinding of SiC mirrors (flat) and in post-polishing techniques.
- Completed 60 Ghz standards for high power, impedance and attenuation.
- Completed upgrade of automated angle measurement capability to 0.1 micro radian accuracy over full 360 degrees.
- Developed methods to reduce errors in optical surface figure measurements using phase measuring interferometers.
- Provided surface profile measurements of optical surfaces with subnanometer resolution.
- Completed design and fabrication of a low-background infrared (LBIR) spectral instrument for use in LBIR calibration facility at NIST.
- Selected NIST as the manager/integrator for the Software Producibility MODIL.
- NIST developed Software Producibility MODIL "white paper" and held several government workshops; NIST also held working sessions with GBI contractors.
- Provide calibration support to various SDIO sensor aircraft, black body chambers, and experiments.
- Provide calibrated measurements of optical surfaces at subnanometer levels of accuracy.
- Complete Dimensional Stability Tests of Al, SiC, and Beryllium.
- Complete 60 Ghz antenna measurements.
- Complete Software Domain Analysis Core Study.
- Complete Software Metrics for Reuse.
- Develop Process for Template - Driven Software Development.

Program Element: 0603215C
PE Title: Limited Defense System

Project Number: 3103
Budget Activity: 03
Strategic Programs
April 1993

- o Complete 60 Ghz phase noise standards.
- o Perform joint software management, engineering, and testing productivity improvements with industry, universities, and software centers of excellence.
- o Develop Software Reuse Criteria for Software R&D.
- o Evaluate SESE, support connection of software reuse libraries.

Program Plan to Completion: This is a continuing program.

D. WORK PERFORMED BY:

- o National Institute of Standards and Technology
- o US Air Force Material Command

E. COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. TECHNICAL CHANGES: None
2. SCHEDULE CHANGES: None
3. COST CHANGES: FY93 funding transferred from PMAs 3104 and 3105.

F. PROGRAM DOCUMENTATION:

G. RELATED ACTIVITIES: All GPALS elements are related to this effort, as are Other Follow-On, and Research and Support projects. There is no unnecessary duplication of effort within SDIO or the DoD.

H. OTHER APPROPRIATION FUNDS: None

I. INTERNATIONAL COOPERATIVE AGREEMENTS: None

J. MILESTONE SCHEDULE:

- o Complete LBIR spectral capability for sources
- o Software Producibility MODIL Plan
- o Complete 60 GHz antenna capability
- o Complete LBIR detector calibration
- o Complete SEM magnification standards
- o Complete 60 GHz phase noise measurements
- o Establish software reuse library "network"
- o Complete BRDF optical scattering standards

FY1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: 0603215C
PE Title: Limited Defense System

Project Number 3104
Budget Activity: 03
Strategic Programs
April 1993

A. RESOURCES: ($ in Thousands)
Project Title: Integrated Logistics Support

Program Name:	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	Total Program
LDS DEM/VAL	4,304	2,920	3,906	Continuing

B. BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

The Integrated Logistics Support (ILS) project addresses the identification and quantification of the essential elements of a Global Protection Against Limited Strikes (GPALS) support system. It identifies the basic supportability costs, schedule, performance, and support technology drivers in each SDI project to ensure the minimum cost of ownership and maximum effectiveness of the GPALS system.

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

- o Integrated logistics efforts of Services.
- o Updated GPALS Integrated Logistics Support Plan (ILSP).
- o Allocated Reliability, Availability, and Maintainability goals to GPALS elements.
- o Identified system level cost drivers/sensitivities.
- o Developed NMD ILSP.
- o Update GPALS ILSP.
- o Integrate logistics efforts of services.
- o Update logistics models.
- o Integrate logistics efforts of Services.
- o Refine and issue GPALS supportability policies.
- o Review RAM goals progress of GPALS elements.
- o Update GPALS ILSP.
- o Update NMD segment ILSP.
- o Update GPALS element ILSPs.

Program Plan to Completion: This is a continuing program.

D. WORK PERFORMED BY:

- o US Army Space and Strategic Defense Command
- o US Air Force Space and Missile Systems Center
- o US Air Force Material Command
- o BDM International

E. COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. TECHNICAL CHANGES: None
2. SCHEDULE CHANGES: None
3. COST CHANGES: Reduced FY93 effort by approximately 50 percent. Curtailed Theater Missile Defense support efforts, reduced support to C^2E, and simulation model development stopped.

Program Element: 0603215C
PE Title: Limited Defense System

Project Number 3104
Budget Activity: 03
Strategic Programs
April 1993

F. PROGRAM DOCUMENTATION:

G. RELATED ACTIVITIES: All GPALS elements are related to this effort, as are systems analysis projects. There is no unnecessary duplication of effort within SDIO or the DoD.

H. OTHER APPROPRIATION FUNDS: None.

I. INTERNATIONAL COOPERATIVE AGREEMENTS: None.

J. MILESTONE SCHEDULE:

- o Update NMD ILSP
- o Establish Support Architecture
- o Update GPALS ILSP
- o Update Element ILSPs
- o Update NMD ILSP
- o Update GPALS ILSP
- o Update Element ILSPs

FY1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: 0603215C
PE Title: Limited Defense System

Project Number: 3105
Budget Activity: 03
Strategic Programs
April 1993

A. RESOURCES: ($ in Thousands)
Project Title: Producibility and Manufacturing

Program Name:	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	Total Program
LDS DEM/VAL	8,997	8,839	3,476	Continuing

B. BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

This project will identify P&M risks and develop generic risk mitigation programs associated with the new technologies and designs being proposed for Global Protection Against Limited Strikes (GPALS) defense and will coordinate and implement a structured, unified approach to risk reduction and mitigation of common P&M issues.

The reduced program in FY94 approach involves the following three efforts:

1. Manufacturing Strategy Development. This effort develops and implements a capstone Strategic Defense Initiative Manufacturing Strategy (based on the revised DoDD 5000.1, DoDI 5000.2) providing leadership and direction as the Elements and Systems Engineer develop their manufacturing strategies. This strategy development will flow down to the Element Contractors and subcontractor levels.
2. Manufacturing Operations Development and Integration Laboratories (MODILs). MODILs serve to address and mitigate high producibility risks. This involves accelerating the development, integration, and introduction of modern, cost-effective manufacturing technologies into elements' design and the industrial base using existing national resources (government labs, industry, academia). FY94 program will be greatly reduced, only continuation of priority projects will be conducted.
3. Coordinating and leveraging SDI investments with DoD Industrial Base programs (MANTECH, IMIP, Title III, etc.) and new DOD/government programs such as Reinvestment for Economic Growth, Defense Conversion, Dual Use Technologies, etc.

These efforts combine to assure that commitment and emphasis will be placed on risk reduction and design-for-manufacturability during the appropriate design or development phase.

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

- Software MODIL initiated based upon software reuse strategies. The National Institute of Science & Technology (NIST) is the integrator. Projects for this MODIL are funded under SDIO project 3103 (which is the project SDIO uses to fund metrology and MODIL projects with NIST)
- Employed MODIL, SETAs, NIST, and Technology personnel as members of interdisciplinary "Producible Technology Working Groups" to develop mitigation strategies directly with Element Program offices and/or

Element contractors. PTWGs worked with BE, BP, GSTS, and GBI contractors.

- o Integrated GPALS needs/cost/schedules with DoD industrial base investment programs.
- o Continued to monitor execution and flow-down of SDI manufacturing strategy.
- o Supported SDI segments for DABs in areas of producibility and manufacturing and industrial base capabilities. Responded to milestone exit criteria that have P&M aspects.
- o Used MODILs as means for government/industry cost-sharing projects to address producibility and manufacturing projects in optical components and systems, IR sensors, electronic device fabrication and device hardness, software reuse, manufacture and testing of space qualified materials and components.
- o Monitored and integrated development of Element P&M mitigation and industrial base investment projects.
- o Software - initiate projects with industry to demonstrate software reuse engineering tool development (see project 3103).
- o Space Systems Assembly & Test - pursue projects with industry utilizing a MODIL integrated by Lawrence Livermore National Lab to address fabrication and qualification of a number of advanced materials and innovative, low-cost fabrication and testing of space-qualified components (including cryocoolers, precision guidance and propulsion components, advanced materials, alignment).
- o Electronic & Sensors MODIL - pursue tech transfer projects and Cooperative Research & Development Agreements (CRADAs) for Molecular Beam Epitaxy (MBE) and Metallic Oxide Chemical Vapor Deposition (MOCVD) in-process monitoring and control. Pursue radiation-hardening testing and qualification of commercial components, advanced electronics, ASICs, and electronic modules.
- o Survivable optics - initiate advanced polishing, statistical process control experiments, and metrology processes.
- o Continuation of the Survivable Optics MODIL at a greatly reduced level.
- o Termination of the Electronics & Sensors MODIL.
- o Continuation of the Spacecraft Fabrication & Testing MODIL at a greatly reduced level.
- o Continuation of the Software Producibility MODIL at a reduced level.
- o Monitoring of P&M programs and milestones of SDI segments and elements.

Program Plan to Completion: This is a continuing program.

D. WORK PERFORMED BY:

- o TASC
- o Oak Ridge National Laboratory
- o TBE & UIE
- o Aerospace Corp.
- o National Institute of Standards & Technology
- o Lawrence Livermore National Laboratory

Program Element: 0603215C
PE Title: Limited Defense System

Project Number: 3105
Budget Activity: 03
Strategic Programs
April 1993

E. COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. TECHNICAL CHANGES: None
2. SCHEDULE CHANGES: None
3. COST CHANGES: Reduced level of effort to approximately one-third of planned. Delayed completion of producibility efforts by approximately 2 years.

F. PROGRAM DOCUMENTATION:

G. RELATED ACTIVITIES: These efforts affect hardware-related projects within all PE Numbers and all PMAs. There is no unnecessary duplication of effort within SDIO or the DoD.

H. OTHER APPROPRIATION FUNDS: None

I. INTERNATIONAL COOPERATIVE AGREEMENTS: None

J. MILESTONE SCHEDULE:

- o Software Producibility MODIL workshops with industry
- o Software MODIL solicitations with industry
- o Manufacturing Assessment Review
- o Review of Elements Individual Producibility Programs
- o Update Manufacturing Strategy of Annexes
- o Begin Production Readiness Reviews for selected elements
- o MODILs business/technology plans, reviews, industry briefings
- o P&M participation in element program/design reviews for continuous concurrent engineering emphasis and transition from design/development to production

Program Element: 0603218C
PE Title: Research & Support Activities

Project Number: 3107
Budget Activity: 03
Strategic Programs
April 1993

A. RESOURCES: ($ in Thousands)
Project Title: Environment, Siting and Facilities

Program Name:	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	Total Program
R&S DEM/VAL	6,102	5,680	5,606	Continuing
R&S D/V MILCON	5,100	0	2,697	Continuing

B. BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

Provide environmental impact analysis documentation and real property facility siting and acquisition support for the SDIO systems and technology projects. Plan, program, budget and monitor facility acquisition of Military Construction (MILCON) and RDT&E construction projects. Provide guidance and prepare Environmental Assessments and Environmental Impact Statements, as applicable, for SDIO technology demonstrations and test and evaluation activities. Develop guidance for Executing Agents on facility siting and acquisition and environmental matters.

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

- o Completed the Research Environmental Technical Report and established revised SDIO environmental framework.
- o Developed Siting and Basing deployment plans in support of technology demonstrations and test and evaluations.
- o Completed the STARS Environmental Impact Statement (EIS) and various technology demonstration Environmental Analyses (SSRT,LEAP, MSX).
- o Executed the Military Construction and RDT&E facilities projects.
- o Initiated siting analysis in support of technology demonstration and test and evaluations, including the Space Test Facility.
- o Initiate real estate planning in support of technology demonstration and test and evaluation activities.
- o Supported for Military Construction and environmental planning.
- o Continue environmental documentation for critical SDI test and evaluation programs (TMD Ranges EIS, USAKA System Test, RTMD, TOPAZ II).
- o Develop siting criteria for an optimum system configuration at the ABM Treaty Compliant site in North Dakota.
- o Complete facility planning in support of technology demonstrations and test and evaluation activities, with emphasis on the USAKA System Test Site.
- o Manage the Military Construction and RDT&E facility design projects, with emphasis of finishing the National Test Facility and awarding the USAKA GBR-T projects.
- o Provide oversight for Military Construction and environmental planning activities accomplished by other government agencies.
- o Develop siting and basing deployment plans in support of technology demonstrations and tests and evaluation activities.

Program Element: 0603218C
PE Title: Research & Support Activities

Project Number: 3107
Budget Activity: 03
Strategic Programs
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- o Complete the BMD and TMD Environmental Impact Statements (EIS) and various technology demonstration Environmental Assessments.
- o Manage the Military Construction and RDT&E facilities design and construction program.
- o Initiate siting analysis in support of technology demonstration and test and evaluation activities to include extended range testing for TMD and System Test Site.
- o Initiate real estate planning in support of technology demonstration and test and evaluation activities.
- o Provide oversight for Military Construction design and construction, and environmental planning activities accomplished by other government agencies.

Program Plan to Completion: This is a continuing program.

D. WORK PERFORMED BY:

Facility planning and execution is performed by mainly the US Army, US Air Force, and US Navy facility engineers, with significant activities accomplished by the US Army Corps of Engineers and the Naval Facilities Engineering Command. SDIO activities are supported by a government staff, with research accomplished by the Harris Group. The US Army Space and Strategic Defense Command is supported by Teledyne Brown Engineering and the Earth Technology Company.

E. COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. TECHNICAL CHANGES: None
2. SCHEDULE CHANGES: None
3. COST CHANGES: None

F. PROGRAM DOCUMENTATION:

G. RELATED ACTIVITIES: Provides Environment, Siting, and Facilities Engineering support for all SDIO projects. There is no unnecessary duplication of effort within SDIO or the DoD.

H. OTHER APPROPRIATION FUNDS: MILCON: FY92: $5.4M; FY94: $2.697M.

I. INTERNATIONAL COOPERATIVE AGREEMENTS: None

J. MILESTONE SCHEDULE:

- o Complete USAKA Supplemental EIS
- o Update SDIO Facility Acquisition Strategy Plan
- o Physically complete NTF Construction
- o Complete TMD Programmatic EIS
- o Complete TMD Ranges EIS
- o Complete TOPAZ EIS
- o Complete BMD EIS

Program Element: 0603218C
PE Title: Research & Support Activities

Project Number: 3107
Budget Activity: 03
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- Complete facility requirements documentation for program
- Complete environmental planning for program
- Update SDIO Facility Acquisition Strategy Plan
- Complete design of MILCON
- Complete facility requirements documentation for program

FY1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: 0603215C
PE Title: Limited Defense System

Project Number: 3108
Budget Activity: 03
Strategic Programs
April 1993

A. RESOURCES: ($ in Thousands)
Project Title: Operational Environments

Program Name:	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	Total Program
LDS DEM/VAL	958	59	0	Completed

B. BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

The purpose of this project is to identify, integrate, coordinate, and resolve natural and nuclear environmental issues. The program will focus on characterizing natural, debris, engagement and nuclear environments from a systems perspective. DoD and DOE programs will be reviewed to identify specific areas where additional effort is needed to support deployment/operation of a Global Protection Against Limited Strikes system (GPALS), thus providing an adequate understanding of natural, debris, and potential nuclear environments within which a missile defense system must operate.

There are two main efforts ongoing within this project: (1) the Kinetic Energy Weapons (KEW) Space Debris Modeling effort, in which the Debris Radiance (DEBRA) model and a long-term DoD model of the space debris environment (Debris Analysis Workstation, or DAW) are being developed; and (2) the Nuclear Effects Physics Modeling effort, in which first-principle physics satellite nuclear radiation codes are being upgraded to provide higher-fidelity, faster-running trapped radiation transport codes.

The objective of DEBRA is to model KEW engagement scenarios from a sensor discrimination viewpoint. The objective of DAW is to provide a platform containing a standardized set of empirical software codes capable of performing on-orbit event analysis, pre-test intercept breakup predictions, and long-term flux predictions. Both DEBRA and the nuclear effects codes, with associated documentation, will be delivered to SDIO's National Test Bed (NTB) for use in assessing system survivability of GPALS space assets. DAW is planned for delivery to the Consolidated Space Test Center (CSTC) Space Test Range and the Air Force Operation Test Center (AFOTEC) for use by range safety when conducting SDIO intercept tests; and to AFSPACECOM and USSPACECOM for use in analysis of on-orbit break-up.

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

- Upgraded Debris Radiance model to incorporate Level II System Simulator-specific interface enhancements, and deliver upgraded model to the NTB.
- Initiated Verification and Validation of Debris Radiance model.
- Delivered prototype Debris Analysis Workstation to the AF Consolidated Space Test Center (AFCSTS) and Air Force Operational Test and Evaluation Center (AFOTEC).
- Developed Verification and Validation plan for the Debris Analysis Workstation.

Program Element: 0603215C
PE Title: Limited Defense System

Project Number: 3108
Budget Activity: 03
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- o Conducted analysis of debris effects on the GPALS space-based elements.
- o Integrated an improved fireball and debris transport model into the current codes.
- o Finalized atmospheric heave model.
- o Continued multiburst time-dependent decay algorithm coding and integration.
- o Identified interface requirements and desired formats for delivery of the nuclear environment code to the NTB.
- o Deliver Version 1.1 Debris Radiance Model code.

Program Plan to Completion: Program will be terminated during FY93.

D. WORK PERFORMED BY:

- o AF Phillips Laboratory
- o Kaman Sciences Corp
- o The Aerospace Corp
- o Orion International Technology
- o Lockheed Missiles & Space Co.

E. COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. TECHNICAL CHANGES: None
2. SCHEDULE CHANGES: None
3. COST CHANGES: Program Terminated

F. PROGRAM DOCUMENTATION:

G. RELATED ACTIVITIES:

o	1501	Survivability Technology	PE No. 0603214C/0603215C/ 0603216C
o	1504	Material and Structures	PE No. 0603217C/0603214C
o	1105	Discrimination	PE No. 0603215C
o	1601	Innovative Science and Technology	PE No. 0603218C
o	3111	Surveillance Engineering	PE No. 0603215C

There is no unnecessary duplication of effort within SDIO or the DoD.

H. OTHER APPROPRIATION FUNDS: None

I. INTERNATIONAL COOPERATIVE AGREEMENTS: None

J. MILESTONE SCHEDULE: None

FY1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: 0603215C
PE Title: Limited Defense System

Project Number: 3109
Budget Activity: 03
Strategic Programs
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A. RESOURCES: ($ in Thousands)
Project Title: System Security Engineering

Program Name:	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	Total Program
LDS DEM/VAL	11,513	12,595	12,776	Continuing

B. BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

The objective of the project is to ensure that Electronic Information Systems Security (ELINFOSEC) is integrated into the Global Protection Against Limited Strikes (GPALS) system. This objective will counter the existing and rapidly growing threat arrayed against an electronic information system like the GPALS system. Communications Security (COMSEC) and Computer Security (COMPUSEC) equipment, technology, methodologies, and designs will be integrated with the development of GPALS elements.

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

- Began Development of INFOSEC Module (WINDJAMMER).
- Determined which command and control architectures are most amenable to INFOSEC requirements.
- Prepared security design for all test beds.
- Provided system security architecture to element contractors.
- Began implementation of Trusted Software Methodology.
- Completed Concept Definition effort for INFOSEC Module.
- Continue integration activities in support of LOC and GPALS.
- Implement system security demo in C^2 Prototype.
- Heavy involvement in WINDJAMMER integration through design/ development effort.
- Continue integration activities through and beyond early deployment of Limited Operational Capability (LOC).
- Begin development of key management system to support BMD electronic key requirements.
- Continue technology development and trusted processors and operating systems.
- Continue implementation strategy for Trusted Software, including training and analysis of use.
- Define Security Engineering requirement to implement secure distributed processing.
- Complete Critical Design Review of WINDJAMMER Module.
- Expand and develop additional MLS applications for validation.
- Integrate MLS technology into an operational MLS system.

- o ELINFOSEC technology support for WINDJAMMER design, development, deployment.
- o ELINFOSEC technology support for the security architecture.
- o WINDJAMMER DT&E and OAT&E held.
- o WINDJAMMER prototypes delivered.
- o WINDJAMMER security evaluation complete.
- o WINDJAMMER Phase II LRIP contract kick-off.
- o Develop interface between Key Management Facility (KMF) and System Network Controller (SNC).
- o Begin development of User Application Software (UAS) for EKMS.
- o Develop seed key conversion over the BMD communications network.
- o Formal verification guidance for Trusted Software Development Methodology.
- o Training in Trusted Software Development for Program Managers, evaluators, and program acquisition personnel.
- o Analysis and maintenance of Trusted Software Development Methodology.

Program Plan to Completion: This is a continuing program.

D. WORK PERFORMED BY: This work will be spread across multiple contractors (i.e., Motorola), including the System Engineer (SE).

E. COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. TECHNICAL CHANGES: None
2. SCHEDULE CHANGES: None
3. COST CHANGES: FY93 funding increased slightly to support CC/SOIF systems.

F. PROGRAM DOCUMENTATION:

G. RELATED ACTIVITIES:

- o 2300 CC/SOIF Systems — PE No. 0603215
- o 3102 System Engineering — PE No. 0603215C/0603216C
- o 2304 System Software Engineering — PE No. 0603215C

There is no unnecessary duplication of effort within SDIO or the DoD.

H. OTHER APPROPRIATION FUNDS: None

I. INTERNATIONAL COOPERATIVE AGREEMENTS: None

J. MILESTONE SCHEDULE:

- o Key Management Plan (WINDJAMMER)
- o Key Management Plan (BMD System)
- o Deliver Secure Oracle Products on Gemsos
- o Key Management Kick-off Mtg
- o Complete WINDJAMMER Phase I Security Evaluations
- o WINDJAMMER Prototype Delivery

Program Element: 0603215C
PE Title: Limited Defense System

Project Number: 3109
Budget Activity: 03
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- o WINDJAMMER E-Model Delivery
- o Complete WINDJAMMER system testing
- o Received WINDJAMMER prototypes
- o Kick-off WINDJAMMER Phase I LRIP contract
- o Hold WINDJAMMER Qualification Tests (Space & Ground)
- o Key Management Center
- o Deliver WINDJAMMER components to BE Program Management Office
- o ELINFOSEC architecture update
- o Receive WINDJAMMER E-Models (Space and Ground)
- o Receive WINDJAMMER Phase II LRIP First Article

Program Element: 0603215C
PE Title: Limited Defense System

Project Number: 3110
Budget Activity: 03
Strategic Programs
April 1993

A. RESOURCES: ($ in Thousands)
Project Title: Survivability Engineering

Program Name:	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	Total Program
LDS DEM/VAL	1,449	562	600	Continuing

B. BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

The System Survivability Program is responsible for oversight and management of the Global Protection Against Limited Strikes (GPALS) Survivability Program. This oversight activity includes coordination of the SDIO's survivability-related activities to support the GPALS acquisition process, ensuring that proper interfaces are established and maintained within system, element and component levels of the Program.

The Program provides for generation of system and top-level element survivability requirements that are directly traceable to SDIO-approved mission requirements and threat scenario(s). Analyses will be performed to support GPALS Defense. These analyses include performance of system-level trade studies to assess the ability of the system and elements to survive and operate in natural (e.g., debris) and manmade hostile (e.g., nuclear, laser, Anti-satellites (ASATs)) environments. Additionally, the System Survivability Program ensures elements' survivability design concepts are consistent with survivability requirements and segments/elements are prepared for Defense Acquisition Board (DAB) and other critical reviews. The Program is also responsible for defining requirements for and performing system-level survivability-related tests, namely through SDIO's test beds within the National Test Bed (NTB). This includes defining system survivability test requirements as inputs to the SDI test and evaluation planning process. Finally, the Program is responsible for defining and assessing critical survivability-related operational concepts that are consistent with system and element survivability requirements, that enhance the system/elements' survivability, and that provide maximum flexibility to the User.

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

- Continued survivability system and element requirements definition/refinement coordination/validation process for NMD and GMD. Provided survivability inputs to element Technical Requirements Document (TRD), Request for Proposals/Statement of Work, and Cost Analysis Requirements Document. Developed survivability Preplanned Product Improvement goals.
- Determined adequacy of system level requirements documents.
- Determined if Brilliant Eyes (BE) and Brilliant Pebbles (BP) TRDs met system survivability requirements.
- For TMD, determined the survivability of BE's communication architecture and operational plans and determined requirements for uplink and downlink.

Program Element: 0603215C
PE Title: Limited Defense System

Project Number: 3110
Budget Activity: 03
Strategic Programs
April 1993

- o Developed survivability Concept of Operation for redistribution of BE and BP.
- o Supported NMD and TMD Project Offices in monitoring Vulnerability and Hardening efforts.
- o Analyzed BE and BP vulnerability against Desert Storm and 91-2 threat scenarios. Set survivability requirements where needed.
- o Identified/documented system survivability testing requirements via interface with SDIO/TN; ensured requirements are reflected in future versions of the SDIO Test and Evaluation Master Plan.
- o Developed V&H program plans for the NMD elements' SOWs.
- o Supported validation of System Engineering and Integration Contractor survivability requirements analyses.
- o Performed system-level survivability analyses.
- o Identified/document critical survivability technology needs for GPALS.
- o Began developing data base of traceable system survivability requirements, and flowing requirements down to elements.
- o Supported validation of SEIC survivability requirements analysis.
- o Determined the adequacy of system level requirements documents.
- o Evaluate Ground Based Element hardware development contractor Preliminary Design Review & Critical Design Review designs for V&H/S, and provide engineering support.
- o Coordinate USASSDC & USAFSMC System Survivability Programs with SEIC and other Government Agencies.
- o Perform independent assessment to ensure element survivability design concepts are adequate to meet system survivability requirements.
- o Determined the adequacy of system level requirements documents. Provide independent assessment of contractors documentation with respect to survivability.
- o Continue assessment of system survivability requirements traceability and flowdown to elements.
- o Support validation of SEIC survivability requirements analysis.

Program Plan to Completion: This is a continuing program.

D. WORK PERFORMED BY:

- o Booz Allen & Hamilton Inc.
- o Kaman Sciences Corp.

E. COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. TECHNICAL CHANGES: None
2. SCHEDULE CHANGES: None
3. COST CHANGES: The funding cuts for this program resulted in a termination of all GPALS-level System Survivability technical efforts, except for some small activity in planning for integrated validation testing of ground-based systems. No Theater interface related System Survivability activities will be performed.

Program Element: 0603215C
PE Title: Limited Defense System

Project Number: 3110
Budget Activity: 03
Strategic Programs
April 1993

F. PROGRAM DOCUMENTATION:

G. RELATED ACTIVITIES:

- o 1501 Survivability Technology — PE No. 0603214C/0603215C/ PE No. 0603216C
- o 3102 System Engineering — PE No. 0603215C

There is no unnecessary duplication of effort within SDIO or the DoD.

H. OTHER APPROPRIATION FUNDS: None

I. INTERNATIONAL COOPERATIVE AGREEMENTS: None

J. MILESTONE SCHEDULE:

- o Survivability inputs to SRD, ERDs, CARDs
- o Survivability evaluation at Element design reviews
- o Integrated SDS and GDS Environment Report
- o Proof of Concept NMD System Survivability Validation Demonstration
- o Drawdown vulnerability analysis for BE/BP
- o BE survivability CONOPS validated

FY1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: 0603215C
PE Title: Limited Defense System

Project Number: 3111
Budget Activity: 03
Strategic Programs
April 1993

A. RESOURCES: ($ in Thousands)
Project Title: Surveillance Engineering

Program Name:	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	Total Program
LDS DEM/VAL	9,320	4,950	3,900	Continuing

B. BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

In all mission areas and phases of the Global Protection Against Limited Strikes (GPALS) System, some level of target surveillance/discrimination capability will be needed in order to meet mission discrimination requirements. However, surveillance/discrimination, to include bulk filtering, track initiation, tracking, track correlation, discrimination, and sensor management, is one of the most difficult and fundamental problems facing GPALS. This problem will also become more complex in the future as target decoy technology improves and is acquired by potential threats. This program addresses a wide range of surveillance/discrimination issues from a systems perspective and develops and evaluates algorithms and systems schemata to meet mission requirements by efficient use of available sensing resources. To accomplish this, this program is developing a simulated test environment known as the Surveillance Test Bed (STB). The STB is one of several test beds that will be resident on the National Test Bed (NTB). The STB provides the capability to evaluate element algorithms or Test Articles (bulk filtering, tracking, discrimination, etc.) and system schema (the framework that integrates elements and algorithms into a coordinated system) on a high fidelity simulation of element sensors. In addition to the STB, other lower fidelity software tools will be utilized to conduct analysis and identify scenarios to be evaluated with the STB. This program will also develop and implement a methodology for validation of system level discrimination performance, including performance of system discrimination schema and algorithms in wartime environments. Close coordination is maintained with the Discrimination Technology project (#1105). Discrimination algorithms developed under that project will be evaluated and validated.

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

- Established and documented test article interfaces with the STB test environment via a Test Article Working Group.
- Supported integration of externally developed test articles into the STB.
- Established and documented user programmatic interfaces and experimenter access procedures to the STB and its data products.
- Provided remote access to STB via workstations and network software.
- Supported SDIO Countermeasure Mitigation Experiment.
- Supported Brilliant Eyes (BE) Proof-of-principle (POP) activities by modeling BE POP system.
- Supported SEIC Experiment SE-1, Baseline Surveillance Performance of GPALS System.

Program Element: 0603215C
PE Title: Limited Defense System

Project Number: 3111
Budget Activity: 03
Strategic Programs
April 1993

- o Conducted analysis to verify system surveillance/discrimination requirements. (See Surveillance Engineering Summer Study No. 1, Bootstrap Analyses of iNMD Epochs 1 and 2 Sensing Performance).
- o Demonstrated Early Deployment Analysis Tool Set (see Surveillance Engineering Summer Study No. 1.)
- o Initialized System Discrimination Data Base (see Surveillance Engineering Summer Study No. 1.)
- o Provided generic system level target tracking and track correlation algorithms for STB for L2SS.
- o Provided bootstrap optics fusion schema (task 7) and algorithms (from project 1105, tested under project 3111).
- o Continued to coordinate information exchange between technology level, element level and system level surveillance/discrimination efforts.
- o Support system surveillance requirements analysis.
- o Support linkage between test data and system level simulations.
- o Modify the STB test environment to address NMD and TMD specific needs.
- o Expand the STB test environment to model targets in the boost phase.
- o Verify early deployment NMD discrimination capability.
- o Pursue integration of hardware/software Test Articles with the STB.
- o Plan Discrimination ground tests.
- o Conduct further SEIC experiments using STB.
- o Provide discrimination algorithms and test support to System Simulator.
- o Provide baseline systems schema and fusion algorithms to NMD Project.
- o Demonstrate discrimination schema performance against early deployment scenarios.
- o Demonstrate initial National Missile Defense System integrated sensing (esp. discrimination) baseline performance capability in wartime in Surveillance Test Bed (STB).
- o Characterize integrated system sensing (esp. discrimination) performance, using INMD sensing schema, including adaptive discrimination, intercept sampling, test data from GBR, GBI, BE, and Battle Management Element.
- o Verify sensing performance capability of INMD using STB and lower detail simulation test tools.

Program Plan to Completion: This is a continuing program.

D. WORK PERFORMED BY:

- o The tasks are performed through a number of support contracts, and civilian program managers as employees of the Army Strategic Defense Command. Work is performed by the following contractors:
  - General Electric
  - Nichols Research Corp.
  - COLSA, Inc.
  - Teledyne Brown Engineering
  - SRS, Inc.
  - Raytheon

Program Element: 0603215C
PE Title: Limited Defense System

Project Number: 3111
Budget Activity: 03
Strategic Programs
April 1993

E. COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. TECHNICAL CHANGES: None
2. SCHEDULE CHANGES: None
3. COST CHANGES: Validation of sensing schema and algorithms under task 8 will use much less STB and L2SS verification/validation testing, due to 30 percent reduction of funding.

F. PROGRAM DOCUMENTATION:

G. RELATED ACTIVITIES:

o	1105 Discrimination	PE No. 0603215C
o	3108 Operational Environments	PE No. 0603215C
o	3102 Systems Engineering & Integration	PE No. 0603215C
o	3110 Survivability Engineering	PE No. 0603215C
o	3308 Systems Simulation	PE No. 0603215C

There is no unnecessary duplication of effort within SDIO or the DoD.

H. OTHER APPROPRIATION FUNDS: None

I. INTERNATIONAL COOPERATIVE AGREEMENTS: None

J. MILESTONE SCHEDULE:

- o Demo TCMP 1B Support
- o Navy TBMD Support
- o Demo TCMP Analysis
- o Demonstrate TMD sensing performance analysis in STB
- o Demonstrate INMD baseline sensing effectiveness in STB
- o Deliver verified system discrimination schema and algorithms for initial National Missile Defense
- o Report results of verification of initial National Missile Defense sensing capability
- o GBR Support Experiment
- o BE Support Experiment
- o Demonstrate initial NMD performance in critical scenarios in STB
- o Design System Sensing Schema for full NMD phase of GPALS
- o Validate initial NMD sensing capability using calibrated/validated SDIO test beds

FY1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: 0603215C
PE Title: Limited Defense System

Project Number: 3112
Budget Activity: 03
Strategic Programs
April 1993

A. RESOURCES: ($ in Thousands)
Project Title: Systems Engineering Support

Program Name:	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	Total Program
LDS DEM/VAL	26,550	11,120	9,744	Continuing

B. BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

The systems engineering support will provide critically needed capability to develop and use test beds and other models/simulations in support of the design and validation of Limited Defense System (LDS) concepts. State-of-the-art test beds, models/simulations, and analysis tools are being developed in support of studies and analyses conducted prior to the Milestone II engineering and manufacturing development decision. These tools will support the SDIO community and international cooperative efforts in evaluation/ comparison of alternative architectures and support element model development/integration. In general, system engineering support will include: design, development, integration, test, and maintenance of Level Two System Simulators (L2SS); design, development of Human-In-Control Command and Control simulators (C^2 Sims); conduct Concept of Operations Exercises (CONEXes); and command and control simulations (C2 Sims) for the unified commands and their components and operation of the NTF Center for Software Engineering and Technology (CSET).

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

- o Supported the development and integration of L2SS Build 1.
- o Supported the development of L1SS Build 2 Release 2.
- o Developed and provided the appropriate level technical support for Command and Control Simulations.
- o Developed the Center for Software Engineering and Technology (CSET).
- o Support the development and integration of L2SS Build 2 first site system (NMD/FSS).
- o Conduct bi-monthly CONEXs and bi-annual C^2Sims as required by USCINCSPACE.
- o Produce two major versions releases of the command and control simulator.
- o Support and operation of CSET activities.
- o Expand the capabilities of the C2 Simulator to evaluate C2 interfaces and command center functional requirements.
- o Support the development and maintenance of system simulations.
- o Develop and provide the appropriate level technical support for command and control simulations.
- o Support development and maintenance of the C2 Simulator and conduct CONEXs and C2 Sims.
- o Development of support tools for the SDIO community.
- o Support and operation of CSET activities.
- o Support development and integration of L2SS Build 2 Global Protection Against Limited Strikes (GPALS).

Program Element: 0603215C
PE Title: Limited Defense System

Project Number: 3112
Budget Activity: 03
Strategic Programs
April 1993

Program Plan to Completion: Capabilities developed under this program have application throughout the weapon system life cycle.

D. WORK PERFORMED BY:

- o National Test Bed (NTB)
- o National Test Facility (NTF)
- o Vanguard Research Inc.

E. COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. TECHNICAL CHANGES: None
2. SCHEDULE CHANGES: None
3. COST CHANGES: FY93 funding cuts reduced level of effort by 62 percent in supporting GPALS deployment.

F. PROGRAM DOCUMENTATION:

G. RELATED ACTIVITIES:

- o Theater Missile Defense — PE No. 0603216C
- o National Test Bed — PE No. 0603218C

There is no unnecessary duplication of effort within SDIO or the DOD.

H. OTHER APPROPRIATION FUNDS: None

I. INTERNATIONAL COOPERATIVE AGREEMENTS: SDIO has memoranda of agreement with defense agencies of five other nations. The agreement with the United Kingdom is applicable for C2 Simulation activities in FY93.

J. MILESTONE SCHEDULE:

- o Conduct CONEX 93-A
- o Conduct C2 SIM 93-1
- o Conduct UKMOD Demo
- o Conduct C2 Sim Ver. 9.0
- o Complete Level 2 Build 1 Integration
- o Conduct CONEX 93-B
- o Conduct US/UK CONEX 93-A
- o Conduct CONEX 93-C
- o Comp L2 NMD First Site Sys (FSS) Build Integration
- o Deliver C2 Sim Ver. 10.0
- o Conduct C2 Sim 93-2
- o Conduct CONEX 93-D
- o Conduct US/UK CONEX 94-A
- o Conduct CONEX 94-A
- o Complete L2 Initial GPALS Build 2
- o Deliver C2 Sim Ver. 11.0
- o Conduct CONEX 94-B
- o Conduct C2 Sim 94-1

Program Element: 0603215C
PE Title: Limited Defense System

Project Number: 3112
Budget Activity: 03
Strategic Programs
April 1993

- Conduct CONEX 94-C
- Conduct CONEX 94-D
- Deliver C2 Sim Ver. 12
- Conduct CONEX 94-E
- Conduct C2 Sim 95-1
- Conduct CONEX 94-F
- Complete Level 2 GPALS Build 2
- Complete Level 2 Build 3

FY1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: 0603215C
PE Title: Limited Defense System

Project Number: 3113
Budget Activity: 03
Strategic Programs
April 1993

A. RESOURCES: ($ in Thousands)
Project Title: Ground Common

Program Name:	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	Total Program
LDS DEM/VAL	14,250	0	965	Continuing

B. BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

Provide environmental impact analysis documentation, deployment siting and basing analysis, and real property facility siting and acquisition support planning of the SDIO National Missile Defense (NMD) and Global Missile System (GMD) systems. Plan, program, budget site specific Environmental Assessments, Environmental Impact Statements, and Environmental Mitigation actions, as applicable, for SDIO NMD and GMD common facilities design and construction activities. Develop guidance for Executing Agents on facility acquisition and environmental matters. Provide common facilities, equipment such as vehicles, support equipment, test equipment, computers and tools.

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

- o Executed the FY92-93 Military Construction and RDT&E facilities project design and program requirements identification in support of NMD system deployment.
- o Developed siting and basing deployment plans in support of NMD system deployment activities.
- o Started the Global Protection Against Limited Strikes Programmatic Environmental Impact Statement (EIS), supporting documentation, and held public scoping meetings.
- o Developed siting criteria for required systems and coordinate between Services and interagency regulatory groups.
- o Initiated siting analysis in support of NMD activities.
- o Initiated real estate planning in support of NMD system deployment activities.
- o Conduct siting studies that establish the optimum system configuration at the ABM treaty compliant site in North Dakota.
- o Manage the FY96 Military Construction design process in support of NMD deployment.

Program Plan to Completion: This is a continuing program.

D. WORK PERFORMED BY:

Facility planning and execution is performed mainly by the US Army, US Air Force and US Navy facility engineers, with significant activities accomplished by the US Army Corps of Engineers and the Naval Facilities Engineering Command. SDIO activities are supported by a government staff, with research accomplished by The Harris Group. The US Army Space and Strategic Defense Command is supported by Teledyne Brown Engineering and the Earth Technology Company.

Program Element: 0603215C
PE Title: Limited Defense System

Project Number: 3113
Budget Activity: 03
Strategic Programs
April 1993

E. COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. TECHNICAL CHANGES: None
2. SCHEDULE CHANGES: None
3. COST CHANGES: None

F. PROGRAM DOCUMENTATION:

G. RELATED ACTIVITIES: Provides Environment, Siting, and Facilities Engineering support for all SDIO projects. There is no unnecessary duplication of effort within SDIO or the DoD.

H. OTHER APPROPRIATION FUNDS: None

I. INTERNATIONAL COOPERATIVE AGREEMENTS: None

J. MILESTONE SCHEDULE:

- Update SDIO Facility Acquisition Strategy Plan
- Complete design of FY96 MILCON
- Complete FY95 facility environmental planning
- Complete FY96 facility environmental planning
- Complete design of FY97 MILCON
- Complete programmatic EIS
- Complete site specific site utilization study

FY1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: 0603215C
PE Title: Limited Defense System

Project Number: 3114
Budget Activity: 03
Strategic Programs
April 1993

A. RESOURCES: ($ in Thousands)
Project Title: Launch Common

Program Name:	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	Total Program
LDS DEM/VAL	600	0	0	Continuing

B. BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

Provide facility acquisition support for the launch and deployment of SDIO space elements systems and technical development projects. Provide common facilities and equipment.

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

- Identified equipment, facilities, and services common to the deployment of space elements.

Program Plan to Completion: N/A

D. WORK PERFORMED BY:

Launch facilities studies performed by the Dynamics Research Corp. and BE/BP contractors.

E. COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. TECHNICAL CHANGES: None
2. SCHEDULE CHANGES: None
3. COST CHANGES: None

F. PROGRAM DOCUMENTATION:

G. RELATED ACTIVITIES: There is no unnecessary duplication of effort within SDIO or the DoD.

H. OTHER APPROPRIATION FUNDS: None

I. INTERNATIONAL COOPERATIVE AGREEMENTS: None

J. MILESTONE SCHEDULE:

- Launch Facilities Study

FY1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: 0603215C
PE Title: Limited Defense System

Project Number: 3115
Budget Activity: 03
Strategic Programs
April 1993

A. RESOURCES: ($ in Thousands)
Project Title: GPALS Sys Eng

Program Name:	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	Total Program
LDS DEM/VAL	0	4,993	0	Continuing

B. BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

Provide facility acquisition support for the launch and deployment of SDIO space elements systems, technical development projects, and common facilities and equipment. A future requirement is to support the General Manager (GM) by providing an independent assessment of Global Protection Against Limited Strikes (GPALS) SE&I activities across all the Service developed Elements.

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

- Review and assess engineering and integration studies and analysis which support planning and requirements definition of GPALS.
- Support the GM in identifying integration issues and performing in-depth analyses to support GPALS system program milestones.
- Defines the engineering and integration details necessary to support the GM in managing the GPALS program across all of the Service developed Elements.
- Develop requirements for the TI&EC/BMC3 Integration Contractor.

Program Plan to Completion: This is a continuing program.

D. WORK PERFORMED BY:

- Dynamics Research Corporation
- Jamison Science and Engineering Incorporated
- International Telephone & Telegraph Corporation
- U.S. Army Missile & Space and Foreign BMD Studies
- U.S. Army Research Institute
- U.S, Army Air Defense Artillery Center and School

E. COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. TECHNICAL CHANGES: None
2. SCHEDULE CHANGES: None
3. COST CHANGES: None

F. PROGRAM DOCUMENTATION: None

G. RELATED ACTIVITIES: There is no unnecessary duplication of effort within SDIO or the DoD.

H. OTHER APPROPRIATION FUNDS: None

Program Element: 0603215C
PE Title: Limited Defense System

Project Number: 3115
Budget Activity: 03
Strategic Programs
April 1993

I. INTERNATIONAL COOPERATIVE AGREEMENTS: None

J. MILESTONE SCHEDULE:

- Independent Science and Evaluation Reports
- NMD ORD
- Initial TRACE Database Population
- Space Foreign BMD Studies
- Manpower Guidance Document

FY1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: 0603215C
PE Title: Limited Defense System

Project Number: 3201
Budget Activity: 03
Strategic Programs
April 1993

A. RESOURCES: ($ in Thousands)
Project Title: Architectures and Analysis

Program Name:	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	Total Program
LDS DEM/VAL	0	4,320	4,084	Continuing
R&S DEM/VAL	3,259	850	0	Continuing

B. BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

This project develops, evaluates, and compares alternative architecture concepts for all phases of the Strategic Defense System (SDS), including follow-on architectures. Emphasis is on the insertion of newly emerging technologies into the system elements to reduce system cost and increase effectiveness. Additional areas of investigation include new and innovative concepts, implications of new technical concepts, and architectural effects of specific technical issues. Includes upgrading and maintaining simulation tools which are necessary to conduct architectural level analyses, such as the Mission Effectiveness Model (MEM). Element task areas are: Architecture Studies, Systems Analysis, Army Analytic Support, Air Force Analytic Support, Mission/Operations/Policy Analysis.

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

- Investigated lethality issues associated with post-boost vehicle engagements.
- Analyzed ability of Brilliant Pebbles constellation to serve as surveillance sensor for ground weapons.
- Analyzed test and evaluation issues related to family-of-radars concept.
- Conduct analysis of target handover from surveillance sensor to interceptor.
- Complete work on missile trajectory shaping to avoid sun/moon interference in target tracking.
- Maintain and enhance the Mission Effectiveness Model (MEM) and Exo-atmospheric Discrimination Simulation (XoDis) to support ongoing system analysis and studies.
- Conduct head-to-head comparison of simulation models to determine strengths and weaknesses of each.
- Quantify the degradation of a missile defense system in the presence of severe countermeasures. Recommend several design changes to restore improvement.
- Examine ability of radars to do kill assessment.
- Investigate impact of radar jamming on protection coverage of CONUS.
- Examine utility of BE sensor for target signature and background data collection.
- Maintain and enhance the Mission Effectiveness Model (MEM) and Exo-atmospheric Discrimination Simulation (XoDis) to support ongoing system analysis and studies.

Program Element: 0603215C
PE Title: Limited Defense System

Project Number: 3201
Budget Activity: 03
Strategic Programs
April 1993

- o Evaluate advanced technology concepts such as the designs of fire-and-forget interceptors that can engage targets using only early warning sensor data.
- o Continue investigations of special topics and unique system concepts.

Program Plan to Completion: This is a continuing program.

D. WORK PERFORMED BY:

- o US Army Strategic Defense Command
- o US Air Force Space Division
- o TASC
- o Sparta Inc.

E. COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. TECHNICAL CHANGES: None
2. SCHEDULE CHANGES: None
3. COST CHANGES: None

F. PROGRAM DOCUMENTATION:

G. RELATED ACTIVITIES:

- o Theater Missile Defenses — PE No. 0603216C
- o Other Follow-On Systems — PE No. 0603217C
- o Research & Support Activities — PE No. 0603218C
- o This project provides direction and focus for SDI technology development and acquisition efforts. There is no unnecessary duplication of effort within SDIO or the DoD.

H. OTHER APPROPRIATION FUNDS: None

I. INTERNATIONAL COOPERATIVE AGREEMENTS: None

J. MILESTONE SCHEDULE:

- o Status Reports on Army and Air Force analysis
- o Architecture Analysis Reports
- o Final report on study and analysis work completed by contractor(s) in FY 1994

FY1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: 0603215C
PE Title: Limited Defense System

Project Number: 3202
Budget Activity: 03
Strategic Programs
April 1993

A. RESOURCES: ($ in Thousands)
Project Title: Operations Interface

Program Name:	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	Total Program
LDS DEM/VAL	0	8,041	0	Continuing
R&S DEM/VAL	7,505	0	0	Continuing

B. BRIEF DESCRIPTION OF MISSION REQUIREMENTS AND SYSTEM CAPABILITIES:

The mission of the SDI Organization is twofold: (a) to support national security policy and strategy and (b) to manage the development and deployment of a ballistic missile defense (BMD) system that meets the operational mission requirements of the designated users of that system. For the first part, analyses and simulations focus on definition of the GPALS concept, coordinating and refining the concept definition with other parts of DoD, external agencies, and (indirectly) with Allies and friends who may cooperate in mutual deployments of a BMD system. The Mission Analysis function provides direct support to the Director, SDIO, and senior OSD policy officials on a variety of sensitive policy and strategy issues, including implications of events in Russia and other members of the Commonwealth of Independent States (CIS) for the SDIO/GPALS program; the status of formerly-Soviet offensive ballistic missile capabilities; arms control; strategic stability and deterrence; and proliferation of nuclear weapon and ballistic missile technology in the rest of the world. For the second part, analyses and simulations address strategic and tactical effectiveness, including offense-defense interaction of proposed GPALS system architectures against offensive ballistic missile threats to the U.S., our Allies and friends, and deployed forces. Analytical results are then used to support activities required for the Defense acquisition process. Funds are also provided from this project to operational users (USSPACECOM, ARSPACE, AFSPACE, NAVSPACE, Marines, SAC/STRATCOM) to enable them to develop their operational requirements and concepts of operations for employing BMD and ensuring that these concepts are integrated into the overall BMD system deployment strategy and planning.

C. PROGRAM ACCOMPLISHMENT AND PLANS:

- o Continued operational mission effectiveness analysis of GPALS.
- o Two-sided and multipolar stability and deterrence analyzed.
- o Third world mission analyzed.
- o Defined USSPACECOM, component SPACECOM and other users, capstone and element requirements for primary/other missions.
- o Continued operational analysis of command center functions, including functional analysis.
- o Refined offense-defense interaction analysis.
- o Defined Integrated Tactical Warning & Assessment (ITW&A) interfaces.
- o Developed BMD operational doctrine and Concept of Operations.
- o Analyzed rules of engagement, acquisition plans.
- o Developed test/evaluation criteria.
- o Wargaming/strategic gaming/simulations/expert roundtables.

FY1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: 0603215C
PE Title: Limited Defense System

Project Number: 3202
Budget Activity: 03
Strategic Programs
April 1993

- o Continue operational mission effectiveness analysis of GPALS based on refined architecture and threat definition.
- o Continue deterrence and third world mission analysis.
- o Refinement of mission requirements for primary/alternate missions.
- o Development of material acquisition document inputs.
- o Command center connectivity analysis.
- o Update of offense-defense concept of operations.
- o Continued command and control analysis of ops requirements.
- o Wargaming/strategic gaming/simulations/expert roundtables.
- o GPALS CONOPS/Rules of Engagement.
- o Component cost and operational effectiveness analysis.
- o Development of Operational Requirements Document (ORDs).
- o Development of operational concept(s) of operations for GPALS.
- o Conduct strategic and theater wargaming.
- o Conduct mission analysis for GPALS.
- o Conduct stability analyses for BMD GPALS.

Program Plan to Completion: This is a continuing program.

D. WORK PERFORMED BY:

- o SAIC, BDM, CEXEC, and Sparta
- o Aries Analytics, SRS, TASC, Riverside Research Institute, Booz, Allen & Hamilton, Inc., DSA, ANSER, and General Research Corporation
- o Rockwell International, TBE, ANSER
- o SPARTA, TBE
- o SAIC, SPARC
- o NIPP
- o GAMA

E. COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. TECHNICAL CHANGES: None
2. SCHEDULE CHANGES: None
3. COST CHANGES: None

F. PROGRAM DOCUMENTATION:

G. RELATED ACTIVITIES: Mission analysis is in parallel with mission performance assessment performed by GE. There is no unnecessary duplication of effort within SDIO or the DoD.

H. OTHER APPROPRIATION FUNDS: None

I. INTERNATIONAL COOPERATIVE AGREEMENTS: None

J. MILESTONE SCHEDULE:

- o Operational requirements development (Annually)
- o Deterrence/stability analysis (Annually)
- o Wargames reports (As Required)

FY1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: 0603215C
PE Title: Limited Defense System

Project Number: 3202
Budget Activity: 03
Strategic Programs
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- o Offense-defense interaction analysis reports (Annually)
- o Command control analysis reports (Annually)
- o Offense-defense concepts of operations (Annually)
- o Command center connectivity analysis

FY1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: 0603218C
PE Title: Research & Support Activities

Project Number: 3203
Budget Activity: 03
Strategic Programs
April 1993

A. RESOURCES: ($ in Thousands)
Project Title: Intelligence Threat Development

Program Name:	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	Total Program
R&S DEM/VAL	10,274	14,875	10,245	Continuing

B. BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

The purpose of the SDI Intelligence Threat Development project is to provide an up-to-date Intelligence Community-validated threat description against which system-specific threat-driven specifications, lethality designs, and target objects are developed. The primary vehicle for providing these threat descriptions is the System Threat Assessment Report (STAR), which is updated and validated by the Intelligence Community annually under this project. The STAR addresses the threat faced by a Global Protection Against Limited Strikes (GPALS) system from two points of view. First, the descriptions of CIS and Chinese threat vehicles, warheads, and penetration aids (Penaids) are provided which apply to limited or all-out strategic nuclear attack against U.S. assets. Second, ROW threat descriptions are provided that address the attack of overseas theater (tactical) resources of the U.S. and its allies. In addition to the STAR, six annexes, one for each Major Defense Acquisition Program (MDAP), are provided and validated by the intelligence community each year. The annexes contain somewhat more information than the STAR and are system-specific to each MDAP. The Intelligence Threat Development Program divides the threat into three major categories-Operational Threat Environment, Targets, and System-Specific Threats. The Operational Threat Environment category includes assessments of the operational, physical and technological environment and projects the effects of those developments and trends on mission capability out to the end-of-life cycle. The outputs often take the form of assessed limits on deployment and employment tactics or strategies for the use of projected threats in attack scenarios. The Targets category includes a projection of threat systems and the countermeasures that enhance their performance. This includes force structure, performance characteristics, limits on employment and control, and where available, sample signatures. The System Specific Threat category includes identification of probable nonlethal (EW and INFOSEC) and Lethal (KEW and DEW) threats to specific SDI systems, including force structures, combat readiness, and doctrinal issues at IOC and IOC plus 10 years. In all categories some effort is also made to project most likely reactive threats and technically feasible reactive threats including changes in performance, numbers, and application. Both targets and SST are described up to four levels of detail. Level 0 is the highest level in terms of basic capabilities and country of origin. Level 1 provides the form, fit and function characteristics necessary to support system tradeoff studies. Level 2 is a very detailed design in which actual materials and structures are described for use in lethality studies and detail element designs. And, Level 3 is flight target designs with manufacturing blue prints for either signature or lethality testing. Additional Analysis evaluate emission signatures, reflection signatures

and dynamics signatures (trajectories and microdynamics), and the system specific vulnerabilities for strategic and theater elements of GPALS. These analyses will provide detailed data for developing both theater defense systems and other GPALS systems.

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

- The STAR was updated and validated to reflect the latest changes in the threat environment and any revised SDI program plans. Long-range plans were re-evaluated in terms of the CIS with emphasis shifting from revolutionary changes in the threat to evolutionary improvements to current systems and incorporation of observations and projections of CIS political alignments and attendant controls of nuclear weapons within the CIS.
- The National Missile Defense annex was prepared for incorporation into the STAR and in support of the Defense Acquisition Board (DAB) process for this MDAP segment.
- The Upper Tier Theater Missile Defense System (UTTMDS) annex was written by the Army and reviewed and coordinated through SDIO/SI for DIA validation in support of the MDAP.
- Began Level 1 designs of most stressing ROW ballistic missiles.
- Evaluated potential/capabilities for ROW Anti-Satellite (ASAT) weapons.
- Began ROW non-nuclear payload Level 1 designs.
- Update and validate the STAR and the NMD Annexes produced in FY 1992 to reflect the latest changes in the threat environment and any revised SDI program plans.
- Generate Global Missile Defense and Battle Management, Command, Control and Communications annexes for incorporation into the STAR and in support of the Defense Acquisition Board (DAB) process for these MDAP segments.
- UTTMD, Patriot, and Corps SAM annexes to the STAR will be re-written to conform with DoD 5000.2 instructions.
- Continue Level 1 designs of most stressing ROW ballistic missiles.
- Continue ROW nuclear payload Level 1 designs.
- Begin ROW nuclear payload Level 1 designs.
- Evaluate Theater aerodynamic missile threat and begin Level 1 and 2 designs of actual ARM systems.
- Continue ROW non-nuclear payload Level 1 designs.
- Begin Level 1 and 2 designs of the sample evolutionary CIS and ROW Penaid designs and tactics.
- An unclassified developing nation ballistic missile defense system threat was produced to support broader exposure of the system threat.
- Developed detailed test and evaluation plan to ensure data collection for theater representative threats.
- Generated Strategic and Theater IPRs.
- Begin three Level 2 SRBM designs.
- Begin Intelligence Assessments of Theater Ballistic Missile Mobil Ground Operations threat specification.

Program Element: 0603218C
PE Title: Research & Support Activities

Project Number: 3203
Budget Activity: 03
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- Begin TBM Guidance upgrades and CBW Agent threat specification.
- Evaluate ROW Low Observable intelligence assessments.
- Deliver an upgraded Capstone STAR.
- Deliver an upgraded system specific GMD STAR Annex.
- Deliver an upgraded system specific NMD STAR Annex.
- Deliver an upgraded system specific UTTMD STAR Annex.
- Deliver an upgraded system specific PATRIOT TMD STAR Annex.
- Deliver an upgraded system specific Corps SAM TMD STAR Annex.
- Deliver an upgraded system specific BM/C^3 STAR Annex.
- Deliver specialty threats, (regional or unclassified), on demand.
- Upgrade material on the Operational Environment.
- Develop Level 1 and Level 2 descriptions for a very limited amount of the highest priority threats within funding to support system specific performance analysis and design to threat development.
- Deliver upgraded Intelligence Production Requirements (IPRs).

Program Plan to Completion: This is a continuing program.

D. WORK PERFORMED BY:

- Alpha Tech
- Boeing Aerospace Corporation
- Delta Research, Inc.
- Dynetics, Inc.
- General Electric, Company
- Kaman Sciences
- McDonnell-Douglas Space Systems Company
- Nichols Research
- Science Applications International Corporation
- Sparta, Inc.
- SRS Technologies
- Teledyne Brown
- Textron
- TRW
- Air Force Foreign Aerospace Science and Technology Center
- Army Foreign Science and Technology Center
- Army Strategic Defense Command
- Defense Intelligence Agency
- Central Intelligence Agency
- DIA Missile and Space Intelligence Center
- Naval Maritime Intelligence Center
- Lawrence Livermore National Laboratory
- Los Alamos National Laboratory

E. COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. TECHNICAL CHANGES: None
2. SCHEDULE CHANGES: None
3. COST CHANGES: None

Program Element: 0603218C
PE Title: Research & Support Activities

Project Number: 3203
Budget Activity: 03
Strategic Programs
April 1993

F. PROGRAM DOCUMENTATION:

G. RELATED ACTIVITIES:

The Threat Program involves organizations of the Army, Navy, Air Force, and the Office of the Secretary of Defense (e.g., the Joint Chiefs of Staff and the Defense Intelligence Agency). Activities are defined in Program Management agreements with the Services. Coordination is accomplished through daily monitoring of activities and periodic meetings with representatives from the Services, Agencies, and the Department of Defense to ensure that product quality is maintained, that schedules are being met, and that there is no unnecessary duplication.

H. OTHER APPROPRIATION FUNDS: None

I. INTERNATIONAL COOPERATIVE AGREEMENTS: None

J. MILESTONE SCHEDULE:

- Deliver Third World Missile Proliferation document
- Deliver GMD STAR Annex
- Deliver NMD STAR Annex
- Deliver BM/C^3 STAR Annex
- Re-write UTTMDS STAR annex in DoD 5000.2 format
- Re-write Patriot STAR annex in DoD 5000.2 format
- Re-write Corps SAM STAR annex in DoD 5000.2 format
- Deliver updated and validated Capstone STAR
- Upgrade Capstone STAR and 6 Annexes
- Upgrade Capstone STAR and 6 Annexes
- Level 1, 2 and 3 Threat descriptions are delivered as funding permits

FY1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: 0603218C
PE Title: Research & Support Activities

Project Number: 3204
Budget Activity: 03
Strategic Programs
April 1993

A. RESOURCES: ($ in Thousands)
Project Title: Countermeasures Integration

Program Name:	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	Total Program
R&S DEM/VAL	17,127	17,266	22,330	Continuing

B. BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

The mission of the SDI Countermeasure Integration (CMI) Program is to stress GPALS architectures and elements to ensure that deployed ballistic missile defense systems are robust to potential countermeasures which are within the means of anticipated adversaries. Included in this mission is a twofold responsibility. First, the CMI program supports the SDI threat development process by stimulating the examination and assessment of all credible counters to future deployed systems. Secondly, the CMI program provides the GPALS system designer with advance warning necessary for building preplanned improvements and program hedges into the design.

The SDIO CMI Program carries out its mission by pursuing the following objectives: identify potential countermeasures; determine credibility through analyses and tests; characterize credible countermeasures by providing designs and performance parameters; inform intelligence and system threat developers of potential countermeasures; and inform GPALS system designers with advance warning of potential countermeasures. These last two objectives represent the cardinal goals of the program. The support provided by the CMI Program to the threat development process and its outcome is the chief means by which the program achieves its mission of ensuring the robustness of future deployed systems. Making vulnerability and susceptibility information available to the system designers provides a mechanism by which the designers can build robustness into their designs during early stages of the system development process. The ability to improve the robustness of the design in its formative stages provides a cost-effective means of ensuring a flexible high performance design. Timely screening of countermeasures also allows the system designer to focus on the critical countermeasures and safely ignore countermeasures which ultimately prove to be technically, politically, militarily or economically infeasible.

The CMI Program uses three primary resource groups to execute the process of countermeasure identification, analysis, verification and assessment. These three resource groups are the Red Teams, laboratories, and strategic analysis groups. Red teams are formed and tasked to identify and analyze potential countermeasures to a GPALS architecture or element. The laboratories and the contractor are responsible for verification of the technical feasibility of potential countermeasures. The strategic analysis groups provide assessments of the reality of potential countermeasures within the total context of the adversary's environment. Through this framework, the CMI program is able to access an array of

countermeasure evaluation resources from government agencies, national laboratories, and contractors.

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

- The Strategic Analysis Activity (SAA) conducted studies of how the former Soviet Union and the rest of the world might respond to a missile defense deployment by the US.
- Executed the Countermeasures Demonstration Experiment (CDX) flight test of electro-optic chaff, multiple inflatable reentry vehicle replicas for midcourse, and exo- and endoatmospheric pyrotechnic flare concepts.
- Executed the Firebird 1B flight test to assess complex surfaces, active motion control techniques, plume impingement effects on RV replicas.
- Assessed the viability of closely spaced objects to negate midcourse discrimination.
- Provided support to a Defense Science Board Task Force for a review of the SDIO countermeasure programs.
- Conduct Red/Blue Exchange of NMD Initial Site systems.
- Conduct Red/Blue Exchange of objective NMD architecture.
- Complete susceptibility studies of NMD elements.
- Conduct STB experiments of selected countermeasures to NMD-GBR.
- Publish Countermeasure Position Papers on selected potential countermeasures to support STAR update and system engineering.
- Complete analysis of selected NMD countermeasure concepts to support development of threat specifications.
- Provide senior-level oversight of Red/Blue Exchanges.
- Conduct studies on foreign country propensity for specific classes of countermeasures.
- Support USSPACECOM Wargaming at NTF through BM/C^3 countermeasure insertion.
- Begin implementation of DSB Task Force recommendations.
- Conduct susceptibility studies for BE, GBR (FOC) and GBI (FOC).
- Continue to develop, define and evaluate countermeasures against NMD and the integrated GPALS.
- Conduct Red/Blue Exchanges for NMD segment.
- Select countermeasures and conduct STB experiments for these countermeasures against BE and GBR.
- Publish Countermeasure position papers on selected potential Countermeasures.
- Continue to maintain, evaluate and upgrade Countermeasure data base and library; complete document imaging and develop links with other countermeasure-related databases.
- Initiate design, development and test of pyrotechnic and end-game countermeasures.
- Initiate analyses for countermeasures against GPALS BM/C^3 architecture.
- Continue definition of test threat objects for discrimination and targets programs.

Program Element: 0603218C
PE Title: Research & Support Activities

Project Number: 3204
Budget Activity: 03
Strategic Programs
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- Provide senior-level oversight for, review of, and strategic analysis support to NMD Red/Blue Exchanges.
- Continue to expand and update studies on possible FSU views of BMD.

Program Plan to Completion: This is a continuing program.

D. WORK PERFORMED BY:

- Science Applications International Corporation - (prime contractor)
- System Planning Corporation - (prime contractor)
- MIT/LL
- Sandia National Laboratories
- Ballistic Missile Organization
- US Army Strategic Defense Command
- USAF Phillips Laboratory

E. COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. TECHNICAL CHANGES: None
2. SCHEDULE CHANGES: None
3. COST CHANGES: None

F. PROGRAM DOCUMENTATION:

G. RELATED ACTIVITIES:

- The countermeasure and threat projects involve organizations of the Army, Air Force, and Department of Energy (DOE). Activities are defined in Program Management Agreements (PMAs) for the Services, Federally Funded Research and Development Centers, DOE, and the prime contractors. NMD benefits from this work through improvements to system robustness.
- Coordination is accomplished through daily monitoring of activities and a weekly technical interchange and direction meeting with prime contractor management.
- There is no unnecessary duplication of effort within SDIO and DOE.

H. OTHER APPROPRIATION FUNDS: None.

I. INTERNATIONAL COOPERATIVE AGREEMENTS: Yes

J. MILESTONE SCHEDULE:

- Conclude Round I of NMD Red/Blue Exchange
- Complete STB experiment for NMD-GBR
- Complete Round II of NMD Red/Blue Exchange
- Complete STB experiment for BE and GBR countermeasures
- Complete NMD Red-Blue Exchange
- Complete integrated GPALS Red/Blue Exchange
- Complete NTB experiments for BP and NMD-CCE countermeasures
- Complete second integrated GPALS Red-Blue Exchange

FY1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: 0603218C
PE Title: Research & Support Activities

Project Number: 3206
Budget Activity: 03
Strategic Programs
April 1993

A. (U) RESOURCES: ($ in Thousands)
Project Title: System Threat

Program Name:	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	Total Program
R&S DEM/VAL	8,350	9,231	10,062	Continuing

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

(U) With the changing world situation and the projection of continuing proliferation of ballistic missiles, it is imperative that an accurate characterization of theater, national, and global threats be developed. The accurate specification and characterization of ballistic missiles and the appropriate development and integration of scenarios using these characterizations is critical to: (1) the analysis of alternative ballistic missile defense architectures; (2) the performance assessments of potential technology applications; and (3) the operational performance evaluations of candidate designs. The threat specifications and characterizations must be based on accepted intelligence community threat projections or realistic estimates of technological/operational innovations; be traceable back to objective and quantifiable analyses; and be supported by the using organizations. These threat projections, described in engineering terms and parameters, must be used by all SDIO agencies to ensure that results can be compared and contrasted.

(U) The System Threat development project is an integral part of SDIO's three-part Threat Program. The System Threat Project uses as a baseline the System Threat Assessment Report (STAR) developed under the Intelligence Threat Development Project (#3203) and incorporates likely adversary countermeasures identified in the Countermeasures Integration Project (#3204). The System Threat Project adds system-specific engineering characterization details described in the form of scenarios characterizing particular timing, targets, and tactics.

(U) The System Threat Project achieves its objectives through the auspices of the Threat Working Group (TWG) and the TWG subgroups (the Scenario Working Group (SWG) and the Penetration Aids Panel). The TWG and the TWG subgroups include representatives from: the Intelligence Community (DIA, CIA, Service Science & Technology centers, etc.); the SDIO and Service element development office; the using commands (USSPACECOM, USASDC, USAFSSD, etc.); and the Service engineering support agencies. Using the expertise available through the TWG, the System Threat Project:

(1) Identifies user needs for threat scenario descriptions.
(2) Identifies analyses needed to fully specify and characterize the threat missile systems, penetration aids, tactics, etc., and ensures the analyses is done.
(3) Provides the analysis results to all interested agencies for review and comment.
(4) Addresses critical threat issues which arise during the analysis process.

(5) Ensures all supporting agencies' views on threat issues are fully aired.
(6) Reviews, approves, produces, and distributes all System Threat Scenario Descriptions.
(7) Produces threat computer tapes and supporting documentation for use by the development and acquisition communities.

The System Threat Scenario Description Documents are presented to the SDIO System Design Board (SDB) for endorsement and configuration control.

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

- o Updated the GPALS Scenario Descriptions to reflect the latest version of the STAR.
- o Developed threat characterizations and scenarios against GPALS elements as required by users.
- o Continue work on START constrained nonresponsive threat systems and scenarios.
- o Continued work on threat characterizations for global scenarios.
- o Continued work on threat characterizations for accidental and Nth country attack scenarios.
- o Developed threat excursions for COEA and AIS-2 studies.
- o Sponsor a United Kingdom developed global threat scenario to provide an independent view of the threat.
- o Expanded TMD scenarios to include old Soviet Republics.
- o Produced integrated ballistic missile, cruise missile, and aerodynamic threat systems in campaign-style scenarios.
- o Continued upgrade of the threat tape generator, TG90A.
- o Performed analyses to develop threat system, penaids, and DST characterization data.
- o Continued to support test and experiment activities.
- o Continued TWG leadership.
- o Supported preparation of threat documentation to support milestone decisions.
- o Produce threat tapes at the NTB Special Programs Center.
- o Update all scenario descriptions to reflect the latest version of the STAR.
- o Develop threat characterizations and scenarios against SDS follow-on systems.
- o Develop threat excursions for architecture concept studies.
  - NATO Research Study Group (RSG).
- o Continue upgrade of the threat tape generator, TG90A.
- o Perform analyses to develop threat system, penaids, and characterization data.
- o Support USSPACECOM GRANITE SHIELD scenario requirements through SWG.
- o Continue to support the threat analysis/scenario needs of the Architecture Integration Study (AIS).
- o Support the Threat Key Topic Forum.
- o Support test and experiment activities.
- o Continue TWG leadership.

- o Preparation of threat documentation to support element milestone decisions.
- o Continue operation of the Special Programs Center at the NTB.
- o Develop single-event (non-campaign), campaign, and special purpose scenarios as needed by the user community.
- o Update work on the START constrained, non-responsive threat systems and scenarios in response to changing treaty interpretation.
- o Develop scenarios which reflect possible BMD applications in the context of:
  - Exchanges from and to old Soviet Republics
  - An amphibious landing scenario
  - A defense suppression scenario
  - A counterforce scenario.
- o Continue to support the Countermeasures Integration Program efforts to define, assess, test, and evaluate candidate countermeasures, and to conduct Red/Blue interchanges.
- o Update the GPALS Scenario Descriptions to reflect latest intelligence program projections contained in the STAR.
- o Develop threat system characterizations, and scenario descriptions in response to the analysis needs of the system/element developers.
- o Develop scenario constructs which specify and characterize threat systems involved in global environments.
- o Develop scenario constructs which specify and characterize threat systems involved in accidental, unauthorized, or Nth country attacks.
- o Develop threat scenarios for use in cost, effectiveness and architecture analysis studies.
- o Continue to sponsor allied participation in scenario construction to provide an independent view of the threat.
- o Continue to integrate ballistic missile, cruise missile, and aerodynamic threat systems in campaign-style scenarios.
- o Continue to support the System Design Board's need for threat issue briefings and discussions during the requirements definition decision meetings.
- o Continue upgrade of the National Test Bed (NTB) threat system modeling capability (TG90A).
- o Continue to produce threat tapes and supporting documentation through the NTB Special Programs Center.
- o Continue to support the Intelligence Office's efforts to update the STAR.
- o Continue to lead the TWG and the TWG subgroups.
- o Support system and element project offices with preparation of required threat documentation in support of acquisition milestones.

Program Plan to Completion: This is a continuing program.

D. WORK PERFORMED BY:

- o US Air Force Space and Missile Center
- o US Air Force Foreign Aerospace and Technology Center
- o Defense Intelligence Agency

- o US Army Missile and Space Intelligence Center
- o Navy Maritime Intelligence Center
- o SDIO Security, Intelligence and Countermeasures Directorate
- o US Army Strategic Defense Command
- o Ministry of Defense
- o Joint Program Office of the National Testbed
- o Booze-Allen & Hamilton
- o Riverside Research
- o Kaman Sciences Corporation

E. COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. TECHNICAL CHANGES: None
2. SCHEDULE CHANGES: None
3. COST CHANGES: None

F. PROGRAM DOCUMENTATION:

G. RELATED ACTIVITIES: Work performed under the Intelligence Threat Development Project and the Countermeasures Threat Project (Projects 3203 and 3204, PE No. 0603218C) complement and support this effort. There is no unnecessary duplication of effort within SDIO or the DoD.

H. OTHER APPROPRIATION FUNDS: None

I. INTERNATIONAL COOPERATIVE AGREEMENTS: Yes

J. MILESTONE SCHEDULE:

- o Update Scenario Description Documents (as required)
- o TG90A Software Upgrades (Annually)
- o TWG meetings (Quarterly)
  - Scenario Working Groups (10 per year)
  - Penetration Aids Panel (10 per year)
- o Threat Tape Production (as required)
- o Develop Red/Blue Interchange Scenario (semi-annually)
- o Middle East Amphibious Campaign Scenario/Tape
- o Start Constrained Global Scenario/Tape
- o Counterforce Scenario/Tape
- o Additional TMD Scenario/Tapes
- o One-Day-of-a-War Scenarios/Tapes
- o Additional NMD/GMD Scenario/Tapes
- o Update all Scenarios vs 92 STAR
- o Scenario for TMD Red/Blue Interchange
- o Additional Scenarios Per Users Needs
- o Update all Scenarios vs new STAR

FY1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: 0603215C
PE Title: Limited Defense System

Project Number: 3207
Budget Activity: 03
Strategic Programs
April 1993

A. RESOURCES: ($ in Thousands)
Project Title: Systems Analysis

Program Name:	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	Total Program
LDS DEM/VAL	25,175	11,950	6,837	Continuing

B. BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

The objective of this project is to conduct systems analysis on alternative ballistic missile defense architectures. Independent studies of the architectures, the design of elements comprising architectures and the interfaces between elements will be carried out to determine operational effectiveness and cost of various alternatives. Complex technical issues affecting performance will be analyzed in detail. The results will determine the impact of changing threats, protection requirements and advances in technology on current and proposed missile defense systems. Part of the effort will involve the development of sophisticated computer models to simulate all aspects of a ballistic missile engagement by defensive sensors and interceptors. This project will provide recommendations on System Elements, command and control, battle management, acquisition strategies, and deployment basing. This project will also provide inputs to element requirements, Cost and Operational Effectiveness Analysis (COEA), and other required acquisition documents.

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

- o Completed architecture integration study.
- o Determined architectural alternatives for initial deployment of NMD system.
- o Generated detailed acquisition strategy for developing and deploying components of an evolving NMD architecture.
- o Complete a Cost and Operational Effectiveness Analysis (COEA) for National Missile Defense. Alternatives for an all-ground, an all space, and a mixture of space and ground elements will be evaluated.
- o Battle Management/C3 concepts will be developed for National Missile Defense.
- o Initial NMD architecture alternatives will be examined in detail.
- o Interceptor radiation hardness requirements will be determined.
- o The ability of Brilliant Eyes to provide discrimination and kill assessment will be determined.
- o Comparison of the government baseline and specific contractor element designs will be make in order to update architecture performance previously determined.
- o Sensitivity of element designs to threat assumptions and operational performance requirements will be determined.
- o Kill assessment algorithms for Brilliant Eyes satellite will be developed.
- o The effect of potential arms control agreements on the alternative NMD system will be studied.

Program Element: 0603215C
PE Title: Limited Defense System

Project Number: 3207
Budget Activity: 03
Strategic Programs
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Program Plan to Completion: This is a continuing program.

D. WORK PERFORMED BY:

- o TASC
- o BDM
- o Riverside Research, Inc

E. COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. TECHNICAL CHANGES: None
2. SCHEDULE CHANGES: None
3. COST CHANGES: None

F. PROGRAM DOCUMENTATION:

G. RELATED ACTIVITIES:

- o Space-Based Interceptors — PE No. 0603214C
- o Theater Missile Defenses — PE No. 0603216C
- o Other Follow-On Systems — PE No. 0603217C
- o Research and Support Activities — PE No. 0603218C
- o There is no unnecessary duplication of effort within SDIO or DoD.

H. OTHER APPROPRIATION FUNDS: None.

I. INTERNATIONAL COOPERATIVE AGREEMENTS: None.

J. MILESTONE SCHEDULE:

- o Bimonthly progress briefings
- o Technical reports and briefings as work on specific issues as completed
- o Final Technical Report

FY1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: 0603215C
PE Title: Limited Defense System

Project Number: 3301
Budget Activity: 03
Strategic Programs
April 1993

A. RESOURCES: ($ in Thousands)
Project Title: SDIO Test Data Centers

Program Name:	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	Total Program
LDS DEM/VAL	0	10,000	9,767	Continuing
FOT DEM/VAL	0	2,990	0	Continuing
R&S DEM/VAL	12,591	0	0	Continuing

B. BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

This task provides for overall coordination of Test and Experiment Data Management support throughout the SDI Program and, as such, is funded across several SDIO Program Elements.

These Centers archive, catalog, maintain, process, distribute, and provide controlled access to SDIO experiment data. Their mission is to serve as the principal repository for SDIO experiment data, and to assist the analysis and science community with their requirements for information to evaluate Strategic Defense System feasibility, development, and implementation. Additionally, the Data Centers provide specialized data products and analysis support for SDIO System Elements. Presently, there are three Data Centers located at DoD centers of expertise in specific areas of science and technology. They are the Backgrounds Data Center (BDC), the Plume Data Center (PDC), and the Midcourse Data Center (MDC), and the Kinetic Energy Weapon Data Center (KDC). In FY94 consolidation of MDC and KDC is under consideration.

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

- o Integrated into the Data Centers data from the AST, CIRRIS 1A, IBSS, SPIRIT II, EXCEDE III, SRMP, Red Gemini V, Firefly, Red Tigress, and Starbird.
- o Developed detailed plans for the management of data from the Midcourse Space Experiment (MSX).
- o Finished developing design and implementing master Data Center catalog.
- o Developed detailed data center cost models based on ingest rates, archive maintenance, level of archive, total data stored, etc.
- o Began upgrading BDC and MDC capabilities to handle MSX data (approx. 1 TeraByte/yr).
- o Completed development and implemented prototype of Common User Interface for Data Centers.
- o Completed database on experiment data archive locations.
- o Begin archiving Pre-Launch Data from MSX Program.
- o Integrate into the Data Centers data from ZB, STARS, and other SDIO experiment programs.
- o Begin Data Center mass storage upgrades.
- o Integrate Brilliant Pebbles (BP) data into Data Centers.
- o Populate database from ground and flight test interceptor experiments such as GBI, THAAD, LEAP, ERINT, etc.

Program Element: 0603215C
PE Title: Limited Defense System

Project Number: 3301
Budget Activity: 03
Strategic Programs
April 1993

- o All data centers will continue to support archiving, processing, and distribution for data received through FY 94.
- o Assess data center requirements at all centers to support GPALS and NMD.
- o Complete distributed database development at BDC.
- o Integrate MSX data at the BDC, MDC and PDC.
- o Begin receiving GBI flight test data at the MDC and KDC.
- o Begin receiving BP test data at MDC, PDC.
- o Receive GBR test data at MDC.
- o Begin receiving MSTI Booster Test Flight data at BDC.
- o Receive ODES flight test data at PDC.
- o Continue receiving Rapid Fire HVG test data at MDC.
- o Begin receiving THAAD flight test data at MDC.
- o Receive ARE-3 data at MDC.
- o Receive POAM data at BDC.
- o Store and manage BE data at PDC, BDC, MDC.
- o Receive and archive SPASII/III Data at PDC.
- o Support SDI Plume Analysis Data Program (SPDAP).
- o Support CREAM, CCRES, ABE, RAIDS, and Polar Bear programs at BDC.
- o Provide various levels of support for AST at MDC.
- o Continue preparing ARGUS/HALO imaging data at PDC.

Program Plan to Completion: This is a continuing program.

D. WORK PERFORMED BY:

- o Naval Research Lab
- o Arnold Engineering Development Center
- o U.S. Army Strategic Defense Command

E. COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. TECHNICAL CHANGES: None
2. SCHEDULE CHANGES: None
3. COST CHANGES: None

F. PROGRAM DOCUMENTATION:

G. RELATED ACTIVITIES:

o 1101 Passive Sensors	PE No. 0603215C PE No. 0603214C
o 1105 Discrimination Technology	PE No. 0603215C
o 1106 Sensors Studies and Experiments	PE No. 0603215C/ PE No. 0603216C/ PE No. 0603217C
o 1202 Exo Integration Technology	PE No. 0603215C/ PE No. 0603217C
o 1209 Endo-Atmospheric Integration Technology	PE No. 0603215C
o 2102 BE	PE No. 0603215C/ PE No. 0603216C

Program Element: 0603215C
PE Title: Limited Defense System

Project Number: 3301
Budget Activity: 03
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o	2103 GSTS	PE No. 0603215C
o	2104 GBR	PE No. 0603215C/ PE No. 0603216C
o	2202 Ground Based Interceptor	PE No. 0603215C
o	2205 Brilliant Pebbles	PE No. 0603214C

There is no unnecessary duplication of effort within SDIO or the DoD.

H. OTHER APPROPRIATION FUNDS: None

I. INTERNATIONAL COOPERATIVE AGREEMENTS: None

J. MILESTONE SCHEDULE:

- Begin Starbird Data Management
- BDC Integrated Science Catalog
- Begin IBSS Data Management
- Begin AST Data Management
- Begin Red Gemini V Data Management
- Begin CIRRIS 1A Data Management
- BDC Complete Physical Archive System
- Prototype Visual Interface for Space and Terrestrial Analysis (VISTA)
- Begin integrating BP Data (KDC)
- KDC FOC
- Begin MSX Data Management (BDC & MDC)
- Receive GBI data at MDC, KDC
- Complete distributed database development at BDC
- Begin receiving MSX data at the BDC, MDC and PDC
- Begin receiving GBI test data at the MDC
- Begin receiving BP test data at MDC
- Begin receiving THAAD flight test data at MDC, KDC
- Receive ODES flight test data at PDC
- Receive POAM data at BDC
- Receive ARE-3 data at MDC
- Receive GBR test data at MDC
- Begin receiving MSTI Booster Test Flight data at MDC
- Begin Receiving BE Data at MDC, PDC, BDC
- Begin Receiving BP Data at KDC, PDC, MDC
- Receive KITE 3, ERINT 8, LEAP VII, MISTI Data at KDC
- Receive STARS, CWDD, HABE, & SPICE Data at MDC
- Receive CREAM Data at BDC
- Begin Receiving MSX Data at BDC, MDC
- Receiving GSTS Validation Experiment Data at MDC
- Receive RAIDS, MISTI Data at BDC

FY1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: 0603215C
PE Title: Limited Defense System

Project Number: 3302
Budget Activity: 03
Strategic Programs
April 1993

A. RESOURCES: ($ in Thousands)
Project Title: System Test Environment

Program Name:	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	Total Program
LDS DEM/VAL	0	91,067	53,718	Continuing
R&S DEM/VAL	77,398	0	0	Continuing

B. BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

The mission of the Strategic Defense Initiative (SDI) National Test Bed (NTB) Program is to provide a comprehensive capability to experiment and evaluate alternative SDI system concepts; architectures, including battle management/command, control and communications (BM/C^3); and key defensive technologies. The NTB consists of a network of integrated, geographically distributed, simulation and support facilities. The National Test Facility (NTF) at Falcon AFB, CO is the hub and central experiment and simulation facility. This project only funds the infrastructure that supports the NTB Prime Mission Products previously identified as part of Project 3302. Those projects/tasks now are identified separately under their respective projects. This project consists of the acquisition, operation and maintenance of computing and communications networks, secure facilities, and technology required to support the NTB mission. The network nodes include SDIO, Unified Space Command, Army Strategic Defense Command, Air Force Space and Missile Systems Center, Air Force Electronic Systems Center, STRATCOM, Los Alamos National Laboratory, Naval Research Laboratory, General Electric Corporation., Army Space Command, The Analytical Sciences Corporation Martin Marietta Corporation, Booz-Allen Hamilton, BDM Corp, and Theater Area C2 Simulation Facility.

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

- Provided NTB/NTF System Engineering for technology selection, test support planning, and test bed integration to support SDS Developmental/Operational Test & Evaluation.
- Continued development support of Level 1 System Simulator and Level 2 System Simulator Builds.
- Continued CERES support for test and experiment programs.
- Developed and implemented Computer Resource Performance Analysis Capability (RPAC) Prototype.
- NTB wide area network future architecture design and implementation planning.
- Implemented computer platform operating system security features to fulfill the requirements for operating the NTB Network at the System High mode of operation.
- Began migration of the NTF computing system to a multi-level secure environment.
- Developed NTF Common Support Computer Architecture System Migration Plan.
- New SDIO VTC connection to NTF.

FY1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: 0603215C
PE Title: Limited Defense System

Project Number: 3302
Budget Activity: 03
Strategic Programs
April 1993

- o NTF transition to multi-level secure environment plan.
- o NTB future architecture design and implementation plan.
- o Initial NMD integration begins at NTF to support the deployment mandated by Congress.
- o Continue to support Level 2 System Simulator upgrades for evolving analyses requirements.
- o Continue CERES development support to full operational capability.
- o Expand nodes on the NTB to support CERES, gaming programs.
- o NTBIC contract recompetition package development.
- o Completion and operation of the NTF Electronic Security Systems for the protection of all NTB classified media.
- o Provide support to BMC3 Block 0 Element developers and limited software rehost.
- o Continue NMD integration and test planning as mandated by the Missile Defense Act of 1991.
- o Achieve Initial Operational Capability (IOC) of the Technical Insertion Lab.
- o Continue to support existing developmental efforts to the extent resources permit.

Program Plan to Completion: This is a continuing program.

D. WORK PERFORMED BY:

- o Martin Marietta
- o National Test Bed Joint Program Office

E. COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. TECHNICAL CHANGES: Work on NTF multi-level secure communication/computer environment terminated. Further expansion of distributed network stopped. Ongoing*pl19 Systems Engineering for technolog selection, test support planning and testbed integration terminated.
2. SCHEDULE CHANGES: Ability to meet user schedules will depend on 15-25% surcharge to users.
3. COST CHANGES: Severe reductions stop facility upgrades. ADPE, communication and technical baseline becomes obsolete.

F. PROGRAM DOCUMENTATION:

G. RELATED ACTIVITIES:

o	2205 Brilliant Pebbles	PE No. 0603214C
o	3112 System Test Environment/Modeling & Simulation	PE No. 0603215C
o	3203 Threat Develop	PE No. 0603218C
o	3205 TMD Studies	PE No. 0603216C
o	3206 System Threat	PE No. 0603218C
o	3301 Data Center	PE No. 0603218C
o	3306 CREO	PE No. 0603218C
o	3308 Sys Sim	PE No. 0603215C

Program Element: 0603215C
PE Title: Limited Defense System

Project Number: 3302
Budget Activity: 03
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- o 3309 System Test/Plan PE No. 0603215C
- o 3310 Test Facility PE No. 0603218C
- o 3312 NTB Support PE No. 0603218C

There is no unnecessary duplication of effort within SDIO or the DoD.

H. OTHER APPROPRIATION FUNDS: None

I. INTERNATIONAL COOPERATIVE AGREEMENTS: None

J. MILESTONE SCHEDULE:

- o NTF Consolidated Support Facility Construction complete
- o DDN classified and unclassified connectivity
- o Technical Insertion Lab IOC/MLS test bed
- o Automated secure user/password system implementation
- o RPAC Implementation
- o Complete Resource Management System implementation
- o Additional NTB remote node
- o NTBIC and SETA contract recompetition
- o CRAY II Replacements
- o Real Time Network Operations Center IOC
- o Computer/Comm upgrades
- o Additional NTB remote nodes (3)

FY1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: 0603215C
PE Title: Limited Defense System

Project Number: 3303
Budget Activity: 03
Strategic Programs
April 1993

A. RESOURCES: ($ in Thousands)
Project Title: Independent Test and Evaluation (T&E) Oversight and Assessment

Program Name:	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	Total Program
LDS DEM/VAL	0	3,758	5,860	Continuing
R&S DEM/VAL	5,220	0	0	Continuing

B. BRIEF DESCRIPTION OF MISSION REQUIREMENTS AND SYSTEM CAPABILITIES:

Provide independent T&E oversight and assessment of all (GPALS) element tests to ensure that comprehensive T&E programs are implemented to support GPALS design, development, construction, operational capability, and deployment. This effort provides GPALS wide T&E programmatic and technical management, verification and validation (V&V) accreditations, certification, status monitoring, target requirements, planning to support SDI test programs.

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

- o Completed GPALS Test Resources Master Plan and Resources Catalog.
- o Proceeded with Integrated Systems Test Capability development and draft program plan.
- o Reviewed draft GPALS Test Plan.
- o Initiated Test Requirements Traceability.
- o Continued Publication of T&E Activity Summary, while expanding the test and experiment historical data base and improving retrieval capabilities.
- o Produced revision to the GPALS TEMP.
- o Continued to update SDIO booster requirements.
- o Initiated Range Management Oversight for SDIO assets.
- o Drafted Test and Evaluation inputs to the NMD deployment plan required by Congress.
- o Continued development of updates to the System T&E CARD and PMA.
- o Developed GPALS Program Introduction document for USAKA.
- o Drafted GPALS Test Resources Master Plan and Resources Catalog.
- o Compile a fully integrated SDIO test and experiment schedule to ensure optimum use of test assets and resources.
- o Continue refinement of the GPALS TEMP.
- o Continue refinement of System T&E PMA and CARD.
- o Continue test requirements traceability.
- o Continue oversight of SDIO Targets Program.
- o Update (as required) TEMP, T&E Activity Summary, Cost Analysis Requirement Documents, Test Resources Master Plan, Target Plans.
- o Refine Integrated System Test Capability and System Integrated Tests.
- o Begin deployment site test planning.

Program Plan to Completion: This is a continuing program.

FY1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: 0603215C
PE Title: Limited Defense System

Project Number: 3303
Budget Activity: 03
Strategic Programs
April 1993

D. WORK PERFORMED BY: SRS Technologies.

E. COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. TECHNICAL CHANGES: None
2. SCHEDULE CHANGES: None
3. COST CHANGES: None

F. PROGRAM DOCUMENTATION:

G. RELATED ACTIVITIES:

o	Other Follow-On Systems	PE No. 0603217C
o	Theater Missile Defenses	PE No. 0603216C
o	Limited Defense System	PE No. 0603215C
o	Space-Based Interceptors	PE No. 0603214C

There is no unnecessary duplication of effort with SDIO or the DoD.

H. OTHER APPROPRIATION FUNDS: None

I. INTERNATIONAL COOPERATIVE AGREEMENTS: None

J. MILESTONE SCHEDULE:

- o GPALS TEMP Publication
- o Publish T&E Activity Summary
- o GPALS Test Resources Master Plan
- o Update SIT/ISTC Test Plan utilization
- o Initiate deployed site test planning
- o Assess accreditation of test resources
- o Develop milestone roadmap for T&E
- o Initiate deployed site test planning

FY1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: 0603215C
PE Title: Limited Defense System

Project Number: 3304
Budget Activity: 03
Strategic Programs
April 1993

A. RESOURCES: ($ in Thousands)
Project Title: Targets

Program Name	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	Total Program
LDS DEM/VAL	70,404	99,770	84,974	Continuing
SBI DEM/VAL	6,693	0	0	Continuing
R&S DEM/VAL	49,417	13,270	0	Continuing

B. BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

This task provides for overall coordination of targets and target support throughout the SDI Program.

The objective of the Targets Program is to provide engineering and threat representative test targets for experiments and for Developmental/ Operational Test (DT/OT) for the GPALS program. These targets must meet NMD performance, engineering, and threat characteristics requirements to provide test articles that will adequately emulate the expected threat and support engineering and development tests. Test and Evaluation is the staff function designated to provide for the design, development, characterization, validation, production, acquisition, and support system tests. The targets of concern are Boosters, and Re-entry vehicles (RV), Post Boost Vehicle (PBV), Decoys and Penetration aids (Penaids).

Targets will be designated and developed based on element and system level development test/experiment requirements. Initial target design and development will include an engineering and threat representative target set approved by the Test and Evaluation Working Group (TEWG), and validated by the intelligence community. Testing will be conducted on the test targets to ensure that they meet the characterization and validation requirements of the standard/threat target set. This characterization will ensure the proper data is available, post test, for accurate and timely test evaluation.

Products resulting from this effort will include:

- o Pre-production prototypes (target booster, PBVs, RVs, Decoy/Penaids)
- o Flight qualified hardware
- o Pre-production, validated test articles (PBV/RVs, Penaids/Decoys) for GBI, MSX, GBR, BE, and AST
- o Launcher Boosters (Minuteman, STARS, sounding rockets)
- o Range Telemetry Communication Equipment and sensors for data collection and characterization

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

- o Fabricated, targets for: ERIS FTV-2B, AST DT-2.
- o Completed STARS EIS.
- o Completed Environmental study and system development of Penaids.
- o Continued ODES development and fabrication.
- o Delivered ORBUS motor to BP, LEAP, ARE-3, and ODES programs.

Program Element: 0603215C
PE Title: Limited Defense System

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- o Completed construction of SMRV and performed flight test.
- o Began Light-Weight Instrumentation System (LWIS) test and fabrication.
- o Continued planning for GBI, GBR, BP, AST, MSX, and LEAP target tests.
- o Provided infrastructure support for Minuteman and STARS boosters.
- o Continued development of threat targets.
- o Performed RV ARE-2H lethality flight test.
- o Conclude LWIS test and fabrication.
- o Perform Target Development Test (TDT) flight test.
- o Perform ODF flight test qualification.
- o Deliver ORBUS motors for MSX FT 2 and MSX-4 programs.
- o Conduct STARS FTU-1 and STARS M-1 flight tests.
- o Conduct AST-D-2 target flights.
- o Completed Verification and Validation of ERIS, Patriot, and ERINT target systems.
- o Provide infrastructure support for Minuteman and STARS boosters.
- o Continue development of threat targets.
- o Perform ODES Demonstrate Flight (ODF)
- o Conduct AST DT-2A mission.
- o Conduct LWIS and BTS flight test.
- o Fabricate MSX targets.
- o Provide infrastructure support for Minuteman and STARS boosters.
- o Continue development of threat targets.

Program Plan to Completion: This is a continuing program.

D. WORK PERFORMED BY:

- o USASDC
- o Technical & Analytical Services Support/SRS Technologies

E. COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. TECHNICAL CHANGES: None
2. SCHEDULE CHANGES: None
3. COST CHANGES: None

F. PROGRAM DOCUMENTATION:

G. RELATED ACTIVITIES:

o	1106 MSX	PE No. 0603215C
o	1202 LEAP	PE No. 0603217C
o	2102 BE	PE No. 0603215C
o	2104 GBR	PE No. 0603215C
o	2202 GBI	PE No. 0603215C

There is no unnecessary duplication of effort within SDIO or the DoD.

H. OTHER APPROPRIATIONS: None

Program Element: 0603215C
PE Title: Limited Defense System

Project Number: 3304
Budget Activity: 03
Strategic Programs
April 1993

I. INTERNATIONAL COOPERATIVE AGREEMENTS: None

J. MILESTONE SCHEDULE:

- Conducted ERIS FTV-2B
- Completed Environmental Impact Statement
- Conduct STARS FTU-1
- Conduct AST DT-2 target flight
- Conduct STARS M-1 (ARE-2H)
- Conduct LWIS Test & Fabrication
- Conduct Target Development Test Flight Test
- Conduct ODES demonstration flight
- Provide STARS/ODES for MSX
- Provide STARS/ODES for MSX
- Provide Minuteman target for MSX
- Conduct GBI target flights (4 missions)
- Conduct GBR target flights
- Conduct BE target flights
- Conduct System Integration Test target flights

FY1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: 0603215C
PE Title: Limited Defense System

Project Number: 3306
Budget Activity: 03
Strategic Programs
April 1993

A. RESOURCES: ($ in Thousands)
Project Title: Computer Resources & Engineering

Program Name:	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	Total Program
LDS DEM/VAL	0	17,045	11,731	Continuing
R&S DEM/VAL	29,114	0	0	Continuing

B. BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

This project provides funding for the Advanced Research Center and Simulation Center (ARC/SC) for ongoing operations and maintenance in support of Ground Based Elements (GBE). The ARC/SC is an advanced computation technology system providing the operational test bed for resolving weapons, sensors, and battle management and command, control and communications (BM/C^3) issues for strategic and theater defense. It also serves as a development and test capability for other USASSDC programs, to include the Surveillance Test Bed (STB), Extended Air Defense Test Bed (EADTB) and Ground Based Radar (GBR) Test Facility. The ARC/SC is a major node in the National Test Bed (NTB).

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

- Continued support of NTB/SDIO requirements.
- Prepared facility and initiated EADTB integration into the Advanced Research Center (ARC).
- Expanded Midcourse Data Center analysis and processing area.
- Upgraded remote user interface to STB.
- Upgraded the test bed to meet GBE requirements for development and run-time experiments.
- Established USAKA interface to support GBE experiments, engineering analysis and quick look evaluations.
- Supported GBR test facility development.
- Provided analysis and system engineering support to Theater Missile Defense elements.
- Established system high development and operating environment requirements.
- Provided support for kinetic energy, directed energy, survivability and sensor technology.
- Provided integration support for SDIO data centers.
- Supported analysis and system engineering to the Initial Deployment System.
- Provided analysis, system engineering, and development of the ARCCC at the ARC and NTF, in support of BM/C^3.
- Provided analysis and system engineering of the Terrestrial Communication Network in support of $Comm^3$ activities.
- Upgraded super computing processing, memory, and storage to meet user requirements.
- Installed large high speed archival/retrieval system.
- Provide responsive support to the National Test Bed (NTB) user requirements.

FY1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: 0603215C
PE Title: Limited Defense System

Project Number: 3306
Budget Activity: 03
Strategic Programs
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- o Complete installation/integration of EADTB into ARC.
- o Support the development and integration of the limited deployment system for strategic defense.
- o Provide a development and test environment for GBEs.
- o Support upgrade of Kinetic Energy Emulation and test capability.
- o Provide distributed access to element test environments within the ARC/SC.
- o Upgrade secure network to meet user requirements.
- o Provide user support for the STB.
- o Support the integrated system test capability of the NTB.
- o Support access and requirements for integration of SDIO data centers.
- o Complete data evaluation and visualization capabilities for GBE.
- o Provide test bed facilities and support technology development.
- o Support GBR model development, testing and verification.
- o Provide analysis, test, demonstration support for ground Based Interceptor (GBI) Milestone II decision.
- o Operate and maintain EADTB and provide limited support to TMD systems integration/testing.
- o Limited participation in geographically distributed experiments.
- o Provide experimentation support to USASSDC.

Program Plan to Completion: This is a continuing program.

D. WORK PERFORMED BY: The ARC/SC is presently operated and maintained by COLSA, Corporation.

E. COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. TECHNICAL CHANGES: ARC/SC user requirements have increased for verification and validation of TMD and NMD system software, signal, and data processing components, and modeling and simulation test bed services. The current ARC/SC user base exceeds 1500 analysts and engineers representing over 150 contracted efforts. The ARC/SC support is negotiated as GFE to the contractors utilizing these resources. The projected requirements for FY94 exceeds 2000 users representing approximately 200 different contracts. The growth is primarily in the TMD area which represents increased use of the EADTB and the TMD Analysis Center. The following areas required increased support at the ARC/SC: EADTB; TMD Analysis Center; ISTC; GBR Test Facility; GBI Evaluation and Analysis; and Missile Defense Data Center.

2. SCHEDULE CHANGES: Scheduling changes have delayed some milestones for SDIO systems but have intensified the requirements for the ARC/SC to support simulations and emulations during the concept development and demonstration/validation stages. The reduced number of flights and live tests are requiring more laboratory testing. New simulations and emulations are being developed by programs to maximize use of the data generated from the limited number of tests.

Program Element: 0603215C
PE Title: Limited Defense System

Project Number: 3306
Budget Activity: 03
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3. COST CHANGES: Due to FY 1993 budget reductions, the ARC/SC was not able to complete needed upgrades. The continued reduced budget in FY 1994 eliminates any ability to accomplish these upgrades for another year, resulting in facilities lagging the technology and performance requirements.

The proposed budget allocation for FY 1994 results in modifications to the FY 1994 plans for the ARC/SC. Support of technology integration and demonstrations will be severely limited. Support of the EADTB, the major TMD test facility, will be constrained. Support of life-cycle software support planning will be eliminated. The ARC/SC will not be able to provide a multi-level secure operation. Resources required for participation in distributed experiments will be constrained to the point that the effectiveness and strategic defense representation accuracy in performing integrated experiments and exercises will be severely limited.

F. PROGRAM DOCUMENTATION:

G. RELATED ACTIVITIES:

o	1101	Optical Sensors	PE No. 0603215C/
o	1104	Signal Processing	PE No. 0603215C
o	1105	Discrimination	PE No. 0603215C
o	1106	MSX Data Analysis	PE No. 0603216C/
o	1202	Exo Projectile Integration	PE No. 0603215C/
o	2103	GSTS	PE No. 0603215C
o	2104	GBR	PE No. 0603215C
o	2202	GBI	PE No. 0603215C
o	2203	HEDI	PE No. 0603215C
o	2208	ERINT	PE No. 0603216C
o	2210	THAAD	PE No. 0603216C
o	2300	CCE	PE No. 0603215C
o	2304	DCDS	PE No. 0603215C/
o	3202	Mission Analysis Supt	
o	3104	ILS	PE No. 0603215C
o	3111	Surveillance Engineering	PE No. 0603215C
o	3211	C4I	PE No. 0603216C
o	3213	Active Defense Analysis	PE No. 0603216C
o	3301	Data Center	PE No. 0603218C
o	3302	NTB	PE No. 0603218C
o	3305	Theater Test Beds	PE No. 0603216C
o	3309	ISTC	PE No. 0603215C
o	3312	STE Support	PE No. 0603218C

There is no unnecessary duplication of effort within SDIO or the DoD.

H. OTHER APPROPRIATION FUNDS: None

I. INTERNATIONAL COOPERATIVE AGREEMENTS: None

J. MILESTONE SCHEDULE:

FY1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: 0603215C
PE Title: Limited Defense System

Project Number: 3306
Budget Activity: 03
Strategic Programs
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- o Surveillance Test Bed (STB) IOC
- o Experiment Opns Ctr (EOC) - USAKA
- o ISTC 4 Node Build 0 Configuration
- o ARC/Kwajalein Comm Link for SIT
- o BM/C^3 Test Bed Mods IOC
- o Kinetic Energy Digital Emulation Ctr FOC
- o SIT Mission Support
- o STB FOC
- o Ground Base Radar (GBR) Test Facility
- o SIT Mission Support
- o Support CTN Design, Acq, Integ and Test
- o BM/C^3 Test Bed Mods FOC
- o GBR Test Facility FOC
- o EOC WSMR Kwaj Edwards links
- o EOC SDC Video Western/Eastern Test Range
- o Evaluate advanced high speed computers
- o Evaluate distributed experimentation with HWIL
- o Complete evaluation of high resolution visualization support components
- o Evaluate large high speed data archival/retrieval systems
- o Complete evaluation of NMD HWIL components
- o Evaluate weapons system support system
- o Complete evaluation of high speed real time ground processor
- o Evaluate surveillance sensor evaluation system

FY1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: 0603215C
PE Title: Limited Defense System

Project Number: 3307
Budget Activity: 03
Strategic Programs
April 1993

A. RESOURCES: ($ in Thousands)
Project Title: Airborne Surveillance Testbed (AST)

Program Name:	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	Total Program
LDS DEM/VAL	38,314	37,830	24,418	Continuing

B. BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

The Airborne Optical Adjunct (AOA) program was reconfigured to use the AOA as an Airborne Surveillance Testbed (AST) to conduct experiments that support SDI issue resolution throughout all phases of a ballistic missile trajectory. The AST program provides for the design, fabrication, integration, and operation of an advanced infrared (IR) sensor. The IR sensor, together with the data processing, display control, communications, and ancillary equipment, is installed on a modified Boeing 767 commercial aircraft. The AST sensor system is the most complex system of its kind ever built. It fulfills the demands for accurate and reliable performance and gathers data critical to SDIO. It collects multi-target signatures, verifies sensor technical and functional requirements, and validates signal and data processing techniques and algorithms. The major issues to be addressed by the AST are bulk filtering, track, sensor-to-sensor correlation, resolution of closely spaced objects, discrimination, handover to other sensors, and signal and data processing requirements for IR sensor performance. The AST provides a design and performance data base for on-going as well as future programs in the areas of optical sensor and signal processor design, system performance and operation of IR sensors, real-time on-board signal and data processing, performance of an integrated IR sensor system, and target signatures. The operation of the AST sensor system provides information essential for risk reduction and effective design of future optical surveillance systems. Initially, the AST subsystems were tested at ground facilities. After integration on the aircraft, the integrated system was tested in flights over the Continental United States (CONUS). Currently, the AST is being used in support of SDIO flight experiments to collect key optical discrimination data and perform functional demonstrations for resolution of critical technical and operational issues. The tests/experiments are being conducted at United States Army Kwajalein Atoll (USAKA), WSMR, ETR, other national test ranges, and other locations.

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

- Supported Red Tigress 1B Mission
- Supported GT146GM Mission
- Supported ERIS FTV-2b Mission
- Supported ERIS FTV-2c Mission
- Supported Firebird 1B Mission
- Supported CDX Mission
- Supported GT148GB Mission
- Support DT-2 Mission

Program Element: 0603215C
PE Title: Limited Defense System

Project Number: 3307
Budget Activity: 03
Strategic Programs
April 1993

- o Support TCMP-1B Mission
- o Support TCMP-1A Mission
- o Anticipate 2 additional AST Missions (funding limited; 5 tests have requested AST support): supporting characterization of unique NMD and TMD penaids, and IR bulk filtering and discrimination algorithm development.
- o Continue flight experiments collecting critical data on countermeasures. (First quarter only; succeeding quarters require additional funding.)
- o Demonstrate critical NMD optical sensor and system functions. (First quarter only; succeeding quarters require additional funding.)
- o Continue flight experiments in support of element discrimination algorithms. (First quarter only; succeeding quarters require additional funding.)

Program Plan to Completion: This is a continuing program.

D. WORK PERFORMED BY:

- o Boeing Aerospace Company
- o Boeing Commercial Airplane Company
- o Honeywell
- o Hughes Aircraft Company

E. COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. TECHNICAL CHANGES: None
2. SCHEDULE CHANGES: Flight test/experiment launch date changes result in revised AST mission dates and increased cost.
3. COST CHANGES: Lowered funding level reduces number of missions supported.

F. PROGRAM DOCUMENTATION:

G. RELATED ACTIVITIES:

o	1105	Discrimination Technology	PE No. 0603215C
o	1106	Sensor Studies & Experiments	PE No. 0603215C
o	2102	Brilliant Eyes (BE) Experiments	PE No. 0603215C
o	2202	Ground Based Interceptor (GBI)	PE No. 0603215C
o	3111	Surveillance Engineering	PE No. 0603215C
o	3301	Test Data Center	PE No. 0603215C
o	3304	Targets	PE No. 0603215C

There is no unnecessary duplication of effort within SDIO or the DoD.

H. OTHER APPROPRIATION FUNDS: None.

I. INTERNATIONAL COOPERATIVE AGREEMENTS: None.

Program Element: 0603215C
PE Title: Limited Defense System

Project Number: 3307
Budget Activity: 03
Strategic Programs
April 1993

J. MILESTONE SCHEDULE:

- Support Brilliant Pebbles (BP)-TD (completed)
- Support AST Dedicated Target (DT)-2 (completed)
- Support TMD Countermeasure Mitigation Program (TCMP)-1A (completed)
- Support TCMP-1B (completed)
- Support STARS M-1
- Support Firebird -2A
- Pending Support Red Tigress-2A
- Pending Support Red Tigress-2B
- Pending Support Target Development Test (TDT)-1
- Pending Support DT-2A
- Pending Support Firebird-2B
- Pending Support Red Tigress-3
- Pending Support ODES Demonstration Flight
- Pending Support Midcourse Space Experiment (MSX) Target Launch-5

FY1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: 0603215C
PE Title: Limited Defense System

Project Number: 3308
Budget Activity: 03
Strategic Programs
April 1993

A. RESOURCES: ($ in Thousands)
Project Title: System Simulations

Program Name:	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	Total Program
LDS DEM/VAL	10,123	7,398	5,458	Continuing

B. BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

The System Simulators are being developed to provide end-to-end analysis capabilities that are based on current Global Protection Against Limited Strikes (GPALS) architectural concepts and are traceable to the top level system requirements. System Simulators will be a high fidelity design with specific representation of the system while retaining some architectural configuration flexibility. System Simulators are a critical exercise in the engineering and integration of the system and its interfaces, in that the System Simulators development spans multiple development agencies and will precede the availability of hardware components and subsystems by years. The cognizant services and Element Program Offices are directly responsible for the development of their models, which will then be integrated into a common simulation framework at the National Test Facility. System Simulators as analysis tools are expected to play a crucial role in the formal testing of the system.

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

- Completed the development of System Simulator Build 1.0 element models and delivered them to the National Test Facility for integration with the System Simulator Framework.
- Initiated the next System Simulator Build 2.0 program that will focus on modeling GPALS as designed.
- Developed requirements for the System Simulator Build 2.0 (NMD/FSS) in support of GPALS architectures.
- Initiated requirements development for System Simulator Build 2.0 (GPALS) to include interfaces for TMD.
- Complete integration and test activities of System Simulator Build 1.0 at the National Test Facility.
- Develop, integrate, and test System Simulator Build 2.0 (NMD/FSS) to support system level analysis prior to system PDR.
- Complete requirements development for System Simulator Build 2.0 (GPALS) with preliminary GPALS capabilities.
- Continue to upgrade system simulators in support of evolving GPALS analyses requirements.
- Commence User Training by NTF using Build 1.0.
- There will be a continuing requirement to reflect the evolving GPALS design into the system simulators. It is anticipated that there will be a recurring development cycle following each major system requirement/design review to update simulator requirements across the various elements, upgrade the element models accordingly, integrate the new models into the simulation framework, conduct required

regression/acceptance testing, and finally, certify the new release for its intended use.

- Additionally, during this period, the service executing agent will be required to provide software life cycle maintenance support and configuration management for their respective element models.

Program Plan to Completion: This is a continuing program.

D. WORK PERFORMED BY:

- Strategic Defense Initiative Organization
- United States Army Strategic Defense Command
- United States Air Force Space Systems Division
- National Test Facility (NTF)

E. COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. TECHNICAL CHANGES: None
2. SCHEDULE CHANGES: L2SS (NMD/FSS) 3Q/FY93 to 4Q/FY93. L2SS (GPALS) 2Q/FY94 to 4Q/FY94
3. COST CHANGES: SDIO funding is 30% less than planned for FY 1993.

F. PROGRAM DOCUMENTATION:

G. RELATED ACTIVITIES:

o	1501	Survivability	PE No. 0603218C
o	2104	GBR	PE No. 0603214C
o	2300	C^2E	PE No. 0603214C
o	2304	Software Engineering	PE No. 0603215C
o	3102	Engineering and Integration	PE No. 0603215C
o	3108	Operational Environment	PE No. 0603215C
o	3110	Survivability Engineering	PE No. 0603215C
o	3111	Surveillance Engineering	PE No. 0603215C
o	3112	System Engineering Support	PE No. 0603215C
o	3302	System Test Environment	PE No. 0603218C
o	3306	Advance Research Center	PE No. 0603218C
o	4201	Systems Engineering Management	PE No. 0603215C

There is no unnecessary duplication of effort within SDIO or the DoD.

H. OTHER APPROPRIATION FUNDS: None.

I. INTERNATIONAL COOPERATIVE AGREEMENTS: None.

J. MILESTONE SCHEDULE:

- System Simulator Build 1.0
- System Simulator Build 2.0 (NMD/FSS)
- System Simulator Build 2.0 (Initial GPALS)
- System Simulator Build 2.0 (GPALS)
- System Simulator Build 3.0

Program Element: 0603215C
PE Title: Limited Defense System

Project Number: 3309
Budget Activity: 03
Strategic Programs
April 1993

A. RESOURCES: ($ in Thousands)
Project Title: System Test Planning and Execution

Program Name:	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	Total Program
LDS DEM/VAL	24,419	31,215	35,069	Continuing

B. BRIEF DESCRIPTION OF MISSION REQUIREMENTS AND SYSTEM CAPABILITIES:

The objective of this project is to provide "system-level" test planning and execution for development testing (DT) for the BMD system and its system-level segments. Element development test and evaluation (DT&E), however, remains the responsibility of the element program manager as does element interface testing. This project supports both the SDIO and Service system-level planning for DT. This project previously supported Operational Test (OT) planning, but OT support in FY94 and beyond is now funded by Project 3314.

System-level testing will consist of four related efforts in DEMVAL: 1) Extraction and augmentation of system data from element DT contractor and government tests to meet system test objectives as defined in the System Test Plan; 2) Development of a test network to support inter-element/MDAP live flight integration and System Integration Tests (SIT); 3) Completion of system wide BMD emulations in a real-time Integrated System Test Capability (ISTC); and 4) Development of a representative system test site at KMR. DEMVAL system test planning also includes planning for the tests in the BMD Engineering and Manufacturing Development (EMD) phase in sufficient detail to define the resources and provide those top-level test plans to support the Milestone reviews and to scope the EMD Statements of Work.

When SDIO-sponsored system-level tests are performed concurrently with element and inter-element tests to collect system data or satisfy "system" test objectives, this project will fund the system-level incremental delta analysis and evaluation over and above the basic element test costs. Certain tasks are related but not included; i.e., Service element DT. Further, Allied tests are not included.

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

- Initiated documentation of the ISTC requirements and development plans.
- Procured and installed hardware for four real-time element emulations, global environment, and test and control to support ISTC proof of principle (POP) demonstrations.
- Began development of software for four element ISTC nodes, global environment, and test and control to support the ISTC POP.
- Prepared for demonstration of an ISTC POP two-node system.
- Began the ISTC Verification, Validation and Accreditation (VV&A) Program for ISTC.
- Established SIT data communication lines with KMP.

Program Element: 0603215C
PE Title: Limited Defense System

Project Number: 3309
Budget Activity: 03
Strategic Programs
April 1993

- Conducted SIT 1 Phase I which collected FTV-2 data for SIT 1 Phase II playback.
- Conducted DT planning for Integration flight data collection exercises.
- Began Technical Independent Evaluation planning for events in the STP.
- Begin definition of the ISTC design.
- Demonstrate ISTC Proof of Principle at the ARC and NTF.
- Begin software development of the ISTC Framework, including global environment, test and control.
- Establish test communications infrastructure to support near-term LFIEs and SITs.
- Conduct SIT 1 Phase III--Live Flight Integration Exercise-DT2 (LFIE-DT2).
- Define interfaces between global environment and GBI, GBR, and BM/c3 nodes.
- Complete a major revision of the System Test Plan.
- Demonstrate ISTC TMD interconnect Proof of Principle.
- Complete initial ISTC VV&A planning.
- Conduct DT planning for integration exercises and SITs.
- Collect data from events included in the System Test Plan.
- Conduct Technical Independent Evaluation of selected STP/ISTC events.
- Conduct SIT-1 Phase II (data playback/HWIL).
- Complete update of the GPALS System/BMC3 Capstone Test and Evaluation Master Plan (TEMP).
- Conduct DT planning for IE and SITs to be conducted.
- Conduct planning for system events included in the System Test Plan.
- Collect data from system test events in the System Test Plan.
- Conduct Technical Independent Evaluation of selected STP/ISTC events.

Plan to Completion: This is a continuing program.

D. WORK PERFORMED BY:

- USASSDC, ANMDPO, ATMDPO
- AF/SMC
- NTB/NTF
- POET, FFRDCs
- AFOTEC
- USA OPTEC

E. COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. TECHNICAL CHANGES: Minimal
2. SCHEDULE CHANGES: System Test Planning and Execution schedule revised to reflect support for adjusted acquisition programs.
3. COST CHANGES: Reduction in cost results from schedule stretch-out.

F. PROGRAM DOCUMENTATION:

Program Element: 0603215C
PE Title: Limited Defense System

Project Number: 3309
Budget Activity: 03
Strategic Programs
April 1993

G. RELATED ACTIVITIES:

o 2102 BE	PE No. 0603215C
o 2103 GSTS	PE No. 0603215C
o 2104 GBR	PE No. 0603215C
o 2202 GBI	PE No. 0603215C
o 2300 Command Center	PE No. 0603215C
o Theater Missile Defenses	PE No. 0603216C
o Limited Defense System	PE No. 0603215C
o Space-Based Interceptors	PE No. 0603214C
o Other Follow-On Systems	PE No. 0603217C
o Research & Support Activities	PE No. 0603218C

There is no unnecessary duplication of effort within SDIO or the DoD.

H. OTHER APPROPRIATION FUNDS: None

I. INTERNATIONAL COOPERATIVE AGREEMENTS: None

J. MILESTONE SCHEDULE:

- o BMD TEMP Publication
- o System Test Plan Update
- o ISTC Requirements Inputs
- o SIT 1 Phase III (LFIE-DT2)
- o ISTC Proof of Principle (POP) at ARC
- o SIT 1 Phase II (Replay/HWIL)
- o SIT 1 Phase IV (LFIE-TDT1)
- o ISTC POP at NTF
- o ISTC POP for TMD Interconnect at NTF
- o LFIE-DT2A
- o ISTC Delivery of Global Framework 1

FY1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: 0603215C
PE Title: Limited Defense System

Project Number: 3310
Budget Activity: 03
Strategic Programs
April 1993

A. RESOURCES ($ in Thousands)
Project Title Test & Evaluation Facilities

Program Name:	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	Total Program
LDS DEM/VAL	0	25,370	19,534	Continuing
R&S DEM/VAL	42,426	0	0	Continuing

B. BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

This task provides for overall coordination of centrally managed test facilities throughout the SDI Program and, as such, is funded across several Program Elements.

This objective of this project is to provide adequate, common-user test and evaluation (T&E) facilities to enable SDIO test and experiment programs to meet their objectives. Prudent consolidation can enhance efficiency and economy while satisfying user requirements. Facilities requirements will be satisfied using existing resources whenever possible. New and upgraded facilities will only be pursued when no existing capability will meet basic requirements. This project includes the following facilities: the Center for Research Support (CERES), Kinetic Energy Digital Emulation Center (KDEC), Aero-Optical Evaluation Center (AOEC), National Hover Test Facility (NHTF), and Kinetic Kill Vehicle Hardware-in-the-Loop (KHILS), the Tunnel 9 Facility, and a BAA to explore foreign test technologies and capabilities.

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

- o CERES: Provided research support at the NTF to test and experiment programs (e.g., payload support of orbital flight tests), focusing on design and implementation of CSTC communication links, telemetry/tracking and commanding systems, data recording, experiment support tools, and facility work space configuration.
- o KDEC: Provided flight predictions for LEAP Hover Tests. Provided an archive and information retrieval system for data, models and simulations associated with KEW development and production. Provided LEAP flight test simulations and support to the SEEDD program and the A-HIT hover test simulation.
- o AOEC: Development of high temperature, high pressure operation of LENS shock tunnel to support aero-optic testing of BAA seekers.
- o NHTF: Provided an indoor, inexpensive, repeatable test capability to demonstrate and validate the propulsion of integrated kinetic energy interceptor configurations. Performed LEAP hover tests.
- o KHILS: Development of high performance infrared (IR) scene generation system to support integrated interceptor hardware-in-the-loop testing. Performed hardware-in-the-loop tests for SEEDD and ULTRASEEK programs.
- o CERES: Continue development of initial operational telemetry, tracking and control capability. Verification of facility to occur

during MSTI 2 flight experiment. Continue to provide research support at the NTF to test and experimental programs.

- o KDEC: Provide analysis support for LEAP, TMD and NMD. FOC for 6 DOF simulations for endo and exoatmospheric interceptors complete.
- o AOEC: Conduct facility calibration and aero-optic instrumentation verification. Perform testing of BAA Seeker Head concepts.
- o NHTF: Perform hover tests to support LEAP, solid and liquid propulsion, and other technology programs.
- o KHILS: Development of advanced scene generation and projection system to include broadband spectrum and the inclusion of aero-optic effects. Perform tests to support ENDO-LEAP, MSTI, SIT and INETS programs.
- o TUNNEL 9: Develop shroud removal analysis to support shroud technology. Development of full flight aerothermal heat soak capability for endointerceptor technology development.
- o BAA announcement released. Evaluations complete. Initial funding for test technology proof-of-concept demonstrations.
- o CERES: Development to full telemetry, tracking and control to perform mission operations during DT&E and combined DT/OT.
- o KDEC: Perform NMD and Endo-LEAP interceptor 6 DOF simulations.
- o AOEC: Endo-Leap seeker head testing.
- o NHTF: Perform hover tests to support Endo-LEAP, and BP. Incorporate captive carry test capability to augment hover testing.
- o KHILS: Complete advanced wideband scene generation and projection capability. Support hardware-in-the-loop tests for NMD, BP, Endo-Leap, SIT and ISTC.
- o TUNNEL 9: Perform shroud removal tests for Endo-LEAP.
- o Continue BAA proof-of-concept demonstrations.

Program Plan to Completion: This is a continuing program.

D. WORK PERFORMED BY:

- o US Army Space and Strategic Defense Command
- o National Test Facility
- o Calspan/ University of Buffalo Research Center (CUBRC)
- o Air Force Space Mission Center
- o Wright Labs
- o Phillips Labs
- o Naval Surface Warfare Center, Dahlgren Division

E. COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. TECHNICAL CHANGES: None.
2. SCHEDULE CHANGES: None.
3. COST CHANGES: Cost reflects reduction in LDS activities. TMD is increasing their funding line as their activities are increasing in 3310 for FY94.

F. PROGRAM DOCUMENTATION:

Program Element: 0603215C
PE Title: Limited Defense System

Project Number: 3310
Budget Activity: 03
Strategic Programs
April 1993

G. RELATED ACTIVITIES:

o	1106	Sensors Studies and Exp/MSX	PE No. 0603215C
o	1202	LEAP	PE No. 0603217C
o	1202	Endo-LEAP	PE No. 0603215C
o	1208	Intercept Active Disk Tech	PE No. 0603215C
o	1209	Endo Technology	PE No. 0603215C
o	1211	Interceptor/Facilities	PE No. 0603215C
o	1501	Surv Tech Prog Support	PE No. 0603215C
o	1502	Lethality & Tgt Hardening	PE No. 0603217C
o	2102	Brilliant Eyes	PE No. 0603214C
o	2104	GBR	PE No. 0603215C
o	2202	GBI	PE No. 0603215C
o	2205	Brilliant Pebbles	PE No. 0603214C
o	3103	SDI Metrology	PE No. 0603215C
o	3107	Environ, Siting & Facilities	PE No. 0603218C
o	3301	Test Data Centers	PE No. 0603215/17C
o	3303	T&E Planning	PE No. 0603215C
o	3304	Test Facilities/Targets	PE No. 0603214/15C
o	3309	System Test Planning/Exec	PE No. 0603215C
o	3311	Mobile Test Assets	PE No. 0603215/17C
o	3313	Test Ranges	PE No. 0603215C

There is no unnecessary duplication of effort within SDIO or the DoD.

H. OTHER APPROPRIATION FUNDS: None

I. INTERNATIONAL COOPERATIVE AGREEMENTS: None

J. MILESTONE SCHEDULE:

- o NHTF LEAP testing
- o KDEC LEAP support
- o BAA Release
- o AOEC Facility Calibration Complete
- o BAA evaluations complete. Initial funding for proof demos
- o CERES Phase 1 IOC. Support MSTI-2 Flight
- o AOEC Endo-LEAP testing
- o KDEC FOC
- o Endo-Leap DT testing
- o CERES Support for MSTI
- o Tunnel 9 Flight Dup Upgrade IOC
- o KHILS FOC Broad band scene generation
- o GBI DT Testing
- o BP Flight Experiments
- o BE Flight Experiments

FY1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: 0603215C/0603217C
PE Title: Limited Defense System/ Follow-On Technologies

Project Number: 3311
Budget Activity: 02/03 Advanced Technology Development/Strategic Programs
April 1993

A. RESOURCES: ($ in Thousands)
Project Title: Mobile Test Assets

Program Name:	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	Total Program
LDS DEM/VAL	0	16,410	0	Continuing
FOT DEM/VAL	0	850	0	Continuing
R&S DEM/VAL	12,439	0	0	Continuing

B. BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

This task provides for overall coordination of test mobile assets throughout the SDI Program and, as such, is funded across several Program Elements.

This project allocates resources to develop, operate, maintain, and upgrade SDIO mobile test assets. SDIO test and technology experiment programs require adequate test resources, ranges, monitoring and data collection to accomplish their test objectives. When existing ranges/launch locations and fixed facilities do not have sufficient capability to support SDIO test and experiment requirements, mobile assets will be programmed consistent with overall T&E requirements. This project currently supports the range support ship, USNS *Redstone* and High Altitude Observatory (HALO). In subsequent years the plan is to consolidate other common user mobile test assets under this project. The USNS *Redstone* and her electronic system, the M247 Flight Test Support System, were specifically designed and developed by the Navy Strategic Systems Program. It will be used to perform the range support mission for SDIO where Wake Island serves as the target launch location. Wake Island has not traditionally been used as a range asset and is not equipped for this mission. HALO is a Gulfstream III B aircraft which has the ability to fly at very high altitudes. HALO is outfitted with many sensors designed to record tests such as missile reentries, booster launches, and experiments in earth orbit.

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

- Provide flight test support, range safety and data collection for interceptor technology programs at Wake Island with the USNS *Redstone*.
- Provide flight test support, range safety and data collection for BP Target Demonstration, LEAP, and COMET target flights.
- Provide flight test support, range safety, and data collection for interceptor tests.

Program Plan to Completion: This is a continuing program.

D. WORK PERFORMED BY:

Program Element: 0603215C/0603217C
PE Title: Limited Defense System/
Follow-On Technologies

Project Number: 3311
Budget Activity: 02/03
Advanced Technology
Development/Strategic
Programs
April 1993

- o U.S. Army Strategic Defense Command
- o Strategic Systems Program, Department of the Navy
- o 45th Space Wing, Department of the Air Force

E. COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. TECHNICAL CHANGES: None
2. SCHEDULE CHANGES: None
3. COST CHANGES: None

F. PROGRAM DOCUMENTATION:

G. RELATED ACTIVITIES:

- o 1701 Launch Services — PE No. 0603217C
- o 3304 Targets — PE No. 0603218C
- o 3310 T&E Facilities — PE No. 0603218C

There is no unnecessary duplication of effort within SDIO or the DoD.

H. OTHER APPROPRIATION FUNDS: None

I. INTERNATIONAL COOPERATIVE AGREEMENTS: None

J. MILESTONE SCHEDULE:

- o Memorandum of Agreement signed
- o Compatibility Test
- o Arrival Wake Island
- o System Checkout
- o BP Demonstration
- o LEAP Flights
- o COMET Flights
- o Target Demos
- o GBI
- o GBR

Program Element: 0603215C
PE Title: Limited Defense System

Project Number: 3312
Budget Activity: 03
Strategic Programs
April 1993

A. RESOURCES: ($ in Thousands)
Project Title: System Test Environment Support

Program Name:	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	Total Program
LDS DEM/VAL	0	7,421	4,884	Continuing
R&S DEM/VAL	12,142	0	0	Continuing

B. BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

The System Test Environment Support project provides a critically needed capability to the SDI community in time sensitive special studies and analyses, dealing with Strategic Defense System (SDS) architectures, elements, technologies, interfaces, strategies, testing, and modeling and simulation (M&S). Programs include: Quick Reaction Studies (QRSs), Analytical Tool Box (ATB), advanced software and hardware initiatives, SDS architectural analysis, and improved security for the NTB Network (NTBN). The ATB is an institutionalized set of models used by test community to support their decision making processes. The advanced hardware and software initiatives support near-term requirements in Software Environment, Technology Insertion, Networking, and Simulation Techniques. NTBN security improvements include NTF communications center upgrades (Project Blue Light) and enhancement of current network capabilities to support multi-level security (MLS) (Project Excalibur).

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

- o Performed SDS time critical studies and analyses in support of the SDIO Community.
- o Developed and performed confidence assessment on ATB Model Set.
- o Developed methodology and tools for specification generation, verification, validation and accreditation.
- o Designed multi-level secure NTB network.
- o Designed and implemented NTBSIM V1.5.
- o Supported BPSIM development.
- o Completed framework methodology study.
- o Continue analytical modeling and simulation support for SDS development.
- o Conduct ATB confidence assessments of models and simulations used to support the SDIO decision making process.
- o Investigate methodologies for the parallelization of computer codes.
- o Analyze speedup techniques for computer architecture enhancements.
- o Begin NTB software engineering activities to support SDIO programs.
- o Develop time critical, special, or quick turn around analytical studies to support element, segment, and system level efforts.
- o Support U.S. Space Command's Ballistic Missile Defense Concept of Operations development, at the Command and Control Gaming Center, through the preparation of and enhancement to the gaming software and war game conduct.
- o Develop a modular, generic simulation framework concept to support architecture development and system evolution.

Program Element: 0603215C
PE Title: Limited Defense System

Project Number: 3312
Budget Activity: 03
Strategic Programs
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- Conduct studies and analyses of SDIO architectural issues related to systems, and element related performance.
- NTF Communications Center upgrades through Project Blue Light.
- Continue to support development and operation/support of the ATB
- Continue MLS development through Project Excalibur.
- Import low risk, near-term technological advances into the NTB network.
- Provide NTB system engineering and integration for Test and Evaluation (T&E) support capability development, system T&E support requirements analysis, and system T&E support plans and implementation.
- Provide leakage analysis of the GPALS System, with greater emphasis placed on integrating ground and flight test data.
- Support SDIO Software Engineering activities and enhance NTF and NTB Software Engineering capabilities.

Program Plan to Completion: This is a continuing program.

D. WORK PERFORMED BY:

- Martin Marietta
- National Test Bed Joint Program Office (NTBJPO)
- Colsa, Inc
- Naval Research Laboratory
- Los Alamos National Laboratory
- Teledyne Brown Engineering
- Nichols Research
- Vanguard Research

E. COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. TECHNICAL CHANGES: None
2. SCHEDULE CHANGES: Slippage is anticipated in IOCs and other deliverables commensurate with overall programmatic funding reductions.
3. COST CHANGES: Funding shortfalls resulted in a significant reduction in NTB support for systems engineering, analytical studies and technical application for SDS Element-, Segment-, and System-level architectural analysis to support the SDIO community and NMD development.

F. PROGRAM DOCUMENTATION:

G. RELATED ACTIVITIES:

3112	Sys Engr Support	PE No. 0603215C
3205	TMD Studies	PE No. 0603216C
3206	System Threat	PE No. 0603218C
3207	Arch Integration	PE No. 0603214C
3301	Data Center	PE No. 0603218C
3302	National Test Bed	PE No. 0603218C

Program Element: 0603215C
PE Title: Limited Defense System

Project Number: 3312
Budget Activity: 03
Strategic Programs
April 1993

- o 3305 Theater Test Bed — PE No. 0603216C
- o 3306 CREO — PE No. 0603218C
- o 3308 Systems Simulator — PE No. 0603214C
- o 3309 System Test/Plan — PE No. 0603214C
- o 3310 Test Facilities — PE No. 0603218C

There is no unnecessary duplication of effort within SDIO or the DoD.

H. OTHER APPROPRIATION FUNDS: None

I. INTERNATIONAL COOPERATIVE AGREEMENTS: None

J. MILESTONE SCHEDULE:

- o Ongoing Quick Reaction Studies
- o Commence Project Blue Light upgrades
- o NTB Framework Methodology Study
- o Analytical Tool Box Initial Operational Capability
- o AIS Review (QRS)
- o Migrate Analytical Tool Box databases
- o Complete Project Blue Light Testing
- o GPALS Mission Performance Evaluation
- o Theater Missile Defense
- o Insert VV&A into Analytical Tool Box Services
- o Tactical Warning/SDS Sensors Simulators
- o System Integration Testing Analysis
- o NMD/TMD Interface Study
- o ATB Model Interfaces
- o Project Excalibur design documentation

FY 1994-95 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: 0603215C
PE Title: Limited Defense System

Project Number: 3313
Budget Activity: 03
Strategic Programs
April 1993

A. RESOURCES ($ in Thousands)
Project Title Test Ranges

Program Name:	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	Total Program
LDS DEM/VAL	0	19,995	14,651	Continuing

B. BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

This task provides for overall coordination of centrally managed test range support throughout the SDI Program and, as such, is funded across several Program Elements.

This objective of this project is to provide adequate, common-user test and evaluation (T&E) ranges to enable SDIO test and experiment programs to meet their objectives. This is the first year these projects are consolidated for management purposes; the plan is to further consolidate management for other multi-user ranges in future years. Prudent consolidation can enhance efficiency and economy while satisfying user requirements. Range requirements will be satisfied using existing resources whenever possible. New and upgraded ranges will only be pursued when no existing capability will meet basic requirements. This project includes the following ranges: WSMR, USAKA, Wake Island, ESMC LC-20, Rapid Optical Beam Steering (ROBS) support, Millstone Hill, Range Instrumentation.

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

- USAKA operations and maintenance: Provided test infrastructure support to include range instrumentation upgrades, power station, fire station, security, inter-island transportation and maintenance of facilities to meet planned flight test requirements.
- WSMR operations: Provided test infrastructure support for SDIO interceptor technology programs.
- Space Launch Complex 20, ETR: Provided site management, administration and technical support to users for SLC 20 activities supporting SDIO.
- MILLSTONE HILL: Provide SDIO representative for flight test planning, execution and reporting for Millstone Hill support of SDIO tests and experiments originating at Wallops Island and ESMC.
- WAKE ISLAND: Provide overall launch services management for targets supporting SDIO flight experiments. Provide test infrastructure support including communication, security CCTV, photography and instrumentation interfaces.
- USAKA: Provide test infrastructure support to include range instrumentation upgrades, power station, fire station, security, inter-island transportation and maintenance or facilities to meet planned flight test requirements.
- WSMR: Provide test infrastructure support for SDIO interceptor technology programs.

Program Element: 0603215C
PE Title: Limited Defense System

Project Number: 3313
Budget Activity: 03
Strategic Programs
April 1993

- Space Launch Complex 20, ETR: Provide site management, administration and technical support to users for SLC-20 activities supporting SDIO.
- Millstone Hill: Provide tracking/discrimination support for ETR launches.
- WSMR: Improve communications system (secure and non-secure). Improve multi-object tracking capability. Install real-time data/graphics displays to support new tests. Support LENS test(s).
- USAKA: Upgrade telemetry system and recording capability. Improve range safety system for high-dynamic interceptors. Expand communications to accommodate more complex tests. Upgrade to radar system (ALCOR, etc.), Global Positioning System.
- Wake Island: Preparation for GBI, LEAP, MSX, and VIP tests. Install range safety system.
- ETR: Support ACTEX, HTSSE 1&2, and SPAS III
- ROBS: Upgrade and conduct range demonstration.

Program Plan to Completion: This is a continuing program.

D. WORK PERFORMED BY:

- US Army Strategic Defense Command
- MIT Lincoln Laboratory
- White Sands Missile Range

E. COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. TECHNICAL CHANGES: None
2. SCHEDULE CHANGES: None
3. COST CHANGES: None

F. PROGRAM DOCUMENTATION:

G. RELATED ACTIVITIES:

o	1701 Launch Services	PE No. 0603217C
o	2104 GBR	PE No. 0603215C
o	2202 GBI	PE No. 0603215C
o	2207 Patriot	PE No. 0603216C
o	2208 ERINT	PE No. 0603216C
o	2210 THAAD	PE No. 0603216C
o	2212 Corps SAM	PE No. 0603216C
o	2300 Command Center	PE No. 0603215C
o	3304 Targets	PE No. 0603218C
o	3311 Mobile Test Assets	PE No. 0603218C

There is no unnecessary duplication of effort within SDIO or the DoD.

H. OTHER APPROPRIATION FUNDS: None

I. INTERNATIONAL COOPERATIVE AGREEMENTS: None

Program Element: 0603215C
PE Title: Limited Defense System

Project Number: 3313
Budget Activity: 03
Strategic Programs
April 1993

J. MILESTONE SCHEDULE:

- o AST
- o ODES
- o Dual GPS
- o MSX
- o GBR-T and NMD-GBR UOE
- o GBI
- o BE

FY 1994-95 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: 0603215C
PE Title: Limited Defense System

Project Number: 3314
Budget Activity: 03
Strategic Programs
April 1993

A. RESOURCES ($ in Thousands)
Project Title Operational Test and Evaluation

Program Name:	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	Total Program
LDS DEM/VAL	0	925	4,000	Continuing

B. BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

This project covers the activities to be performed by the operational test agencies; US Air Force (AFOTEC), US Army (OPTEC), and US Navy (OPTEVFOR) to support operational test planning and execution for the GPALS system and associated NMD MDAPS. This project includes planning for and test of associated software and actual element hardware. It also includes the integration testing of system-level configurations. Operational testing will consist of several related efforts in DEM/VAL: 1) Extraction of system OT data from element DT contractor and government tests to meet est objectives; 2) Extraction of inter-element integration test data from a series of Integration Exercises and System Integration Tests (SITs); and 3) use of a system-wide BMD simulations in real-time Integrated system Test Capability (ISTC). These agencies will support a family of operational test builds and tests as appropriate for the operational impacts and support. Ensure that test plans include test objectives, measure of effectiveness and related measures of performance to permit an assessment of the system and address critical operational issues. Participate in the development test planning to permit maximum application of DT data to support operational evaluation objectives. DEM/VAL operational test planning also includes planning for the tests in the BMD Engineering and Manufacturing Development (EMD) phase in sufficient detail to define the resources and provide those top-level test plans to support the MSII review and to scope the EMD Statements of Work. For FY93, the effort is split between projects 3309 and 3314. This transition to a separate project facilitates the independence of OT consistent with Public Law. The OT objectives include the conduct of OT&E planning, the identification of OT&E resources requirements, and the identification of ISTC and SIT objectives for OT&E.

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

- o Define operational test requirements.
- o Provide OT inputs to the BMD Test and Evaluation Master Plan (TEMP)
- o Participate in Test and Evaluation Working Groups.
- o Develop, review and comment on the test plans, and design documentation.
- o Participate in ISTC and SIT planning.
- o Insure user coordination of test activities.
- o Continue definition of operational test requirements.
- o Provide OT inputs to the BMD Test and Evaluation Master Plan (TEMP).
- o Participate in Test and Evaluation Working Groups.
- o Develop, review and comment on test plans, and design documentation.

Program Element: 0603215C
PE Title: Limited Defense System

Project Number: 3314
Budget Activity: 03
Strategic Programs
April 1993

- o Participate in ISTC including Framework 1 Assessment and SIT planning.
- o Insure user coordination of test activities.

Program Plan to Completion: This is a continuing program.

D. WORK PERFORMED BY:

- o Air Force Operational Test and Evaluation Command (AFOTEC)
- o US Army Operational Test and Evaluation Command (OPTEC)
- o US Navy Operational Test and Evaluation Force (OPTEVFOR)

E. COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. TECHNICAL CHANGES: N/A (all work was in 3309)
2. SCHEDULE CHANGES: N/A (all work was in 3309)
3. COST CHANGES: N/A (all work was in 3309)

F. PROGRAM DOCUMENTATION:

G. RELATED ACTIVITIES:

o Theater Missile Defense Initiative	PE No. 0603216C
o Space Based Interceptor	PE No. 0603214C
o Research and Support Activities	PE No. 0603218C
o 2102 BE	PE No. 0603215C
o 2104 GBR	PE No. 0603215C
o 2105 GBI	PE No. 0603215C
o 2100 Command Center	PE No. 0603215C

There is no unnecessary duplication of effort within SDIO or the DoD.

H. OTHER APPROPRIATION FUNDS: None

I. INTERNATIONAL COOPERATIVE AGREEMENTS: None

J. MILESTONE SCHEDULE:

- o BMD TEMP Publication
- o ISTC Requirements Inputs
- o SIT 1
- o ISTC Documentation
- o Plan for Events in the System Test Plan
- o Evaluate ISTC Framework for OT
- o Plan SITs
- o Plan ISTC OT Assessments
- o Define EMD SOW and Resources
- o Conduct OT Evaluation of SITs
- o Conduct OT Evaluation of ISTC
- o Early Operational Assessment for MSII

Program Elements: 0603215C/0603218C
PE Titles: Limited Defense System/
Research & Support Activities

Project Number: 4000
Budget Activity: 03
Strategic Programs
April 1993

A. RESOURCES: ($ in Thousands)
Project Title: Operational Support Costs

Program Name:	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	Total Program
LDS DEM/VAL	19,229	59,717	10,486	Continuing
SBI DEM/VAL	18,863	0	0	Continuing
FOT DEM/VAL	88	2,279	0	Continuing
R&S DEM/VAL	269,647	201,546	256,709	Continuing

B. BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

This project provides program management, system engineering, and program control support common to all other projects within these PEs. Program management tasks include SDIO and Executing Agent central management functions, including those that support the Office of the Director, Strategic Defense Initiative and his supporting staff located within the Pentagon. Typical system engineering tasks include review and analysis of technical project design, development and testing, test planning, assessment of technology maturity and technology integration across SDIO projects; and support of design reviews and technology interface meetings. Program control tasks include assessment of schedule, cost, and performance, with attendant documentation of the many related programmatic issues. This project supports funding for personnel and expenses for travel (TDY), training, rents, communications, information management, utilities, printing, reproduction, supplies, and equipment.

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

- The funding provided by this project has enabled and will enable the executing agents to centralize funding and management of common and recurring operating costs. This optimizes their value across the entire range of SDIO projects, and allows technical research funding to be devoted solely toward that purpose. This strategy of centralizing management will continue to occur throughout this program.

D. WORK PERFORMED BY: The System Engineering and Program Control tasks are performed through a number of support contracts, and civilian program managers as employees of the Army Strategic Defense Command and the Air Force. Work is performed by the following major contractors:

- Ford Aerospace Division
- ANSER Inc.
- COLSA Inc.
- GRC Inc.
- Hewlett Packard

E. PROGRAM DOCUMENTATION:

Program Elements: 0603215C/0603218C
PE Titles: Limited Defense System/
Research & Support Activities

Project Number: 4000
Budget Activity: 03
Strategic Programs
April 1993

F. RELATED ACTIVITIES: This project supports all other SDIO projects within these PEs. There is no unnecessary duplication of effort within SDIO or the DoD.

G. OTHER APPROPRIATION FUNDS: None

H. MILESTONE SCHEDULE:

- Products are generated on an as-required basis in support of the SDIO technology and management projects.

FY1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: 0603218C
PE Title: Research & Support Activities

Project Number: 4302
Budget Activity: 03
Strategic Programs
April 1993

A. RESOURCES: ($ in Thousands)
Project Title: Technology Transfer

Program Name:	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	Total Program
R&S DEM/VAL	2,592	2,239	2,862	Continuing

B. BRIEF DESCRIPTION OF MISSION REQUIREMENTS AND SYSTEM CAPABILITIES:

The Technology Applications Program was established in 1986 to make SDI technology available to federal agencies, state and local governments, and U.S. business and research interests. The objective of this program is to develop and support the transfer of SDI-derived technology to Department of Defense applications as well as to other federal, state, and local government agencies, federal laboratories, universities, and the domestic private sector.

C. PROGRAM ACCOMPLISHMENT AND PLANS:

- o Expanded the SDIO Technology Applications Information System to over 2,000 on-line.
- o Signed a MOA between SDIO and the AF/NASA National AeroSpace Plane (NASP) program office.
- o Sent information on selected, high-promise, commercializable technologies to over 5,000 organizations.
- o Published a yearly report available to the general public on promising and actual SDI-sponsored spin-offs.
- o Conducted a series of technology transfer demonstrations programs.
- o Continue to make SDI technology available to federal agencies, state and local governments, and U.S. business and research interests. Additional meetings with private and federal technology transfer specialists will be accomplished to review SDI technology for potential application in biomedical research; electronics, communications, and computer technology, power generation, storage, and transmission; and materials and industrial processes. The Joint SDI-Defense Technology Applications effort will continue to be emphasized through the use of technology briefs to Army, Navy, and Air Force laboratories and research centers.
- o Efforts will continue to emphasize the technology transfer programs begun in earlier years. SDI technology will continue to be reviewed for inclusion into the Technology Applications Information System computer database. Additional technology transfer initiatives will be undertaken as opportunities become available. Continue demonstration programs that will assist SDIO in expediting potential technology to the private sector. Develop close interaction working relationship with the National Technology Transfer Center so as to leverage their capabilities in the performance of our mission.

Program Plan to Completion: This is a continuing program.

Program Element: 0603218C
PE Title: Research & Support Activities

Project Number: 4302
Budget Activity: 03
Strategic Programs
April 1993

D. WORK PERFORMED BY:

- o NASA

E. COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. TECHNICAL CHANGES: None
2. SCHEDULE CHANGES: None
3. COST CHANGES: None

F. PROGRAM DOCUMENTATION:

G. RELATED ACTIVITIES:

May be related potentially to all SDIO programs. There is no unnecessary duplication of effort within SDIO or the DoD.

H. OTHER APPROPRIATION FUNDS: None

I. INTERNATIONAL COOPERATIVE AGREEMENTS: None

J. MILESTONE SCHEDULE:

- o Report on successful technology transfer models
- o Conduct five Technology Applications Reviews
- o Publish SDI High Technology Update (quarterly)
- o Publish 1993 SDI Technology Applications Report

FY1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: 0603217C
PE Title: Follow-On Technologies

Project Number: 4305
Budget Activity: 02
Advanced Technology Development
April 1993

A. RESOURCES: ($ in Thousands)
Project Title: Miniaturized Accelerators for PET

Program Name:	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	Total Program
FOT DEM/VAL	1,027	500	0	Completed

B. BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

The Positron Emission Tomography (PET) accelerator program, initiated in FY88 by Congressional direction, is a research project that will reduce the size, weight, and cost of current particle accelerators used to develop radio-pharmaceuticals for Positron Emission Tomography medical diagnoses.

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

- PET Accelerator: A full up system consisting of the miniature accelerator, target chamber, and automated Radio-Pharmaceutical Synthesis Cell will be demonstrated in a research environment at the University Subcontractor Locations.
- Complete the final phase of PET accelerator research, and development of radio-pharmaceuticals for use in Positron Emission Tomography medical diagnoses by demonstrating the systems in a Government clinical environment. Demonstrate a mobile concept to support several users.
- Program Terminated in FY93.

D. WORK PERFORMED BY:

PET Accelerator Program:
- Science Research Laboratory Inc.
- Science Applications International Corporation

E. COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. TECHNICAL CHANGES: None
2. SCHEDULE CHANGES: None
3. COST CHANGES: Remaining funds will be forwarded to SRL to complete field test.

F. PROGRAM DOCUMENTATION:

G. RELATED ACTIVITIES:

There is no unnecessary duplication of effort within the SDIO or DoD.

H. OTHER APPROPRIATION FUNDS: None.

I. INTERNATIONAL COOPERATIVE AGREEMENTS: None.

Program Element: 0603217C
PE Title: Follow-On Technologies

Project Number: 4305
Budget Activity: 02
Advanced Technology Development
April 1993

J. MILESTONE SCHEDULE:

- o Complete research on PET as congressionally mandated

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SDIO

FY 1994

BUDGET ESTIMATES

PROCUREMENT

ANNEX

STRATEGIC DEFENSE INITIATIVE ORGANIZATION
PROCUREMENT JUSTIFICATION

Justification of Procurement Funds

Exhibit P-1 Procurement Summary

Patriot Exhibits:

Exhibit P-40	Budget Item Justification Sheet
Exhibit P-3	Weapon Systems Modifications - Summary
Exhibit P-3a	Missile System Modification
Exhibit P-12	Missile System Component Cost Breakdown
Exhibit P-22a	Budget Procurement History and Planning
Exhibit P-44	Weapon System Cost Data Sheet

PROCUREMENT, DEFENSEWIDE

$ in Thousands

FY 1994 Estimate	120,719
FY 1993 Estimate	75,200
FY 1992 Actual	24,875

Strategic Defense Initiative Organization

Purpose and Scope of Work

These funds provide for the purchase of the latest technologically advanced systems for locating, identifying, tracking, and destroying ground launched ballistic missiles.

Justification of Funds

The FY 1994($120,719 thousand) funding is for the PATRIOT Missile system. Congress established a centrally managed Tactical Ballistic Missile Defense Initiative (which was assigned to SDIO) that included the PATRIOT anti-tactical missile system upgrade. (The Army will still be responsible for planning, programming, and budgeting for the procurement of PATRIOT equipment that meets air defense requirements but not anti-missile goals.) FY94 funds are for modifications to support Radar Enhancement (Quick Response Program) of the PATRIOT anti-missile capabilities level two (PAC 2), Communication Upgrades, Radar Phase III, and contractor and government engineering support.

The Theater High Altitude Air Defense system is a more robust area defense system that will provide wide area defense over deployed PATRIOT systems. It can provide more than 10 times the coverage against tactical ballistic missiles than PATRIOT. It will be compatible with existing and planned air defense hardware such as mobile launchers, BM/C3, etc. The missile will take maximum advantage of technology developed under other SDIO interceptor efforts. FY93 funds of $30,020 thousand will allow piece parts (seven missile components, airframes, propulsion, guidance and control, warheads, and canister) to be purchased and tested for ultimate fielded systems.

Extended Range Interceptor is a fire-and-forget (updatable) missile, single stage, nonseparating, solid rocket interceptor with inertial midcourse guidance and active RF homing guidance capable of destroying tactical ballistic missiles in the atmosphere.

STRATEGIC DEFENSE INITIATIVE ORGANIZATION
FY 1994 BUDGET ESTIMATES

APPROPRIATION: 0300 D PROCUREMENT, DEFENSE AGENCIES

Exhibit P-1
MARCH 1993

Line No.	Nomenclature	Ident Code	Millions of Dollars FY1992 Quantity	Cost	FY1993 Quantity	Cost	FY1994 Quantity	Cost
BUDGET	ACTIVITY 1: MAJOR EQUIPMENT							
	Major Equipment, DCA							
	PATRIOT	---		24.9		75.2		120.7
	Extended Range Interceptor (ERINT)	---	---		---		---	
	Theater High Altitude Air Defense (THAAD)	---	---		---		---	
	TOTAL	---		24.9		75.2		120.7

REPORTS CONTROL SYMBOL DD-COMP (AR) 1092	BUDGET ITEM JUSTIFICATION SHEET	DATE MARCH 1993
APPROPRIATION/BUDGET ACTIVITY PROCUREMENT /ACTIVITY 2	P-1 ITEM NOMENCLATURE TMD - PATRIOT	

	FY 92	FY 93	FY 94	FY 95	FY 96	FY 97	FY 98	FY 99
QUANTITY	0	0	0	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX
COST IN MIL	24.9	75.2	120.7	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX

DESCRIPTION: The PAC-3 Missile provides an autonomous firing capability, enhanced Electronic Counter Countermeasure capabilities, and improved performance against low Radar Cross Section targets, both aircraft and tactical missiles. The missile will expand the limited asset defense capability of the PATRIOT PAC-2 program by incorporating an active seeker into the PATRIOT Missile. These changes are needed to counter Tactical Ballistic Missile with low radar cross section, high terminal velocity and high angle of attack. Modification to PATRIOT radar in support of TMD that will increase PATRIOT effectivity, survivability, flexibility of defense design, footprint and detection of smaller low radar cross section targets.

JUSTIFICATION: The FY 92-99 program includes funds for Radar Enhancements, Missile Enhancements, Remote Launch, Communication Upgrades, and technical support costs.

	P-1 Shopp List No.	Page No. 1 of 1	EXHIBIT P-40

REPORTS CONTROL SYMBOL DD-COMP (AR) 1092	BUDGET ITEM JUSTIFICATION SHEET	DATE MARCH1993
APPROPRIATION/BUDGET ACTIVITY PROCUREMENT /ACTIVITY 3	P-1 ITEM NOMENCLATURE TMD - PATRIOT	

	FY 92	FY 93	FY 94	FY 95	FY 96	FY 97	FY 98	FY 99
QUANTITY	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
COST IN MIL	20.3	21.0	21.2	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX

DESCRIPTION: Modification to PATRIOT radar in support of TMD that will increase PATRIOT effectivity, survivability, flexibility of defense design, footprint and detection of smaller low radar cross section targets. Modification of the launcher for increased survivability, reload, and to support the incorporation of the ERINT missile, and communication upgrades.

JUSTIFICATION: The funds in FY92-99 are to provide lower cross section radar capability, communication upgrades, and PAC-3 launchers.

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MODIFICATION	FIRST PROCUREMENT YEAR
Radar Enhancements (QRP)	FY92
Communication Upgrade Phase I	FY94

MATERIEL CHANGE
TMD - PATRIOT Weapon Systems Modification-Procurement Dollar Summary
$ IN MILLIONS

SYSTEM/MODIFICATION	FY 92	FY 93	FY 94
RADAR ENHANCEMENTS (QRP)	20.3	21.0	14.0
COMMO UPGRADE PH I			7.2
RADAR PHASE III			
REMOTE LAUNCH PHASE III			
GUIDANCE ENHANCEMENTS			
TOTAL	20.3	21.0	21.2

MODIFICATION: RADAR ENHANCEMENT (QUICK RESPONSE PROGRAM) (1-91-03-1234)

DESCRIPTION/JUSTIFICATION

This task has the objective of improving PATRIOT's survivability and war fighting capabilities by incorporating enhancements into the Radar Set (RS) receiver. Overall benefits include a reduction in receiver noise and antenna sidelobe levels. These improvements will be accompanied by changes to the hardware in the Radar Set (AN/MPQ-53).

DEVELOPMENT STATUS:

MILESTONES	PLANNED	ACCOMPLISHED
Preliminary Design Review (PDR)	4QFY91	4QFY91
Critical Design Review (CDR)	1QFY92	1QFY92
Contractor Test and Evaluation (CTE)	2QFY92	2QFY92
Development Test and Evaluation (DTE)	2QFY92	3QFY92
Initial Operational Test and Evaluation (IOTE)	4QFY93	

FINANCIAL PLAN	FY92&PRIOR	FY93	FY94	FY95	FY96	FY97	FY98	FY99	TO COMP	TOTAL

RDT&E FUNDING PROVIDED BY FY91 ARMY SUPPLEMENTAL

PROCUREMENTS	FY92/PRIOR	FY93	FY94	FY95	FY96	FY97	FY98	FY99	TO COMP	TOTAL
KIT QUANTITY	31	31	20							82
INSTALLATION KITS										
INSTALLATION KITS (NON-RECURRING)										
INSTALLED EQUIP	19.3	20.0	13.3							52.6
INSTALLED EQUIP (NON-RECURRING)										
ENG CHANGE ORDERS										
DATA										
TRAINING EQUIP										
SUPPORT EQUIP										
INSTALLATION	1.0	1.0	0.7							2.7
TOTAL (PROC COST)	20.3	21.0	14.0							55.3

METHOD OF IMPLEMENTATION: The modification will be applied in kit form by contractor field teams in conjunction with scheduled CONUS and OCONUS Sweepdowns. 12 months lead time. Includes spares requirement.

CONTRACT DATE:	FY92 AUG 92	FY93 JAN 93	FY94 AUG 93	FY95 _____
PROD DELIV DATE:	FY92 AUG 93	FY93 JAN 94	FY94 AUG 94	FY95 _____

C. INSTALLATION SCHEDULE

		FY 93				FY 94				FY 95				FY 96			
		1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
INPUT	92/PRIOR				9	9	9	4									
	FY93							5	9	9	8						
	FY94									3	4	5	8				
	FY95																

		FY 93				FY 94				FY 95				FY 96			
		1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
OUTPUT	92/PRIOR					9	9	9	4								
	FY93								5	9	9	8					
	FY94										3	4	5	8			
	FY95																

MODIFICATION: COMMUNICATION UPGRADE PHASE I (1-92-03-1237)

DESCRIPTION/JUSTIFICATION

The communication upgrades includes the Routing Logic Radio Interface Unit Upgrade (RLRIU-U) and Joint Tactical Information Distribution System/Mobile Subscriber Equipment (JTIDS/MSE).

The Routing Logic Radio Interface Unit Upgrade (RLRIU-U) will replace the present RLRIU because of imcompatibilities with the Mobile Subscribe Equipment (MSE). Advantage of the RLRIU-U include MSE capability, the ability to interface with the Joint Tactical Information Distribution System (JTIDS) terminals, provide synchronous digitial outputs and has interfaces for remote sensors. The RLRIU-U will also allow a greater bandwidth which provides increased throughput.

DEVELOPMENT STATUS:

This modification provides for an upgrade to the interface between the EWCC and other communication subsystems. Contract award is scheduled for Nov 92.

MILESTONES	PLANNED	ACCOMPLISHED
Preliminary Design Review	1QFY93	
Critical Design Review	3QFY93	
Contractor Test and Evaluation	4QFY93	
Development Test and Evaluation	2QFY94	
Initial Operational Test and Evaluation	4QFY95	

FINANCIAL PLAN:

FY92&PRIOR	FY93	FY94	FY95	FY96	FY97	FY98	FY99	TO COMP	TOTAL

RDTE FUNDING BEING PROVIDED BY DEPT. ARMY

PROCUREMENTS	FY92/PRIOR	FY93	FY94	FY95	FY96	FY97	FY98	FY99	TO COMP	TOTAL
KIT QUANTITY			21	31	21					73
INSTALLATION KITS										
INSTALLATION KITS (NON-RECURRING)										
INSTALLED EQUIP			7.2	23.0	15.0					45.2
INSTALLED EQUIP (NON-RECURRING)										
ENG CHANGE ORDERS										
DATA										
INSTALLATION										
TOTAL (PROC COST)			7.2	23.0	15.0					45.2

METHOD OF IMPLEMENTATION:

CONTRACT DATE: FY92 _____ FY93 _____ FY94 JUN 94 FY95 _____
PROD DELIV DATE: FY92 _____ FY93 _____ FY94 JUN 95 FY95 _____

INSTALLATION SCHEDULE

C.

		FY 93			FY 94				FY 95				FY 96		
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
INPUT FY92																
FY93																
FY94										2	5	5	5	4		
FY95														8	8	8

		FY 93			FY 94				FY 95				FY 96		
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
OUTPUT FY92																
FY93																
FY94											2	5	5	5	4	
FY95															8	8

MISSILE COMPONENT COST BREAKDOWN

EXHIBIT P-12

PROCUREMENT APPROPRIATION /2

MISSILE SYSTEM: TMD-PATRIOT

PRIME CONTRACTOR: RAYTHEON

	FY 92			FY 93			FY 94					
SYSTEM/ITEM BREAKDOWN	QTY	UNIT COST	TOTAL	QTY	UNIT COST	TOTAL	QTY	UNIT COST	TOTAL	QTY	UNIT COST	TOTAL
MISSILE COMPONENTS												
AIRFRAME												
PROPULSION												
GUIDANCE AND CONTROL												
WARHEAD												
CANISTER												
MISSILE ENHANCEMENT (QRP)				180	0.030	5.4						
SUBTOTAL						5.4						
GROUND SUPPORT EQUIPMENT COMPONENTS												
SUBTOTAL												
TOTAL MISSILE & GSE						5.4						
OTHER COSTS												
CONTRACTOR ENGINEERING			1.4			16.7			29.9			
GOVERNMENT ENGINEERING			0.7			8.0			26.7			
INTEGRATED LOGISTICS SUPPORT			0.5			5.6			12.5			
SOFTWARE SUPPORT			0.8			10.7			23.2			
NAMSA												
FIELDING												
IPF (TOOL & TEST)			0.7			7.3			5.2			
DMPE			0.5			0.5			2.0			
GROSS WEAPON SYSTEM COST			4.6			54.2			99.5			
SUBTOTAL			4.6			54.2			99.5			
NET P-1 COST - ACTIVITY 2			4.6			54.2			99.5			
MODS - ACTIVITY 3			20.3			21.0			21.2			
TOTAL PROGRAM COSTS			24.9			75.2			120.7			

P-1 Shopp List No.

Page No. 1 of 1

MARCH 1993

BUDGET PROCUREMENT HISTORY AND PLANNING							DATE MARCH 1993			
APPROPRIATION/BUDGET ACTIVITY PROCUREMENT /ACTIVITY 4				P-1 ITEM NOMENCLATURE TMD (PATRIOT)						
LINE ITEM/FISCAL YEAR	CONTRACTOR	CONTRACT METHOD AND TYPE	CONTR BY	AWARD DATE	DATE OF FIRST DELIVERY	QTY	UNIT COST	SPECS AVAIL NOW	SPEC REV REQ'D	IF YES WHEN AVAIL
N /A										
REMARKS:										

DD FORM 2446-1, JUL 87 P-1 SHOPP LIST ITEM NO. _____ PAGE NO. 1 OF 1 EXHIBIT P-22a
PREVIOUS ADDITIONS ARE OBSOLETE

P-1 SHOPP LINE NO.
WEAPON SYSTEM COST DATA SHEET
(TOA, Dollars In Thousands)

MARCH 1993

WEAPON SYSTEM

I. HARDWARE (UNIT COST)

	FY92	DIFF	FY93	DIFF	FY94	DIFF
CONTRACTOR ENGINEERING	1400	+15300	16700	+13200	29900	-29900

REASON FOR CHANGE: BASED ON REQUIREMENT.

	FY92	DIFF	FY93	DIFF	FY94	DIFF
GOVERNMENT ENGINEERING	700	+7300	8000	+18700	26700	-26700

REASON FOR CHANGE: BASED ON REQUIREMENT.

	FY92	DIFF	FY93	DIFF	FY94	DIFF
INTEGRATED LOGISTICS SUPPORT	500	+5100	5600	+6900	12500	-12500

REASON FOR CHANGE: BASED ON REQUIREMENT.

	FY92	DIFF	FY93	DIFF	FY94	DIFF
SOFTWARE SUPPORT	800	+9900	10700	+12500	23200	-23200

REASON FOR CHANGE: BASED ON REQUIREMENT.

P-1 SHOPP LINE NO.
WEAPON SYSTEM COST DATA SHEET
(TOA, Dollars In Thousands)

MARCH 1993

WEAPON SYSTEM

I. HARDWARE (UNIT COST)

	FY92	DIFF	FY93	DIFF	FY94	DIFF
IPF (TOOL & TEST)	700	+6600	7300	-2100	5200	-5200

REASON FOR CHANGE: BASED ON REQUIREMENT.

EXHIBIT P-44

	FY92	DIFF	FY93	DIFF	FY94	DIFF
DMPE	500	0	500	+1500	2000	-2000

REASON FOR CHANGE: BASED ON REQUIREMENT.

P-1 SHOPP LINE NO.

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SDIO

FY 1994

BUDGET ESTIMATES

MILCON

SUMMARIES

1. COMPONENT	FY 1994 MILITARY CONSTRUCTION PROJECT DATA	2. DATE
DEFENSE (SDIO)		

3. INSTALLATION AND LOCATION	4. PROJECT TITLE
VARIOUS LOCATIONS	UNSPECIFIED MINOR CONSTRUCTION

5. PROGRAM ELEMENT	6. CATEGORY CODE	7. PROJECT NUMBER	8. PROJECT COST ($000)
		SDIO-321	2,192

9. COST ESTIMATES

ITEM	UM	QUANTITY	UNIT COST	COST ($000)
UNSPECIFIED MINOR CONSTRUCTION	LS	--	--	2,192

10. DESCRIPTION OF PROPOSED CONSTRUCTION:
Provide a lump sum amount for unspecified construction projects, not other wise authorized by law, having a funded cost of $1,500,000 or less, including construction, alteration or conversion of permanent or temporary facilities, in accordance with 10 USC 2805.

11. REQUIREMENT: As Required (New Mission).
REQUIREMENT: This package provides the means of accomplishing urgent projects that are not identified but which are anticipated to arise during FY 1994. Included would be projects to support new requirements, support new concepts, or other essential support to Strategic Defense Initiative (SDI) programs.

1. COMPONENT	FY 1994 MILITARY CONSTRUCTION PROJECT DATA	2. DATE
DEFENSE (SDIO)		

3. INSTALLATION AND LOCATION	4. PROJECT TITLE
VARIOUS LOCATIONS	PLANNING AND DESIGN

5. PROGRAM ELEMENT	6. CATEGORY CODE	7. PROJECT NUMBER	8. PROJECT COST ($000)
		SDIO-322	535

9. COST ESTIMATES

ITEM	UM	QUANTITY	UNIT COST	COST ($000)
PLANNING AND DESIGN	LS	--	--	535

10. DESCRIPTION OF PROPOSED CONSTRUCTION:

The funds requested will be used to provide financing for architectural and engineering services and for construction design of Strategic Defense Initiative (SDI) Military Construction projects.

11. REQUIREMENT: As Required (New Mission).

REQUIREMENT: These planning and design funds are required to complete the design of facilities in the FY 1995 SDI Military Construction Program, initiate design of facilities in the FY 1996 SDI Military Construction Program, and accomplish planning and design for major and complex technical projects with a long lead-time to be included in subsequent SDI Military Construction programs.

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SDIO

FY 1994

BUDGET ESTIMATES

OTHER

EXHIBITS

STRATEGIC DEFENSE INITIATIVE ORGANIZATION (SDIO)

SECURITY ACTIVITIES (SA-1, Physical Security)

MANPOWER

	FY 1992	FY 1993	FY 1994
Military Personnel			
a. Officers			
End Strength	0	0	0
Average Strength	0	0	0
b. Enlisted			
End Strength	0	0	0
Average Strength	0	0	0
c. Total Military			
End Strength	0	0	0
Average Strength	0	0	0
Civilian Personnel			
a. Direct Hire			
End Strength	0	0	0
Workyears	0	0	0
b. Indirect Hire			
End Strength	0	0	0
Workyears	0	0	0
c. Total DoD Civilians			
End Strength	0	0	0
Workyears	0	0	0
TOTAL DOD MANPOWER			
End Strength	0	0	0
Contract Personnel			
Workyears	18	18	18

STRATEGIC DEFENSE INITIATIVE ORGANIZATION (SDIO)

SECURITY ACTIVITIES (SA-1, Physical Security)

TOTAL OBLIGATIONAL AUTHORITY
(Dollars in Millions)

	FY 1992	FY 1993	FY 1994
OPERATING & SUPPORT COSTS			
a. Personnel			
(1) Military (Active)	0	0	0
(2) Military (National Guard)	0	0	0
(3) Military (Reserve)	0	0	0
(4) O&M, Active	0	0	0
(5) O&M, National Guard	0	0	0
(6) O&M, Reserve	0	0	0
(7) Other	0	0	0
Subtotal Personnel Costs	0	0	0
b. Security Equipment			
(1) O&M, Active	0	0	0
(2) O&M, National Guard	0	0	0
(3) O&M, Reserve	0	0	0
(4) Other	.014	.014	.014
Subtotal Security Equipment Costs	.014	.014	.014
c. Miscellaneous	.697	.726	.688
TOTAL OPERATING & SUPPORT COSTS	.7	.7	.7
INVESTMENT COSTS			
a. Security Equipment			
(1) Other Procurement	0	0	0
(2) O&M, Active	0	0	0
(3) O&M, National Guard	0	0	0
(4) O&M, Reserve	0	0	0
(5) Defense Business Operations Fund	0	0	0
(6) Other	0	0	0
Subtotal Security Equipment	0	0	0

STRATEGIC DEFENSE INITIATIVE ORGANIZATION (SDIO)

SECURITY ACTIVITIES (SA-1, Physical Security)

TOTAL OBLIGATIONAL AUTHORITY
(Dollars in Millions)

	FY 1992	FY 1993	FY 1994
b. Security RDT&E			
(1) 6.1 (Research)	0	0	0
(2) 6.2 (Exploratory Development	0	0	0
(3) 6.3 (Advanced Development)	0	0	0
(4) 6.4 (Engineering Development)	0	0	0
(5) 6.5 (Management & Support)	0	0	0
Subtotal Security RDT&E	0	0	0
c. Security Construction			
(1) Military Construction appropriation	0	0	0
(2) O&M appropriation	0	0	0
Subtotal Security Construction	0	0	0
TOTAL INVESTMENT COSTS	0	0	0
TOTAL TOA FOR SDIO	.7	.7	.7

C.

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STRATEGIC DEFENSE INITIATIVE ORGANIZATION (SDIO)

SECURITY ACTIVITIES (SA-2, AIS Security)
(SA-4, Compromising Emanations (TEMPEST))
(SA-6, Information Security)
(SA-8, Counterintelligence Support)

Exhibits SA-2, SA-4, SA-6, and SA-8 are Not Applicable, as there are no activities in any year.

STRATEGIC DEFENSE INITIATIVE ORGANIZATION (SDIO)

SECURITY ACTIVITIES (SA-3, Communications Security (COMSEC))

MANPOWER

	FY 1992	FY 1993	FY 1994
Military Personnel			
a. Officers			
End Strength	0	0	0
Average Strength	0	0	0
b. Enlisted			
End Strength	0	0	0
Average Strength	0	0	0
c. Total Military			
End Strength	0	0	0
Average Strength	0	0	0
Civilian Personnel			
a. Direct Hire			
End Strength	1	0	0
Workyears	1	0	0
b. Indirect Hire			
End Strength	0	0	0
Workyears	0	0	0
c. Total DoD Civilians			
End Strength	1	0	0
Workyears	1	0	0
TOTAL DOD MANPOWER			
End Strength	1	0	0
Contract Personnel			
Workyears	0	.25	.5

STRATEGIC DEFENSE INITIATIVE ORGANIZATION (SDIO)

SECURITY ACTIVITIES (SA-3, Communications Security (COMSEC))

TOTAL OBLIGATIONAL AUTHORITY
(Dollars in Millions)

	FY 1992	FY 1993	FY 1994
OPERATING & SUPPORT COSTS			
a. Personnel			
(1) Military (Active)	0	0	0
(2) Military (National Guard)	0	0	0
(3) Military (Reserve)	0	0	0
(4) O&M, Active	0	0	0
(5) O&M, National Guard	0	0	0
(6) O&M, Reserve	0	0	0
(7) Other	.030	0	0
Subtotal Personnel Costs	.030	0	0
b. Security Equipment			
(1) O&M, Active	0	0	0
(2) O&M, National Guard	0	0	0
(3) O&M, Reserve	0	0	0
(4) Other	.002	.002	.002
Subtotal Security Equipment Costs	.002	.002	.002
c. Miscellaneous	0	.021	.040
TOTAL OPERATING & SUPPORT COSTS	.1	.1	.1
INVESTMENT COSTS			
a. Security Equipment			
(1) Other Procurement	0	0	0
(2) O&M, Active	0	0	0
(3) O&M, National Guard	0	0	0
(4) O&M, Reserve	0	0	0
(5) Defense Business Operations Fund	0	0	0
(6) Other	0	0	0
Subtotal Security Equipment	0	0	0

STRATEGIC DEFENSE INITIATIVE ORGANIZATION (SDIO)

SECURITY ACTIVITIES (SA-3, Communications Security (COMSEC))

TOTAL OBLIGATIONAL AUTHORITY
(Dollars in Millions)

	FY 1992	FY 1993	FY 1994
b. Security RDT&E			
(1) 6.1 (Research)	0	0	0
(2) 6.2 (Exploratory Development	0	0	0
(3) 6.3 (Advanced Development)	0	0	0
(4) 6.4 (Engineering Development)	0	0	0
(5) 6.5 (Management & Support)	0	0	0
Subtotal Security RDT&E	0	0	0
c. Security Construction			
(1) Military Construction appropriation	0	0	0
(2) O&M appropriation	0	0	0
Subtotal Security Construction	0	0	0
TOTAL INVESTMENT COSTS	0	0	0
TOTAL TOA FOR SDIO	.1	.1	.1

STRATEGIC DEFENSE INITIATIVE ORGANIZATION (SDIO)

SECURITY ACTIVITIES (SA-5, Industrial Security)

MANPOWER

	FY 1992	FY 1993	FY 1994
Military Personnel			
a. Officers			
End Strength	0	0	0
Average Strength	0	0	0
b. Enlisted			
End Strength	0	0	0
Average Strength	0	0	0
c. Total Military			
End Strength	0	0	0
Average Strength	0	0	0
Civilian Personnel			
a. Direct Hire			
End Strength	0	0	0
Workyears	0	0	0
b. Indirect Hire			
End Strength	0	0	0
Workyears	0	0	0
c. Total DoD Civilians			
End Strength	0	0	0
Workyears	0	0	0
TOTAL DOD MANPOWER			
End Strength	0	0	0
Contract Personnel			
Workyears	0	0	0

STRATEGIC DEFENSE INITIATIVE ORGANIZATION (SDIO)

SECURITY ACTIVITIES (SA-5, Industrial Security)

TOTAL OBLIGATIONAL AUTHORITY
(Dollars in Millions)

	FY 1992	FY 1993	FY 1994
OPERATING & SUPPORT COSTS			
a. Personnel			
(1) Military (Active)	0	0	0
(2) Military (National Guard)	0	0	0
(3) Military (Reserve)	0	0	0
(4) O&M, Active	0	0	0
(5) O&M, National Guard	0	0	0
(6) O&M, Reserve	0	0	0
(7) Other	0	0	0
Subtotal Personnel Costs	0	0	0
b. Security Equipment			
(1) O&M, Active	0	0	0
(2) O&M, National Guard	0	0	0
(3) O&M, Reserve	0	0	0
(4) Other	0	0	0
C. Subtotal Security Equipment Costs	0	0	0
c. Miscellaneous	.030	.030	.030
TOTAL OPERATING & SUPPORT COSTS	.1	.1	.1
INVESTMENT COSTS			
a. Security Equipment			
(1) Other Procurement	0	0	0
(2) O&M, Active	0	0	0
(3) O&M, National Guard	0	0	0
(4) O&M, Reserve	0	0	0
(5) Defense Business Operations Fund	0	0	0
(6) Other	0	0	0
Subtotal Security Equipment	0	0	0

STRATEGIC DEFENSE INITIATIVE ORGANIZATION (SDIO)

SECURITY ACTIVITIES (SA-5, Industrial Security)

TOTAL OBLIGATIONAL AUTHORITY
(Dollars in Millions)

	FY 1992	FY 1993	FY 1994
b. Security RDT&E			
(1) 6.1 (Research)	0	0	0
(2) 6.2 (Exploratory Development	0	0	0
(3) 6.3 (Advanced Development)	0	0	0
(4) 6.4 (Engineering Development)	0	0	0
(5) 6.5 (Management & Support)	0	0	0
Subtotal Security RDT&E	0	0	0
c. Security Construction			
(1) Military Construction appropriation	0	0	0
(2) O&M appropriation	0	0	0
Subtotal Security Construction	0	0	0
TOTAL INVESTMENT COSTS	0	0	0
TOTAL TOA FOR SDIO	.1	.1	.1

C

STRATEGIC DEFENSE INITIATIVE ORGANIZATION (SDIO)

SECURITY ACTIVITIES (SA-7, Personnel Security)

	MANPOWER		
	FY 1992	FY 1993	FY 1994
Military Personnel			
a. Officers			
End Strength	0	0	0
Average Strength	0	0	0
b. Enlisted			
End Strength	0	0	0
Average Strength	0	0	0
c. Total Military			
End Strength	0	0	0
Average Strength	0	0	0
Civilian Personnel			
a. Direct Hire			
End Strength	0	0	0
Workyears	0	0	0
b. Indirect Hire			
End Strength	0	0	0
Workyears	0	0	0
c. Total DoD Civilians			
End Strength	0	0	0
Workyears	0	0	0
TOTAL DOD MANPOWER			
End Strength	0	0	0
Contract Personnel			
Workyears	0	0	0

STRATEGIC DEFENSE INITIATIVE ORGANIZATION (SDIO)

SECURITY ACTIVITIES (SA-7, Personnel Security)

TOTAL OBLIGATIONAL AUTHORITY
(Dollars in Millions)

	FY 1992	FY 1993	FY 1994
OPERATING & SUPPORT COSTS			
a. Personnel			
(1) Military (Active)	0	0	0
(2) Military (National Guard)	0	0	0
(3) Military (Reserve)	0	0	0
(4) O&M, Active	0	0	0
(5) O&M, National Guard	0	0	0
(6) O&M, Reserve	0	0	0
(7) Other	0	0	0
Subtotal Personnel Costs	0	0	0
b. Security Equipment			
(1) O&M, Active	0	0	0
(2) O&M, National Guard	0	0	0
(3) O&M, Reserve	0	0	0
(4) Other	0	0	0
Subtotal Security Equipment Costs	0	0	0
c. Miscellaneous	0	0	0
TOTAL OPERATING & SUPPORT COSTS	0	0	0
INVESTMENT COSTS			
a. Security Equipment			
(1) Other Procurement	0	0	0
(2) O&M, Active	0	0	0
(3) O&M, National Guard	0	0	0
(4) O&M, Reserve	0	0	0
(5) Defense Business Operations Fund	0	0	0
(6) Other	0	0	0
Subtotal Security Equipment	0	0	0

STRATEGIC DEFENSE INITIATIVE ORGANIZATION (SDIO)

SECURITY ACTIVITIES (SA-7, Personnel Security)

TOTAL OBLIGATIONAL AUTHORITY
(Dollars in Millions)

	FY 1992	FY 1993	FY 1994
b. Security RDT&E			
(1) 6.1 (Research)	0	0	0
(2) 6.2 (Exploratory Development	0	0	0
(3) 6.3 (Advanced Development)	0	0	0
(4) 6.4 (Engineering Development)	0	0	0
(5) 6.5 (Management & Support)	0	0	0
Subtotal Security RDT&E	0	0	0
c. Security Construction			
(1) Military Construction appropriation	0	0	0
(2) O&M appropriation	0	0	0
Subtotal Security Construction	0	0	0
TOTAL INVESTMENT COSTS	0	0	0
TOTAL TOA FOR SDIO	0	0	0

C.

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STRATEGIC DEFENSE INITIATIVE ORGANIZATION (SDIO)

SECURITY ACTIVITIES (SA-9, Operations Security)

MANPOWER

	FY 1992	FY 1993	FY 1994
Military Personnel			
a. Officers			
End Strength	1	1	1
Average Strength	1	1	1
b. Enlisted			
End Strength	0	0	1
Average Strength	0	0	1
c. Total Military			
End Strength	1	1	2
Average Strength	1	1	2
Civilian Personnel			
a. Direct Hire			
End Strength	1	2	2
Workyears	1	2	2
b. Indirect Hire			
End Strength	0	0	0
Workyears	0	0	0
c. Total DoD Civilians			
End Strength	1	2	2
Workyears	1	2	2
TOTAL DOD MANPOWER			
End Strength	2	3	4
Contract Personnel			
Workyears	21	21	20.75

STRATEGIC DEFENSE INITIATIVE ORGANIZATION (SDIO)

SECURITY ACTIVITIES (SA-9, Operations Security)

TOTAL OBLIGATIONAL AUTHORITY
(Dollars in Millions)

	FY 1992	FY 1993	FY 1994
OPERATING & SUPPORT COSTS			
a. Personnel			
(1) Military (Active)	.060	.060	.090
(2) Military (National Guard)	0	0	0
(3) Military (Reserve)	0	0	0
(4) O&M, Active	0	0	0
(5) O&M, National Guard	0	0	0
(6) O&M, Reserve	0	0	0
(7) Other	.060	.120	.120
Subtotal Personnel Costs	.120	.180	.210
b. Security Equipment			
(1) O&M, Active	0	0	0
(2) O&M, National Guard	0	0	0
(3) O&M, Reserve	0	0	0
(4) Other	0	0	0
C Subtotal Security Equipment Costs	0	0	0
c. Miscellaneous	1.712	1.770	1.670
TOTAL OPERATING & SUPPORT COSTS	1.8	1.9	1.9
INVESTMENT COSTS			
a. Security Equipment			
(1) Other Procurement	0	0	0
(2) O&M, Active	0	0	0
(3) O&M, National Guard	0	0	0
(4) O&M, Reserve	0	0	0
(5) Defense Business Operations Fund	0	0	0
(6) Other	0	0	0
Subtotal Security Equipment	0	0	0

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STRATEGIC DEFENSE INITIATIVE ORGANIZATION (SDIO)

SECURITY ACTIVITIES (SA-9, Operations Security)

TOTAL OBLIGATIONAL AUTHORITY
(Dollars in Millions)

	FY 1992	FY 1993	FY 1994
b. Security RDT&E			
(1) 6.1 (Research)	0	0	0
(2) 6.2 (Exploratory Development	0	0	0
(3) 6.3 (Advanced Development)	0	0	0
(4) 6.4 (Engineering Development)	0	0	0
(5) 6.5 (Management & Support)	0	0	0
Subtotal Security RDT&E	0	0	0
c. Security Construction			
(1) Military Construction appropriation	0	0	0
(2) O&M appropriation	0	0	0
Subtotal Security Construction	0	0	0
TOTAL INVESTMENT COSTS	0	0	0
TOTAL TOA FOR SDIO	1.8	1.9	1.9

c.

STRATEGIC DEFENSE INITIATIVE ORGANIZATION (SDIO)

SECURITY ACTIVITIES (SA-10, Special Access Program (SAP))

	MANPOWER		
	FY 1992	FY 1993	FY 1994
Military Personnel			
a. Officers			
End Strength	0	0	0
Average Strength	0	0	0
b. Enlisted			
End Strength	1	1	0
Average Strength	1	1	0
c. Total Military			
End Strength	1	1	0
Average Strength	1	1	0
Civilian Personnel			
a. Direct Hire			
End Strength	1	1	1
Workyears	1	1	1
b. Indirect Hire			
End Strength	0	0	0
Workyears	0	0	0
c. Total DoD Civilians			
End Strength	1	1	1
Workyears	1	1	1
TOTAL DOD MANPOWER			
End Strength	2	2	1
Contract Personnel			
Workyears	4	3.75	3.75

STRATEGIC DEFENSE INITIATIVE ORGANIZATION (SDIO)

SECURITY ACTIVITIES (SA-10, Special Access Program (SAP))

TOTAL OBLIGATIONAL AUTHORITY
(Dollars in Millions)

	FY 1992	FY 1993	FY 1994
OPERATING & SUPPORT COSTS			
a. Personnel			
(1) Military (Active)	.030	.030	0
(2) Military (National Guard)	0	0	0
(3) Military (Reserve)	0	0	0
(4) O&M, Active	0	0	0
(5) O&M, National Guard	0	0	0
(6) O&M, Reserve	0	0	0
(7) Other	.060	.060	.060
Subtotal Personnel Costs	.090	.090	.060
b. Security Equipment			
(1) O&M, Active	0	0	0
(2) O&M, National Guard	0	0	0
(3) O&M, Reserve	0	0	0
(4) Other	.025	.025	.025
Subtotal Security Equipment Costs	.025	.025	.025
c. Miscellaneous	.356	.336	.332
TOTAL OPERATING & SUPPORT COSTS	.5	.5	.4
INVESTMENT COSTS			
a. Security Equipment			
(1) Other Procurement	0	0	0
(2) O&M, Active	0	0	0
(3) O&M, National Guard	0	0	0
(4) O&M, Reserve	0	0	0
(5) Defense Business Operations Fund	0	0	0
(6) Other	0	0	0
Subtotal Security Equipment	0	0	0

STRATEGIC DEFENSE INITIATIVE ORGANIZATION (SDIO)

SECURITY ACTIVITIES (SA-10, Special Access Program (SAP))

TOTAL OBLIGATIONAL AUTHORITY
(Dollars in Millions)

	FY 1992	FY 1993	FY 1994
b. Security RDT&E			
(1) 6.1 (Research)	0	0	0
(2) 6.2 (Exploratory Development	0	0	0
(3) 6.3 (Advanced Development)	0	0	0
(4) 6.4 (Engineering Development)	0	0	0
(5) 6.5 (Management & Support)	0	0	0
Subtotal Security RDT&E	0	0	0
c. Security Construction			
(1) Military Construction appropriation	0	0	0
(2) O&M appropriation	0	0	0
Subtotal Security Construction	0	0	0
TOTAL INVESTMENT COSTS	0	0	0
TOTAL TOA FOR SDIO	.5	.5	.4

STRATEGIC DEFENSE INITIATIVE ORGANIZATION (SDIO)

SECURITY ACTIVITIES (SA-11, Total of Exhibits SA-1 through SA-10)

	MANPOWER		
	FY 1992	FY 1993	FY 1994
Military Personnel			
a. Officers			
End Strength	1	1	1
Average Strength	1	1	1
b. Enlisted			
End Strength	1	1	1
Average Strength	1	1	1
c. Total Military			
End Strength	2	2	2
Average Strength	2	2	2
Civilian Personnel			
a. Direct Hire			
End Strength	3	3	3
Workyears	3	3	3
b. Indirect Hire			
End Strength	0	0	0
Workyears	0	0	0
c. Total DoD Civilians			
End Strength	3	3	3
Workyears	3	3	3
TOTAL DOD MANPOWER			
End Strength	5	5	5
Contract Personnel			
Workyears	43	43	43

STRATEGIC DEFENSE INITIATIVE ORGANIZATION (SDIO)

SECURITY ACTIVITIES (SA-11, Total of Exhibits SA-1 through SA-10)

TOTAL OBLIGATIONAL AUTHORITY
(Dollars in Millions)

	FY 1992	FY 1993	FY 1994
OPERATING & SUPPORT COSTS			
a. Personnel			
(1) Military (Active)	.090	.090	.090
(2) Military (National Guard)	0	0	0
(3) Military (Reserve)	0	0	0
(4) O&M, Active	0	0	0
(5) O&M, National Guard	0	0	0
(6) O&M, Reserve	0	0	0
(7) Other	.180	.180	.180
Subtotal Personnel Costs	.270	.270	.270
b. Security Equipment			
(1) O&M, Active	0	0	0
(2) O&M, National Guard	0	0	0
(3) O&M, Reserve	0	0	0
(4) Other	.041	.041	.041
Subtotal Security Equipment Costs	.041	.041	.041
c. Miscellaneous	2.795	2.893	2.760
TOTAL OPERATING & SUPPORT COSTS	3.1	3.2	3.1
INVESTMENT COSTS			
a. Security Equipment			
(1) Other Procurement	0	0	0
(2) O&M, Active	0	0	0
(3) O&M, National Guard	0	0	0
(4) O&M, Reserve	0	0	0
(5) Defense Business Operations Fund	0	0	0
(6) Other	0	0	0
Subtotal Security Equipment	0	0	0

STRATEGIC DEFENSE INITIATIVE ORGANIZATION (SDIO)

SECURITY ACTIVITIES (SA-11, Total of Exhibits SA-1 through SA-10)

TOTAL OBLIGATIONAL AUTHORITY
(Dollars in Millions)

	FY 1992	FY 1993	FY 1994
b. Security RDT&E			
(1) 6.1 (Research)	0	0	0
(2) 6.2 (Exploratory Development	0	0	0
(3) 6.3 (Advanced Development)	0	0	0
(4) 6.4 (Engineering Development)	0	0	0
(5) 6.5 (Management & Support)	0	0	0
Subtotal Security RDT&E	0	0	0
c. Security Construction			
(1) Military Construction appropriation	0	0	0
(2) O&M appropriation	0	0	0
Subtotal Security Construction	0	0	0
TOTAL INVESTMENT COSTS	0	0	0
TOTAL TOA FOR SDIO	3.1	3.2	3.1

Strategic Defense Initiative Organization
Civilian Personnel Costs
FY 1994 Budget Estimates
FY 1992
($ in Thousands)

Date: April 1993

	Full Time Equivalent Beg Strgth	Full Time Equivalent End Strgth Tot	FTP	Workyears Tot	FTP	Basic Comp	Overtime Pay	Holiday Pay	Other OC 11	Total Vrbls	Comp OC 11	Total Benefits OC 11	Comp & Bens
1. Direct Hire Civilian:													
a. U.S. Employees													
(1) Classified and Administrative										106.0	1798.0	245.0	2,043.0
(a) Senior Exec Schedule	16.0	16.0	16.0	16.0	16.0	1,692.0				91.0	4,929.0	670.0	5,599.0
(b) General Merit Pay	60.0	76.0	76.0	75.0	76.0	4,838.0				161.0	1,527.0	208.0	1,366.0
(c) General Schedules	44.0	42.0	42.0	42.0	42.0	1,366.0				0.0	0.0	0.0	0.0
(d) Special Schedules	0.0	0.0	0.0	0.0									
Subtotal	120.0	134.0	134.0	133.0	134.0	7,896.0	0.0	0.0	0.0	358.0	8,254.0	1,123.0	9,377.0
(2) Wage Board													
(3) Other				9.0		821.0					821.0	77.0	898.0
Subtotal United States	120.0	134.0	134.0	142.0	134.0	8,717.0	0.0	0.0	0.0	358.0	9,075.0	1,200.0	10,275.0
b. DH Foreign Nationals													
c. Total Dir. Hire	120.0	134.0	134.0	142.0	134.0	8,717.0	0.0	0.0	0.0	358.0	9,075.0	1,200.0	10,275.0
d. Disadvantaged Employment													
2. Indirect Hire Foreign Nationals													
3. Foreign Nat'l Separation Liab Accrual													
a. Direct Hire Foreign Nationals													
b. Indirect Hire Foreign Nationals													
4. Benefits for Former Employees (OC-13)													
a. U.S. Direct Hires													
b. Foreign National Direct Hire													
5. TOTAL CIV PERS	120.0	134.0	134.0	142.0	134.0	8,717.0	0.0	0.0	0.0	358.0	9,075.0	1,200.0	10,275.0
6. Reimbursable Data													
a. U.S. Direct Hires													
b. Foreign National Direct Hire													
c. Total Direct Hires													
d. Indirect Hire Foreign Nationals													
e. TOTAL REIMBURSABLE FUNDING													
7. DIR FUND CIV PERS	120.0	134.0	134.0	142.0	134.0	8,717.0	0.0	0.0	0.0	358.0	9,075.0	1,200.0	10,275.0

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Strategic Defense Initiative Organization
Civilian Personnel Costs
FY 1994 Budget Estimates
FY 1993
($ in Thousands)

Date: April 1993

	Full Time Equivalent Beg Strgth	Full Time Equivalent End Strgth Tot	Full Time Equivalent End Strgth FTP	Workyears Tot	Workyears FTP	Basic Comp	Overtime Pay	Holiday Pay	Other OC 11	Total Vrbls	Comp OC 11	Total Benefits OC 11	Comp & Bens
1. Direct Hire Civilian:													
a. U.S. Employees													
(1) Classified and Administrative													
(a) Senior Exec Schedule	16.0	16.0	16.0	16.0	16.0	1,682.3					1,682.3	403.3	2,085.6
(b) General Merit Pay	76.0	83.0	83.0	83.0	16.0	5,855.8					5,855.8	1,403.6	7,259.4
(c) General Schedules	42.0	44.0	44.0	44.0	44.0	1,387.3					1,387.3	332.5	1,719.8
(d) Special Schedules	0.0	0.0	0.0	0.0	0.0	0.0					0.0	0.0	0.0
Subtotal	134.0	143.0	143.0	147.7	147.7	8,925.4	69.0	0.3	464.9	534.2	9,459.6	2,139.4	11,599.0
(2) Wage Board													
(3) Other (IPAs)				5.0		261.5					261.5	62.7	324.2
Subtotal United States	134.0	143.0	143.0	152.7	147.7	9,186.9	69.0	0.3	464.9	534.2	9,721.1	2,202.1	11,923.2
b. DH Foreign Nationals													
c. Total Dir. Hire	134.0	143.0	143.0	152.7	147.7	9,186.9	69.0	0.3	464.9	534.2	9,721.1	2,202.1	11,923.2
d. Disadvantaged Employment													
2. Indirect Hire Foreign Nationals													
3. Foreign Nat'l Separation Liab Accrual													
a. Direct Hire Foreign Nationals													
b. Indirect Hire Foreign Nationals													
4. Benefits for Former Employees (OC-13)													
a. U.S. Direct Hires													
b. Foreign National Direct Hire													
5. TOTAL CIV PERS	134.0	143.0	143.0	152.7	147.7	9,186.9	69.0	0.3	464.9	534.2	9,721.1	2,202.1	11,923.2
6. Reimbursable Data													
a. U.S. Direct Hires													
b. Foreign National Direct Hire													
c. Total Direct Hires													
d. Indirect Hire Foreign Nationals													
e. TOTAL REIMBURSABLE FUNDING													
7. DIR FUND CIV PERS	134.0	143.0	143.0	152.7	147.7	9,186.9	69.0	0.3	464.9	534.2	9,721.1	2,202.1	11,923.2

Strategic Defense Initiative Organization
Civilian Personnel Costs
FY 1994 Budget Estimates
FY 1994
($ in Thousands)

Date: April 1993

	Full Time Equivalent Beg Strgth	Full Time Equivalent End Strgth Tot	FTP	Workyears Tot	FTP	Basic Comp	Overtime Pay	Holiday Pay	Other OC 11	Total Vrbls	Comp OC 11	Total Benefits OC 11	Comp & Bens
1. Direct Hire Civilian:													
a. U.S. Employees													
(1) Classified and Administrative													
(a) Senior Exec Schedule	16.0	16.0	16.0	16.0	16.0	1,682.3					1,682.3	403.3	2,085.6
(b) General Merit Pay	83.0	161.0	161.0	161.0	161.0	8,894.5					8,894.5	2,132.0	11,026.5
(c) General Schedules	44.0	66.0	66.0	66.0	66.0	2,141.7					2,141.7	513.4	2,655.1
(d) Special Schedules	0.0	0.0	0.0	0.0	0.0	0.0					0.0	0.0	0.0
Subtotal	143.0	243.0	243.0	247.7	243.0	12,718.5	69.0	0.3	464.9	534.2	13,252.7	3,048.7	16,301.4
(2) Wage Board													
(3) Other (IPAs)				5.0		261.5					261.5	62.7	324.2
Subtotal United States	143.0	243.0	243.0	252.7	243.0	12,980.0	69.0	0.3	464.9	534.2	13,514.2	3,111.4	16,625.6
b. DH Foreign Nationals													
c. Total Dir. Hire	143.0	243.0	243.0	252.7	243.0	12,980.0	69.0	0.3	464.9	534.2	13,514.2	3,111.4	16,625.6
d. Disadvantaged Employment													
2. Indirect Hire Foreign Nationals													
3. Foreign Nat'l Separation Liab Accrual													
a. Direct Hire Foreign Nationals													
b. Indirect Hire Foreign Nationals													
4. Benefits for Former Employees (OC-13)													
a. U.S. Direct Hires													
b. Foreign National Direct Hire													
5. TOTAL CIV PERS	143.0	243.0	243.0	252.7	243.0	12,980.0	69.0	0.3	464.9	534.2	13,514.2	3,111.4	16,625.6
6. Reimbursable Data													
a. U.S. Direct Hires													
b. Foreign National Direct Hire													
c. Total Direct Hires													
d. Indirect Hire Foreign Nationals													
e. TOTAL REIMBURSABLE FUNDING													
7. DIR FUND CIV PERS	143.0	243.0	243.0	252.7	243.0	12,980.0	69.0	0.3	464.9	534.2	13,514.2	3,111.4	16,625.6

Strategic Defense Initiative Organization
Schedule of Consulting Services
FY 1994 Budget Estimates
($ in Thousands)

Date: April 1993

	FY 1992	FY 1993	FY 1994
I. Management & Professional Support Services	126,133	107,587	113,062
II. Studies, Analyses, & Evaluations	71,089	40,689	17,202
III. Engineering & Technical Services	2,061	3,337	393
Totals	199,283	151,613	130,657

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STRATEGIC DEFENSE INITIATIVE ORGANIZATION
EXTERNAL PUBLIC AFFAIRS ACTIVITIES
FY 94 PRESIDENT'S BUDGET
($ in thousands)

	FY92				FY93			
	ES	PROGRAM	PAY RAISE	TOTAL	ES	PROGRAM	PAY RAISE	TOTAL
RDTE	2	151.9	6.4	158.3	2	158.3	5.9	164.2

	FY94			
	ES	PROGRAM	RAISE	PAY TOTAL
RDTE	3	299.2	7.7	306.9

MILITARY ASSIGNED TO DEFENSE AGENCIES FROM THE SERVICES

	FY92		FY93		FY94	
	ES	$	ES	$	ES	$
ARMY	1	124.3	1	128.9	0	0.0
USAF	1	88.1	1	91.4	1	95.7
TOTAL	2	212.4	2	220.3	1	95.7

STRATEGIC DEFENSE INITIATIVE ORGANIZATION
EXTERNAL PUBLIC AFFAIRS ACTIVITIES
FY94 PRESIDENT'S BUDGET

OBJECT CLASS DATA
($ IN THOUSANDS)

	FY92	FY93	FY94
RDTE			
1100 PERMANENT POSITION	119.5	124.0	264.8
1200 PERSONAL BENEFITS	38.8	40.2	42.1
TOTAL RDTE	158.3	164.2	306.9
MILPER	212.4	220.3	95.7
Total PAO	370.7	384.5	402.6

END STRENGTH BY GRADE

	FY92	FY93	FY94
CIVILIANS			
GM14	2	2	2
GM15	0	0	1
MIL PERSONNEL			
O6	1	1	0
O4	1	1	1
TOTAL END STRENGTH	4	4	4

Strategic Defense Initiative Organization
Management Headquarters
FY 1994 Budget Estimates
FY 1992 - FY 1994

Date: April 1993

FY 1992 Actual				FY 1993 Estimate				FY 1994			
Mil End Strgth	Civ End Strgth	Total End Strgth	Total Obl ($ 000)	Mil End Strgth	Civ End Strgth	Total End Strgth	Total Obl ($ 000)	Mil End Strgth	Civ End Strgth	Total End Strgth	Total Obl ($ 000)
117.0	134.0	255.0	10,275.0	127.0	143.0	270.0	11.923.2	127.0	243.0	370.0	16,625.6

STRATEGIC DEFENSE INITIATIVE ORGANIZATION
SUMMARY OF LEGISLATIVE ACTIVITIES-FISCAL YEAR 1992
FY94 PRESIDENT'S BUDGET
($ in thousands)

	1 AV. NO CIV. EMPS	2 TOTAL CIV COMPENSATION	3 AV. NO MIL PERS	4 TOTAL MIL COST	5 ALL OTH COSTS	6 TOTAL COST
A. LEGISLATIVE LIAISON						
NOT APPLICABLE						
B. OTHER LEGISLATIVE ACTIVITIES						
1. Personnel not included in Category A "Legislative Liaison" in the various components who spend at least 30 man days per year in direct personal contact with members and committes of the Congress and their staff.						
PROGRAM	0	0	0	0	0	0
PAYRAISE	0	0	0	0	0	0
SUBTOTAL	0	0	0	0	0	0
2. Personnel involved with routine activities necessary for the preparation of a legislative program such as tracking legislation, writing analyses and performing research with respect to legislation.						
PROGRAM	0	0	0	0	0	0
PAYRAISE	0	0	0	0	0	0
SUBTOTAL	0	0	0	0	0	0
3. Personnnel not included above who spend more than 30 mandays per year in coordinating and answering congrssional inquiries, constituent letters, and telephone inquiries.						
PROGRAM	1.0	82.6	.5	34.6	0	117.2
PAYRAISE		3.5		1.5	0	5.0
SUBTOTAL	1.0	86.1	.5	36.1	0	122.2
4. Personnel not included above who spend more than 30 mandays per year in the preparation and the processing of congressional justification books, witness statements, and hearing transcripts.						
PROGRAM	1.0	82.6	.5	34.6	0	117.2
PAYRAISE		3.5		1.5	0	5.0
SUBTOTAL	1.0	86.1	.5	36.1	0	122.2

STRATEGIC DEFENSE INITIATIVE ORGANIZATION
SUMMARY OF LEGISLATIVE ACTIVITIES-FISCAL YEAR 1992
FY 94 PRESIDENT'S BUDGET
($ in thousands)

5. All clerical and adminstrative personnel who spend at least 30 mandays per year assisting those personnel identified in category B.

PROGRAM	.4	13.5	.1	2.6	0	16.1
PAYRAISE		.6		.1	0	.7
SUBTOTAL	.4	14.1	.1	2.7	0	16.8
TOTAL OTHER LEGISLATIVE ACITIVIES						
PROGRAM	2.4	178.7	1.1	71.8	0	250.5
PAYRAISE		7.6		3.1	0	10.7
SUBTOTAL		186.3		74.9	0	261.2
GRAND TOTAL	2.4	186.3	1.1	74.9	0	261.2

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STRATEGIC DEFENSE INITIATIVE ORGANIZATION
SUMMARY OF LEGISLATIVE ACTIVITIES-FISCAL YEAR 1993
FY94 PRESIDENTS'S BUDGET
($ in thousands)

	1 AV. NO CIV. EMPS	2 TOTAL CIV COMPENSATION	3 AV. NO MIL PERS	4 TOTAL MIL COST	5 ALL OTH COSTS	6 TOTAL COST
A. LEGISLATIVE LIAISON						
NOT APPLICABLE						
B. OTHER LEGISLATIVE ACTIVITIES						
1. Personnel not included in Category A "Legislative Liaison" in the various components who spend at least 30 man days per year in direct personal contact with members and committes of the Congress and their staff.						
PROGRAM	0	0	0	0	0	0
PAYRAISE	0	0	0	0	0	0
SUBTOTAL	0	0	0	0	0	0
2. Personnel involved with routine activities necessary for the preparation of a legislative program such as tracking legislation, writing analyses and performing research with respect to legislation.						
PROGRAM	0	0	0	0	0	0
PAYRAISE	0	0	0	0	0	0
SUBTOTAL	0	0	0	0	0	0
3. Personnnel not included above who spend more than 30 mandays per year in coordinating and answering congrssional inquiries, constituent letters, and telephone inquiries.						
PROGRAM	1.0	86.1	.5	36.1	0	122.2
PAYRAISE		3.2		1.3	0	4.5
SUBTOTAL	1.0	89.3	.5	37.4	0	126.7
4. Personnel not included above who spend more than 30 mandays per year in the preparation and the processing of congressional justification books, witness statements, and hearing transcripts.						
PROGRAM	1.0	86.1	.5	36.1	0	122.2
PAYRAISE		3.2		1.3	0	4.5
SUBTOTAL	1.0	89.3	.5	37.4	0	126.7

STRATEGIC DEFENSE INITIATIVE ORGANIZATION
SUMMARY OF LEGISLATIVE ACTIVITIES-FISCAL YEAR 1993
FY94 PRESIDENT'S BUDGET
($ in thousands)

5. All clerical and adminstrative personnel who spend at least 30 mandays per year assisting those personnel identified in category B.

PROGRAM	.4	14.1	.1	2.7	0	16.8
PAYRAISE		.5		.1	0	.6
SUBTOTAL	.4	14.6	.1	2.8	0	17.4
TOTAL OTHER LEGISLATIVE ACITIVIES						
PROGRAM	2.4	186.3	1.1	74.9	0	261.2
PAYRAISE		6.9		2.7	0	9.6
SUBTOTAL		193.2		77.6	0	270.8
GRAND TOTAL	2.4	193.2	1.1	77.6	0	270.8

STRATEGIC DEFENSE INITIATIVE ORGANIZATION
SUMMARY OF LEGISLATIVE ACTIVITIES-FISCAL YEAR 1994
FY94 PRESIDENTS'S BUDGET
($ in thousands)

	1 AV. NO CIV. EMPS	2 TOTAL CIV COMPENSATION	3 AV. NO MIL PERS	4 TOTAL MIL COST	5 ALL OTH COSTS	6 TOTAL COST
A. LEGISLATIVE LIAISON						
NOT APPLICABLE						
B. OTHER LEGISLATIVE ACTIVITIES						
1. Personnel not included in Category A "Legislative Liaison" in the various components who spend at least 30 man days per year in direct personal contact with members and committes of the Congress and their staff.						
PROGRAM	0	0	0	0	0	0
PAYRAISE	0	0	0	0	0	0
SUBTOTAL	0	0	0	0	0	0
2. Personnel involved with routine activities necessary for the preparation of a legislative program such as tracking legislation, writing analyses and performing research with respect to legislation.						
PROGRAM	0	0	0	0	0	0
PAYRAISE	0	0	0	0	0	0
SUBTOTAL	0	0	0	0	0	0
3. Personnnel not included above who spend more than 30 mandays per year in coordinating and answering congrssional inquiries, constituent letters, and telephone inquiries.						
PROGRAM	1.0	89.3	1.0	37.4	0	126.7
PAYRAISE		4.2		1.8	0	6.0
SUBTOTAL	1.0	93.5	1.0	39.2	0	132.7
4. Personnel not included above who spend more than 30 mandays per year in the preparation and the processing of congressional justification books, witness statements, and hearing transcripts.						
PROGRAM	0.0	0.0	1.0	37.4	0	37.4
PAYRAISE		0.0		1.8	0	1.8
SUBTOTAL	0.0	0.0	1.0	39.2	0	39.2

STRATEGIC DEFENSE INITIATIVE ORGANIZATION
SUMMARY OF LEGISLATIVE ACTIVITIES-FISCAL YEAR 1994
FY94 PRESIDENT'S BUDGET
($ in thousands)

5. All clerical and adminstrative personnel who spend at least 30 mandays per year assisting those personnel identified in category B.

PROGRAM	0.0	0.0	.5	2.8	0	2.8
PAYRAISE		0.0		.1	0	.1
SUBTOTAL	0.0	0.0	.5	2.9	0	2.9
TOTAL OTHER LEGISLATIVE ACITIVIES						
PROGRAM	1.0	89.3	2.5	77.6	0	166.9
PAYRAISE		4.2		3.7	0	7.9
SUBTOTAL		93.5		81.3	0	174.8
GRAND TOTAL	1.0	93.5	2.5	81.3	0	174.8

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STRATEGIC DEFENSE INITIATIVE ORGANIZATION
FEDERALLY FUNDED RESEARCH DEVELOPMENT CENTER RESOURCES
(DOLLARS IN MILLIONS)

SOURCE OF SDIO FUNDING: PROGRAM ELEMENT	FY92	FY93	FY94
FFRDC:HANFORD NATIONAL LAB			
PRIMARY SPONSOR: DEPARTMENT OF ENERGY			
0603217C	.546	.150	.100
TOTAL	.546	.150	.100
FFRDC: OAKRIDGE NATIONAL LAB			
PRIMARY SPONSOR: DEPARTMENT OF ENERGY			
0603214C	.707	.950	.950
0603215C	7.342	7.100	7.700
0603217C	.410	.643	.500
0603218C	.075	0.000	0.000
TOTAL	8.534	8.693	9.150
FFRDC: SANDIA NATIONAL LAB			
PRIMARY SPONSOR: DEPARTMENT OF ENERGY			
0603214C	6.341	5.222	4.880
0603215C	57.243	40.789	31.925
0603216C	1.000	.364	.379
0603217C	3.459	1.290	1.332
0603218C	33.064	37.811	9.839
TOTAL	101.107	85.476	48.355
FFRDC: ARGONNE NATIONAL LAB			
PRIMARY SPONSOR: DEPARTMENT OF ENERGY			
0603215C	.910	.750	.890
0603217C	6.846	3.300	.350
TOTAL	7.756	4.050	1.240
FFRDC: BROOKHAVEN NATIONAL LAB			
PRIMARY SPONSOR: DEPARTMENT OF ENERGY			
0603217C	.630	.203	.000
TOTAL	.630	.203	.000

STRATEGIC DEFENSE INITIATIVE ORGANIZATION
FEDERALLY FUNDED RESEARCH DEVELOPMENT CENTER RESOURCES
(DOLLARS IN MILLIONS)

SOURCE OF SDIO FUNDING: PROGRAM ELEMENT	FY92	FY93	FY94
FFRDC: JET PROPULSION LAB			
PRIMARY SPONSOR: DERTMENT OF HEALTH & HUMAN SERVICES			
0603214C	.500	.000	0.000
0603215C	8.245	6.276	2.416
0603217C	16.300	16.950	17.577
0603218C	6.065	6.308	6.560
TOTAL	31.110	29.534	26.553
FFRDC: LAWRENCE BERKELEY LAB			
PRIMARY SPONSOR: DEPARTMENT OF ENERGY			
0603217C	1.134	.750	.750
TOTAL	1.134	.750	.750
FFRDC: LINCCLN LAB/MIT			
PRIMARY SPONSOR: DEPARTMENT OF THE AIR FORCE			
0603214C	.100	.104	.108
0603215C	68.534	68.853	72.236
0603216C	8.916	15.690	11.882
0603217C	.636	5.508	7.216
0603218C	7.326	7.436	8.335
TOTAL	80.512	97.591	99.777
FFRDC: LOS ALAMOS NATIONAL LAB			
PRIMARY SPONSOR: DEPARTMENT OF ENERGY			
0603214C	.247	3.220	3.445
0603215C	1.500	1.500	1.500
0603216C	.474	0.000	0.000
0603217C	50.562	34.313	30.995
0603218C	.132	.007	.567
TOTAL	52.915	39.040	36.507

STRATEGIC DEFENSE INITIATIVE ORGANIZATION
FEDERALLY FUNDED RESEARCH DEVELOPMENT CENTER RESOURCES
(DOLLARS IN MILLIONS)

SOURCE OF SDIO FUNDING: PROGRAM ELEMENT	FY92	FY93	FY94
FFRDC: AEROSPACE CORPORATION			
PRIMARY SPONSOR: DEPARTMENT OF THE AIR FORCE			
0603214C	1.660	4.400	4.400
0603215C	34.062	62.716	43.071
0603216C	0.000	2.640	0.000
0603217C	1.097	.950	.520
0603218C	4.538	10.370	12.159
TOTAL	41.357	81.076	60.150
FFRDC: C3I FEDERAL CONTRACT RESEARCH CENTER (MITRE)			
PRIMARY SPONSOR: OFFICE OF THE SECRETARY OF DEFENSE			
0603215C	11.296	18.325	18.143
0603216C	5.742	5.551	5.163
0603218C	2.965	3.084	3.208
TOTAL	20.003	26.960	26.519
FFRDC:INSTITUTE FOR DEFENSE ANALYSIS			
PRIMARY SPONSOR: OFFICE OF THE SECRETARY OF DEFENSE			
0603214C	.100	.104	.108
0603215C	2.266	2.357	2.451
0603218C	3.250	3.380	3.515
TOTAL	5.616	5.841	6.074
FFRDC: LOGISTICS MANAGEMENT INSTITUTE			
PRIMARY SPONSOR: OFFICE OF THE SECRETARY OF DEFENSE			
0603218C	.600	.624	.649
TOTAL	.600	.624	.649

STRATEGIC DEFENSE INITIATIVE ORGANIZATION
FEDERALLY FUNDED RESEARCH DEVELOPMENT CENTER RESOURCES
(DOLLARS IN MILLIONS)

SOURCE OF SDIO FUNDING: PROGRAM ELEMENT	FY92	FY93	FY94
FFRDC: NATIONAL DEFENSE RESEARCH INSTITUE (RAND)			
PRIMARY SPONSOR: OFFICE OF THE SECRETARY OF DEFENSE			
0603215C	.050	.052	.054
0603218C	.660	.686	.714
TOTAL	.710	.738	.768
FFRDC: PACIFIC NORTHWEST LABS			
PRIMARY SPONSOR: DEPARTMENT OF ENERGY			
0603217C	.028	0.000	0.000
TOTAL	.028	0.000	0.000
FFRDC: LAWRENCE LIVERMORE LAB			
PRIMARY SPONSOR: DEPARTMENT OF ENERGY			
0603214C	96.700	50.650	30.540
0603215C	9.466	13.310	12.815
0603216C	5.330	43.685	24.500
0603217C	17.148	10.660	10.200
0603218C	11.200	10.000	10.560
TOTAL	139.844	128.305	88.615
TOTAL SDIO FFRDCs			
0603214C	106.355	64.650	44.431
0603215C	195.914	222.028	193.201
0603216C	21.462	67.930	41.929
0603217C	98.796	74.717	69.540
0603218C	69.875	79.706	56.106
GRAND TOTAL	492.402	509.031	405.207

STRATEGIC DEFENSE INITIATIVE ORGANIZATION
(SDIO)
BUDGET EXHIBIT 43

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EXHIBIT 43A ($000) SDIO
REPORT ON INFORMATION TECHNOLOGY SYSTEMS

	FY 92	FY 93	FY 94
1. CAP INVEST			
A. PURCH H/W	$2,392	$3,911	$2,997
B. PURCH S/W	$911	$2,203	$2,130
C. SITE	$30	$0	$483
SUBTOTAL	$3,333	$6,114	$5,610
2. PERSONNEL			
A. COMP	$709	$976	$1,023
B. WORKYEARS	6.5	8.3	8.3
SUBTOTAL	$709	$976	$1,023
3. EQUIP RENT			
A. LEASE H/W	$0	$0	$0
B. LEASE S/W	$0	$0	$0
C. SPACE	$0	$0	$0
D. SUPPLIES	$421	$335	$567
SUBTOTAL	$421	$335	$567
4. COMM SVC			
A. ADPE TIME	$12	$12	$12
B. VOICE COMM	$0	$0	$0
C. DATA COMM	$30	$30	$31
D. OPNS/MAINT	$6,973	$7,748	$8,440
F. ANAL/PROG	$7,911	$8,061	$8,431
G. STUDIES	$64	$64	$64
H. SIG USE	$0	$0	$0
SUBTOTAL	$14,990	$15,915	$16,978
5. INTERAGENCY			
A. PAYMENTS	$0	$0	$0
B. OFFSET	$0	$0	$0
SUBTOTAL	$0	$0	$0
6. INTRAAGENCY			
A. PAYMENTS	$3,639	$3,919	$4,051
B. OFFSET	$0	$0	$0
SUBTOTAL	$3,639	$3,919	$4,051
7. OTHER			
A. PAYMENTS	$0	$0	$0
B. OFFSET	$0	$0	$0
SUBTOTAL	$0	$0	$0
TOTAL OBLIGATIONS	$23,092	$27,259	$28,229
WORKYEARS:	6.5	8.3	8.3

APPROPRIATION (specify): RDT&E

XHIBIT 43A-1 ($000) SDIO
SUMMARY REPORT ON DEVELOPMENT & MODERNIZATION

	FY 92	FY 93	FY 94
1. CAP INVEST			
A. PURCH H/W	$2,392	$3,911	$2,997
B. PURCH S/W			
1)OP SW/COMMO	$0	$0	$0
2)CUST SW	$478	$1,630	$1,568
3)COTS	$433	$573	$562
C. SITE	$30	$0	$483
SUBTOTAL	$3,333	$6,114	$5,610
2. PERSONNEL			
A. COMP	$217	$445	$465
B. WORKYEARS	2.8	4.3	4.3
SUBTOTAL	$217	$445	$465
3. EQUIP RENT			
A. LEASE H/W	$0	$0	$0
B. LEASE S/W			
1)LEASE OP/COMM	$0	$0	$0
2)LEASE APP SW	$0	$0	$0
C. SPACE	$0	$0	$0
D. SUPPLIES			
1)OTS OP/COMM	$100	$25	$100
2)OTS-APP SW	$151	$150	$300
3)SUPPLIES	$90	$80	$85
4)OTHER	$80	$80	$82
SUBTOTAL	$421	$335	$567
4. COMM SVC			
A. ADPE TIME	$12	$12	$12
B. VOICE COMM	$0	$0	$0
C. DATA COMM	$30	$30	$31
D. CPNS	$5,441	$5,948	$6,313
E. MAINT			
1)H/W	$688	$763	$911
2)S/W	$488	$491	$623
F. ANAL/PROG			
1)PURCH CUST S/W	$0	$0	$0
2)DESIGN/DEV S/W	$7,911	$8,061	$8,431
G. STUDIES			
1)STUDIES	$20	$20	$20
2)COMM TRAIN	$44	$44	$44
3)OTHER	$0	$0	$0
H. SIG USE	$0	$0	$0
SUBTOTAL	$14,634	$15,369	$16,385
5. INTERAGENCY			
A. PAYMENTS	$0	$0	$0
B. OFFSET	$0	$0	$0
SUBTOTAL	$0	$0	$0
6. INTRAAGENCY			
A. PAYMENTS	$3,573	$3,855	$3,987
B. OFFSET	$0	$0	$0
SUBTOTAL	$3,573	$3,855	$3,987
7. OTHER			
A. PAYMENTS	$0	$0	$0
B. OFFSET	$0	$0	$0
SUBTOTAL	$0	$0	$0
TAL OBLIGATIONS	$22,178	$26,118	$27,014
RKYEARS:	2.8	4.3	4.3

APPROPRIATION (specify): RDT&E

Exhibit 43A-1 (Page 1 of 1)

EXHIBIT 43A-1b ($000) SDIO
REPORT ON NON-MAJOR AUTOMATION INFORMATION SYSTEM COST
Automated Information System Name and Number: USASDC MIS/TMIS
Life Cycle Cost (LCC) in Millions of Dollars: _____(then-year dollars)
_____(constant dollars)(BY)

Period Covered by LCC: _____
Life-Cycle Management Phase: IV
Warner Exempt (Yes or No): NO

	FY 92	FY 93	FY 94
1. CAP INVEST			
A. PURCH H/W	$1,241	$2,550	$1,550
B. PURCH S/W			
1)OP SW/COMMO			
2)CUST SW	$478	$730	$650
3)COTS			
C. SITE			
SUBTOTAL	$1,719	$3,280	$2,200
2. PERSONNEL			
A. COMP	$31	$32	$34
B. WORKYEARS	2.00	2.00	2.00
C. TRAVEL	$15	$21	$21
SUBTOTAL	$46	$53	$55
3. EQUIP RENT			
A. LEASE H/W			
B. LEASE S/W			
1)LEASE OP/COMM			
2)LEASE APP SW			
C. SPACE			
D. SUPPLIES			
1)OTS OP/COMM			
2)OTS APP SW	$151	$150	$300
3)SUPPLIES			
4)OTHER			
SUBTOTAL	$151	$150	$300
4. COMM SVC			
A. ADPE TIME			
B. VOICE COMM			
C. DATA COMM			
D. CPNS	$2,430	$2,941	$3,230
E. MAINT			
1)H/W	$425	$525	$551
2)S/W	$300	$343	$360
F. ANAL/PROG			
1)PURCH CUST S/W			
2)DESIGN/DEV S/W	$1,100	$570	$627
G. STUDIES			
1)STUDIES	$20	$20	$20
2)COMM TRAIN	$20	$20	$20
3)OTHER			
H. SIG USE			
SUBTOTAL	$4,295	$4,419	$4,808
5. INTERAGENCY			
A. PAYMENTS			
B. OFFSET			
SUBTOTAL	$0	$0	$0
6. INTRAAGENCY			
A. PAYMENTS			
B. OFFSET			
SUBTOTAL	$0	$0	$0
7. OTHER			
A. PAYMENTS			
B. OFFSET			
SUBTOTAL	$0	$0	$0
TOTAL OBLIGATIONS	$6,211	$7,902	$7,363
WORKYEARS:	2.00	2.00	2.00

APPROPRIATION (specify): 2040

EXHIBIT 43A-1b ($000) SDIO
REPORT ON NON-MAJOR AUTOMATION INFORMATION SYSTEM COST
Automated Information System Name and Number: SDIO INFORMATION SYSTEM
Life-Cycle Cost (LCC) in Millions of Dollars: _____(then-year dollars)
_____(constant dollars)(BY)

Period Covered by LCC: _____
Life-Cycle Management Phase:_____
Warner Exempt (Yes or No): _____

	FY 92	FY 93	FY 94
1. CAP INVEST			
A. PURCH H/W	$357	$618	$367
B. PURCH S/W			
1)OP SW/COMMO			
2)CUST SW			
3)COTS	$198	$223	$205
C. SITE			
SUBTOTAL	$555	$841	$572
2. PERSONNEL			
A. COMP			
B. WORKYEARS			
C. TRAVEL			
SUBTOTAL	$0	$0	$0
3. EQUIP RENT			
A. LEASE H/W			
B. LEASE S/W			
1)LEASE OP/COMM			
2)LEASE APP SW			
C. SPACE			
D. SUPPLIES			
1)OTS OP/COMM			
2)OTS APP SW			
3)SUPPLIES			
4)OTHER			
SUBTOTAL	$0	$0	$0
4. COMM SVC			
A. ADPE TIME			
B. VOICE COMM			
C. DATA COMM			
D. OPNS	$1,111	$1,107	$1,145
E. MAINT		$0	$0
1)H/W	$163	$208	$215
2)S/W	$93	$133	$138
F. ANAL/PROG			
1)PURCH CUST S/W			
2)DESIGN/DEV S/W	$5,100	$5,082	$5,255
G. STUDIES			
1)STUDIES			
2)COMM TRAIN			
3)OTHER			
H. SIG USE			
SUBTOTAL	$6,467	$6,530	$6,753
5. INTERAGENCY			
A. PAYMENTS			
B. OFFSET			
SUBTOTAL	$0	$0	$0
6. INTRAAGENCY			
A. PAYMENTS	$3,573	$3,855	$3,987
B. OFFSET			
SUBTOTAL	$3,573	$3,855	$3,987
7. OTHER			
A. PAYMENTS			
B. OFFSET			
SUBTOTAL	$0	$0	
TOTAL OBLIGATIONS	$10,595	$11,226	$11,312
WORKYEARS:			
APPROPRIATION (specify): RDT&E			

EXHIBIT 43A-1b ($000) SDIO
REPORT ON NON-MAJOR AUTOMATION INFORMATION SYSTEM COST
Automated Information System Name and Number: AF SDI EIS/No Number
Life-Cycle Cost (LCC) in Millions of Dollars: _____(then-year dollars)
_____(constant dollars)(BY)

Period Covered by LCC: _____
Life-Cycle Management Phase: _____
Warner Exempt (Yes or No): _____

	FY 92	FY 93	FY 94
1. CAP INVEST			
A. PURCH H/W	$558	$690	704
B. PURCH S/W			
1)OP SW/COMMO			
2)CUST SW		$900	918
3)COTS	$235	$350	$357
C. SITE			
SUBTOTAL	$793	$1,940	$1,979
2. PERSONNEL			
A. COMP			
B. WORKYEARS			
C. TRAVEL	$31	$31	$32
SUBTOTAL	$31	$31	$32
3. EQUIP RENT			
A. LEASE H/W			
B. LEASE S/W			
1)LEASE OP/COMM			
2)LEASE APP SW			
C. SPACE			
D. SUPPLIES			
1)OTS OP/COMM			
2)OTS APP SW			
3)SUPPLIES	$20	$20	$20
4)OTHER	$80	$80	$82
SUBTOTAL	$100	$100	$102
4. COMM SVC			
A. ADPE TIME	$12	$12	$12
B. VOICE COMM			
C. DATA COMM	$30	$30	$31
D. OPNS	$1,900	$1,900	$1,938
E. MAINT			
1)H/W	$15	$15	$15
2)S/W	$5	$5	$5
F. ANAL/PROG			
1)PURCH CUST S/W			
2)DESIGN/DEV S/W	$10	$10	$10
G. STUDIES			
1)STUDIES			
2)COMM TRAIN	$24	$24	$24
3)OTHER			
H. SIG USE			
SUBTOTAL	$1,996	$1,996	$2,035
5. INTERAGENCY			
A. PAYMENTS			
B. OFFSET			
SUBTOTAL	$0	$0	$0
6. INTRAAGENCY			
A. PAYMENTS			
B. OFFSET			
SUBTOTAL	$0	$0	$0
7. OTHER			
A. PAYMENTS			
B. OFFSET			
SUBTOTAL	$0	$0	$0
TOTAL OBLIGATIONS	$2,920	$4,067	$4,148
WORKYEARS:			
APPROPRIATION (specify): 0400			

EXHIBIT 43A-1b ($000) SDIO
REPORT ON NON-MAJOR AUTOMATION INFORMATION SYSTEM COST
Automated Information System Name and Number: Navy Background Data Center
Life-Cycle Cost (LCC) in Millions of Dollars: _____(then-year dollars)
_____(constant dollars)(BY)

Period Covered by LCC: _____
Life-Cycle Management Phase: _____
Warner Exempt (Yes or No): _____

	FY 92	FY 93	FY 94
1. CAP INVEST			
A. PURCH H/W	$236	$53	$376
B. PURCH S/W			
1)OP SW/COMMO			
2)CUST SW			
3)COTS			
C. SITE	$30	$0	$483
SUBTOTAL	$266	$53	$859
2. PERSONNEL			
A. COMP	$115	$336	$353
B. WORKYEARS	0.8	2.3	2.3
C. TRAVEL	$25	$25	$25
SUBTOTAL	$140	$361	$378
3. EQUIP RENT			
A. LEASE H/W			
B. LEASE S/W			
1)LEASE OP/COMM			
2)LEASE APP SW			
C. SPACE			
D. SUPPLIES			
1)OTS OP/COMM	$100	$25	$100
2)OTS APP SW			
3)SUPPLIES	$70	$60	$65
4)OTHER			
SUBTOTAL	$170	$85	$165
4. COMM SVC			
A. ADPE TIME			
B. VOICE COMM			
C. DATA COMM			
D. OPNS			
E. MAINT			
1)H/W	$85	$15	$130
2)S/W	$90	$10	$120
F. ANAL/PROG			
1)PURCH CUST S/W			
2)DESIGN/DEV S/W	$1,701	$2,399	$2,539
G. STUDIES			
1)STUDIES			
2)COMM TRAIN			
3)OTHER			
H. SIG USE			
SUBTOTAL	$1,876	$2,424	$2,789
5. INTERAGENCY			
A. PAYMENTS			
B. OFFSET			
SUBTOTAL	$0	$0	$0
6. INTRAAGENCY			
A. PAYMENTS			
B. OFFSET			
SUBTOTAL	$0	$0	$0
7. OTHER			
A. PAYMENTS			
B. OFFSET			
SUBTOTAL	$0	$0	$0
TOTAL OBLIGATIONS	$2,452	$2,923	$4,191
WORKYEARS:	0.8	2.3	2.3
APPROPRIATION (specify)			

EXHIBIT 43A-2 ($000) SDIO
SUMMARY REPORT ON OPERATIONS AND OTHER COST

	FY 92	FY 93	FY 94
1. CAP INVEST			
A. PURCH H/W			
B. PURCH S/W			
1)OP SW/COMMO			
2)CUST SW			
3)COTS			
C. SITE			
SUBTOTAL	$0	$0	$0
2. PERSONNEL			
A. COMP	$492	$531	$558
B. WORKYEARS	3.7	4.0	4.0
C. TRAVEL			
SUBTOTAL	$492	$531	$558
3. EQUIP RENT			
A. LEASE H/W			
B. LEASE S/W			
1)LEASE OP/COMM			
2)LEASE APP SW			
C. SPACE			
D. SUPPLIES			
1)OTS OP/COMM			
2)OTS APP SW			
3)SUPPLIES			
4)OTHER			
SUBTOTAL	$0	$0	$0
4. COMM SVC			
A. ADPE TIME			
B. VOICE COMM			
C. DATA COMM			
D. OPNS	$356	$546	$593
E. MAINT			
1)H/W			
2)S/W			
F. ANAL/PROG			
1)PURCH CUST S/W			
2)DESIGN/DEV S/W			
G. STUDIES			
1)STUDIES			
2)COMM TRAIN			
3)OTHER			
H. SIG USE			
SUBTOTAL	$356	$546	$593
5. INTERAGENCY			
A. PAYMENTS	$0	$0	$0
B. OFFSET			
SUBTOTAL	$0	$0	$0
	$0	$0	$0
6. INTRAAGENCY			
A. PAYMENTS	$66	$64	$64
B. OFFSET			
SUBTOTAL	$66	$64	$64
	$0	$0	$0
7. OTHER			
A. PAYMENTS			
B. OFFSET			
SUBTOTAL	$0	$0	$0
	$0	$0	$0
TOTAL OBLIGATIONS	$914	$1,141	$1,215
WORKYEARS:	3.70	3.95	3.95
APPROPRIATION (specify): RDT&E			

Strategic Defense Initiative Organization

Major Information Technology Acquisition Plans
FY1993 - FY1994
(in thousands of dollars)

Other Automated Information Systems:

Management Information System/Technical Information System (MIS/TMIS)

Item: MIS/TMIS Contract

Obligations:	FY 1993	FY 1994
	4419	4640
HW Maint	(525)	(551)
SW Maint	(343)	(360)

Description: The MIS/TMIS contractor will maintain all existing and future MIS/TMIS hardware and software, integrate new hardware and software capabilities, provide functional user support (to include the development of training courses), and operate, maintain, and control the MIS/TMIS and its components to ensure that the overall MIS/TMIS environment is maintained in a safe and secure manner. Enhancements/ upgrades to the MIS/TMIS will include establishment of a classifed and unclassified mode of operation, additional/modified MIS functions, and interoffice networking of PC workstations through Local Area Networks.

Strategic Defense Initiative Organization

Major Information Technology Acquisition Plans
FY1993 - FY1994
(in thousands of dollars)

Other Automated Information Systems:

SDIO Program Information Management System

Item: SPIMS Contract

Obligations:	FY 1993	FY 1994
	5245	5274

Description: Design, develop, and support an integrated program management system to support the SDIO mission.

Strategic Defense Initiative Organization

Major Information Technology Acquisition Plans
FY1993 - FY1994
(in thousands of dollars)

Other Automated Information Systems:

USAF SSD/CNIF

Item: Air Force Strategic Defense Initiative Enterprise Information System

Obligations:	FY 1993	FY 1994
	4067	4148

Description: The Enterprise Information System is being built to support functional users in the contracting, financial, project management, system engineering, system effectiveness, manpower and personnel, and office automation areas. Additionally, the system will provide summary information for decision support purposes to CN senior management.

Strategic Defense Initiative Organization

Major Information Technology Acquisition Plans
FY1993 - FY1994
(in thousands of dollars)

Other Automated Information Systems:

Navy Background Data Center

Item: Development of Background Data Center System

Obligations:	FY 1993	FY 1994
	2424	2789

Description: Design and development of hardware and software systems for archive, catalog, and distribution of the Background Data Center

STRATEGIC DEFENSE INITIATIVE ORGANIZATION

NARRATIVE STATEMENT

I. AIS TITLE AND NUMBER: Management Information System/ Technical Management Information System (MIS/TMIS). The MIS/ TMIS is a Non-Major Automated Information System.

II. RESPONSIBLE ORGANIZATION: U.S. Army Strategic Defense Command, Information Management Office. Point of contact is James D. Quade, CSSD-IM-A, DSN 645-3196.

III. SCOPE:

A. Mission Supported: The MIS/TMIS requirements are to provide automated business management to the USASDC mission of conducting a coordinated anti-tactical missile research program and the GPALS PEO mission of developing and fielding anti-tactical missile systems.

B. Functions Performed: The MIS/TMIS supports function codes of financial management (01), procurement and contract administration (08), RDT&E (13), information retrieval (14) and administrative (24). The MIS/TMIS is basically a stand-alone system that does not interface with other standard/nonstandard Army automated systems, however, this condition is changing due to the new connectivity technologies that have been developed. The system is being modified for access to other agencies automated systems through dialup equipment and dedicated data lines.

C. Current Resources Used: The MIS system components are predominately Digital Equipment Corporation (DEC) VAX series 6000 and 8000 machines and assorted peripherals. There are approximately 1500 personal computer work stations connected to the central node. There are three remote computing nodes. The central node is in Huntsville, AL. The system network is Ethernet, which is implemented using DECNET protocol. Principal software is DEC's VMS Operating System, ORACLE Relational Data Base Management System, and Project/2 Project Management software. The TMIS system components consist of a SUN 41280 and 41478 servers and assorted peripherals and storage devices. SUN technical work stations are interfaced to the central node. Software is the SUN Operating System version 6.0. The MIS/TMIS personnel resources are primarily contractor provided.

D. Benefits: The MIS/TMIS provides automated business management tools such as electronic mail and customized input screens for cost accounting, planning and programming, project schedule, budget and contract planning, and other related areas.

IV. MILESTONES: The MIS/TMIS contract was awarded in 1987. The hardware, software, and software development are basically complete, the this system is in the operation and maintenance

phase. The MIS/TMIS approvals were obtained from Director of Information Systems for Command, Control, Communications and Computers, and the U.S. Army Selection and Acquisition Agency.

V. MAJOR ITEMS OF INTEREST:

A. Status: The MIS/TMIS contract was awarded in 1987, and the hardware, software, and software development has basically been completed. The system is in the operation and maintenance phase with some hardware upgrades planned for the outyears.

B. Contracts: The 1987 MIS/TMIS contract was a 3-year effort awarded to Computer Sciences Corporation and was a cost plus fixed fee. Contract performance was within cost estimates. Our command awarded a MIS/TMIS follow-on contract to Nichols Research Corporation on 28 March 1990 for operation, maintenance, and hardware upgrades (to be identified in future years). This follow-on contract is also a cost plus fixed fee.

C. Resources: The MIS/TMIS is in the operation and maintenance phase of the system life cycle and was completed/contract awarded prior to publication of AR 25-3 pertaining to Army automation life cycle management. The March 1990 follow-on contract award for MIS/TMIS operation, maintenance, and hardware upgrades was estimated at about $17.9 million over four years, including options.

STRATEGIC DEFENSE INITIATIVE ORGANIZATION

NARRATIVE STATEMENT

I. AIS TITLE AND NUMBER: SDIO Program Information Management System (SPIMS).

II. RESPONSIBLE ORGANIZATION: Strategic Defense Initiative Organization, Information Systems Directorate. Point-of-Contact is Mrs. Jeanette Y. Clay, SDIO-DPI, Rm 1E1037, (703) 693-1652.

III. SCOPE:

A. MISSION SUPPORTED: The SPIMS requirement is to provide SDIO with an integrated program management system in support of the SDIO mission.

B. FUNCTIONS PERFORMED: The SPIMS supports function codes of "SN", Other Projected Management, and supports the SDIO Headquarters program management functions.

C. CURRENT RESOURCES USED: The SPIMS system component is predominately a Digital Equipment Corporation (DEC) VAX 8820 machine with assorted peripherals. There are approximately 250 personal computer workstations capable of accessing the VAX. The principal software is DEC's VMS Operating System, ORACLE Relational Data Base Management System, Project/2 Project Management software and Intelligent Business Systems' Easy Talk.

D. BENEFITS: The SPIMS provides an automated integrated program management capability for program management, planning, control, and execution.

IV. MILESTONES: The contract action for the completion of the SPIMS was awarded in 1992. Approvals were obtained from the SDIO Director of Information Systems; the Director, SDIO; Assistant Secretary of Defense, OASD (C3I); and the General Services Administration.

V. MAJOR ITEMS OF INTEREST:

A. Status: Implementation of program management agreements between SDIO and executing agents achieved. This includes the development and modification to and execution of these agreements.

B. Contracts: BDM International, Inc., development, operational support, user support, CPFF, on schedule.

C. Resources:

(1) Life-cycle cost.
Approved estimate - N/A
Current estimate - N/A

(2) Program cost.
Approved estimate - N/A
Current estimate - N/A

(3) Sunk cost - $9.5

(4) Cost to Complete - $15.7

(5) Resource changes - N/A

STRATEGIC DEFENSE INITIATIVE ORGANIZATION

NARRATIVE STATEMENT

I. AIS Title, Number, and CIM Functional Area: Air Force Strategic Defense Initiative Enterprise Information System (AF SDI EIS)

II. Responsible Organization: HQ SMC/CNPC

III. Scope:

A. Mission Supported: Will support the business and decision functions performing contracting, financial management, executive management, project management, system engineering, IPD manpower and personnel, and general office functions.

B. Functions Performed: Concurrent engineering. The project management module supports scheduling, WBS generation and storage. The Executive module rolls up financial, contractual, programmatic, and any other information the executives need to see which is in the database. It also allows for the creation of program status charts. The financial module uses a software called Finite which SSD/CN developed and SSD/AC currently is enhancing. It ties together budget forecasting and execution, downloading information from the General Accounting and Finance System (GAFS) via a software called PICOE. The System Engineering/System Integrated Product Development will primarily support configuration management, IPD requirements, data management, logistics, and testing status. The manpower and personnel software will primarily support executive access to manpower and personnel data, maintenance of directories and organizational charts, personnel action status, and personnel status. The office automation functions will include E-Mail, suspense and action item tracking, meeting scheduling, graphics, and other office functions.

C. Current Resources Used: The AF SDI EIS has two officers working full time with various contractors to manage the design, development, and delivery of the system. The system is being developed using as many existing off-the-shelf resources as possible. The system components will be integrated to the greatest extent possible and praticable. It will run on a LAN Manager 2.1 LAN, with interface to the SMC VAX Cluster and SDIO.

D. Benefits: The AF SDI EIS will greatly enhance communication and collaboration amongst the organizations within AF SDI. The information in the database will allow improved communication because everyone will be looking at the same information, and will be the most current information available. Through improved (but controlled) access to information, AF SDI personnel will be able to make more informed decisions which will allow the government

to realize savings, meet schedules and requirements. Improved efficiency and effectiveness as a result of the AF SDI EIS will enhance the performance of AF SDI and will further save money for the government.

IV. Milestones:

A. Milestone	Description	Approved Schedule	Current Estimate	Approval Level
POP I	Start building POP 1	1/91	1/91	HQ SSD/CC
POP II	(Start 10/92)			

V. Major Items of Interest:

A. Status: Phase I of the AF SDI EIS has been completed. We are currently completing critical design for the system for Phase II.
B. Contracts: Draper Lab, Intelligence Ware, CSC.
C. Resources:
(1) Life-cycle cost
Then year (inflated) dollars
Approved Estimate - N/A (in millions of dollars)
Current Estimate - N/A (in millions of dollars)
Constant base year dollars
Approved Estimate - N/A (in millions of dollars)
Current Estimate - N/A (in millions of dollars)

(2) Program cost.
Then year (inflated) dollars
Approved Estimate - N/A (in millions of dollars)
Current Estimate - $29.7(in millions of dollars)
Constant base year dollars
Approved Estimate - N/A (in millions of dollars)
Current Estimate - $29.7(in millions of dollars)
(3) Sunk cost - $4.0(in millions of dollars)
(4) Cost to complete - $25.7(in millions of dollars)
(5) Resource changes - None.

STRATEGIC DEFENSE INITIATIVE ORGANIZATION

NARRATIVE STATEMENT

I. AIS Title, Number, and CIM Functional Area: Backgrounds Data Center, PMA 3301

II. Responsible Organization: Naval Research Laboratory

III. Scope:

A. Mission Supported: Multiple
B. Functions Performed: Archive, Catalog and Distribution of Backgrounds Data
C. Current Resources Used: VAX 6310, VAX 4300, VAX 4200, VAXStations, etc.
D. Benefits: Consolidated permanent archive and distribution system for viable backgrounds data collected during SDIO experiments.

IV. Milestones:

A. Milestone	Description	Approved Schedule	Current Estimate	Approval Level
N/A				

. Major Items of Interest:

A. Status: On Schedule

B. Contracts: Prime Contractor- Hughes STX (CPFF)/ On Schedule

C. Resources:

(1) Life-cycle cost.
Approved Estimate - $_____(in millions of dollars)
Current Estimate - $_____(in millions of dollars)

(2) Program cost.
Approved Estimate - $_____(in millions of dollars)
Current Estimate - $_____(in millions of dollars)

(3) Sunk cost - $_____(in millions of dollars)

(4) Cost to complete - $_____(in millions of dollars)

(5) Resource changes.

Strategic Defense Initiative Organization
ADP Requirements/Indefinite Delivery-Quantity Contract
(in thousands of dollars)

1. Identification

a. Contract name: Desktop IV (U.S. Air Force contract with _____)

b. Description: PW2 Series 800 microcomputers to support general purpose applications.

2. Data on contracts already awarded

a. Contract Number: F
b. Estimated cost and number of units:

	FY93	FY94
Procure.		
O&M		
RDTE	250	500
c. No. of units:	62	136

3. Contract Data for contracts already awarded (Lead Component only)

Not applicable

4. Contract Data (for contracts not yet awarded)

a. Contract Number:
b. Estimated cost and number of units:

Not applicable

5. Solicitation data for contracts not yet awarded (Lead component only)

Not Applicable

Note: Numbers reflect use of the Desktop IV contract by USASDC. The numbers shown are exclusive of GPALS projects which are outside the scope of this budget exhibit.

Strategic Defense Initiative Organization
Research and Development Activities
FY 1994 Budget Estimates
($ in Millions)

Date: April 1993

Conduct of R&D by Activity		FY1992	FY1993	FY1994
Basic Research	N/A			
Applied Research	BA		41.5	43.6
	Oblig		40.9	43.3
	Outlays		39.4	42.4
Total Research	BA		41.5	43.6
	Oblig		40.9	43.3
	Outlays		39.4	42.4
Total RDT&E	BA	3906.9	3724.8	3637.1
	Oblig	3898.4	3646.0	3686.2
	Outlays	3320.4	3560.9	3646.8
Facilities included in R&D	BA	41.0	2.3	36.0
	Oblig	37.6	5.7	28.0
	Outlays	34.6	4.8	19.5
R&D by Colleges & Univs	BA	399.0	345.0	282.0
	Oblig	379.0	330.0	270.0
	Outlays	350.0	340.0	275.0
Facilities included in MILCON	BA	5.1	5.4	2.7
	Oblig	3.9	33.4	5.2
	Outlays	15.9	17.6	12.3
R&D Facilities(Total)	BA	46.1	7.70	38.7
	Oblig	41.5	39.10	33.2
	Outlays	50.5	22.40	31.8

Strategic Defense Initiative Organization
Budgeted Military And Civilian Pay Raise Amounts
PY 1994 Budget Estimates
FY 1992 - FY 1994
($ In Thousands)

Date: April 1993

	FY 1992	FY 1993	FY 1994
MILITARY PERSONNEL			
Military Personnel, Army, Navy, MC, Air Force			
CY 1 Oct 91 - 30 Dec 91	63.8	58.2	0.0
BY1 1 Jan 92 - 30 Sep 92	191.3	174.7	0.0
Total	255.1	232.9	0.0
TOTAL MILITARY PERSONNEL			
CIVILIAN PERSONNEL			
RDT&E			
Classified			
CY 1 Oct 91 - 30 Dec 91	91.5	80.6	0.0
BY1 1 Jan 92 - 30 Sep 92	274.5	242.1	0.0
Total	366.0	322.7	0.0
Total			

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SDIO

FY 1994

BUDGET ESTIMATES

POINT OF CONTACT LIST

CONGRESSIONAL DESCRIPTIVE SUMMARY (CDS)
POINT OF CONTACT (POC) LIST

CDS REPORTED	PROJECT TITLE (PROGRAM) (ELEMENT)	PROJECT INTEGRATOR	OFC SYM	PHONE NO.	ROOM NO.
1101	Passive Sensors (LDS DEM/VAL) (SBI DEM/VAL)	Mr Erwin Myrick	DTS	58842	1E168
1102	Mwave Radar Tech (LDS DEM/VAL)	MAJ Kevin House	DTS	56862	1E182
1103	Laser Radar Tech (LDS DEM/VAL)	MAJ Kevin House	DTS	56862	1E182
1104	Signal Processing (LDS DEM/VAL) (SBI DEM/VAL)	Capt Scott Larrimore	DTS	58825	1E168
1105	Discrimination (LDS DEM/VAL) (LDS D/V MILCON) (TMD DEM/VAL)	Capt Barry Tilton	DTS	58832	1E182
1106	Sens Stud & Exp (LDS DEM/VAL) (TMD DEM/VAL)	Dr W Frederick	DTS	58845	1E168
1109	TMD Discrimination (TMD DEM/VAL)	LTC John G Upton	GTS	31503	1E1044
1110	Sensor Integration (LDS DEM/VAL) (FOT DEM/VAL)	Lt Col Pete Rustan	DTI	31671	1E167
1201	Int Studies & Anal (LDS DEM/VAL) (FOT DEM/VAL)	Dr Walter Dyer	DTC	58846	1E168
1202	Interceptor Integ (LDS DEM/VAL) (FOT DEM/VAL)	Mr Richard Matlock	DTC	74017	1E168
1203	Hypervelocity Tech (FOT DEM/VAL)	Lt Col Pete Rustan	DTI	31671	1E167
1204	Int Studies & Anal (LDS DEM/VAL) (FOT DEM/VAL)	CDR Al Korejwo	DTC	58843	1E168

CONGRESSIONAL DESCRIPTIVE SUMMARY (CDS)
POINT OF CONTACT (POC) LIST

CDS REPORTED	PROJECT TITLE (PROGRAM) (ELEMENT)	PROJECT INTEGRATOR	OFC SYM	PHONE NO.	ROOM NO.
1206	Advanced TMD Weapons (TMD DEM/VAL)	LTC Juan Jimenez	GTW	31781	1E1020
1208	Disc Int (LDS DEM/VAL)	Dr Walter Dyer	DTC	58846	1E168
1209	Endo Tech (LDS DEM/VAL) (FOT DEM/VAL)	Maj Earl Hill	DTC	58826	1E168
1210	Navy Exo (FOT DEM/VAL) (TMD DEM/VAL)	Mr Richard Matlock	DTC	74017	1E168
1211	Inter/Facil (LDS DEM/VAL)	CDR Al Korewjwo	DTC	58843	1E168
1212	D-2 Program (FOT DEM/VAL)	Dr Walter Dyer	DTC	58846	1E168
1301	FEL Technology (FOT DEM/VAL)	MAJ James Althouse	DTD	31568	1E178
1302	Chem Laser Tech (FOT DEM/VAL)	Mr Daniel Wildt	DTD	31568	1E178
1303	Neutral Part Beam (FOT DEM/VAL)	MAJ Jay Willis	DTD	31568	1E178
1304	NDEW Tech (FOT DEM/VAL)	Mr Neil Griff	DTD	31568	1E178
1305	ATP/FC Tech (FOT DEM/VAL)	Lt Col Dale Tietz	DTD	31568	1E178
1307	DE Demo (FOT DEM/VAL)	Mr Neil Griff	DTD	31568	1E178
1403	Computer Eng (LDS DEM/VAL)	CDR Al Korejwo	DTC	58843	1E168
1405	Communications Eng (LDS DEM/VAL)	CDR Al Korejwo	DTC	58843	1E168

CONGRESSIONAL DESCRIPTIVE SUMMARY (CDS)
POINT OF CONTACT (POC) LIST

CDS REPORTED	PROJECT TITLE (PROGRAM) (ELEMENT)	PROJECT INTEGRATOR	OFC SYM	PHONE NO.	ROOM NO.
1501	Survivability (LDS DEM/VAL) (SBI DEM/VAL) (TMD DEM/VAL)	Capt Gary Schneider	DTS	31665	1E178
1502	Leth & Tgt Hard (LDS DEM/VAL) (SBI DEM/VAL) (FOT DEM/VAL) (TMD DEM/VAL)	Lt Col Chuck Martin	DTC	31668	1E178
1503	Power (FOT DEM/VAL) (R&S DEM/VAL)	MAJ Fred Tarantino	DT	31573	1E152
1504	Matls & Structure (LDS DEM/VAL) (SBI DEM/VAL) (FOT DEM/VAL) (R&S DEM/VAL)	Lt Col Michael Obal	DTI	31663	1E167
1601	IS&T (R&S DEM/VAL)	Dr Dwight Duston	DTI	31673	1E167
1602	New Concepts Dev (SBIR/STTR) (R&S DEM/VAL)	Mr Carl Nelson	DTI	31671	1E167
1701	Launch Services (LDS DEM/VAL) (FOT DEM/VAL)	Lt Col Steve Theriault	DTI	31663	1E180
1702	Spec Test Act (FOT DEM/VAL)	Lt Col Steve Theriault	DTI	31663	1E180
2102	BE (LDS DEM/VAL) (TMD DEM/VAL)	Lt Col David Svetz	GSN	31600	1E149
2103	GSTS (LDS DEM/VAL)	Lt Col David Svetz	GSN	31600	1E149
2104	GBR (LDS DEM/VAL) (TMD DEM/VAL)	Lt Col Thomas Blume	GSN	31600	1E149

CONGRESSIONAL DESCRIPTIVE SUMMARY (CDS)
POINT OF CONTACT (POC) LIST

CDS REPORTED	PROJECT TITLE (PROGRAM) (ELEMENT)	PROJECT INTEGRATOR	OFC SYM	PHONE NO.	ROOM NO.
2106	ACTS (FOT DEM/VAL) (TMD DEM/VAL)	Capt Scott Levinson	GTS	31780	1E1020
2201	SBI (LDS DEM/VAL)	LTC Robert MacMullin	GSN	31600	1E149
2202	GBI (LDS DEM/VAL)	LTC Robert MacMullin	GSN	31600	1E149
2203	E2I (LDS DEM/VAL) (TMD DEM/VAL)	LTC Robert MacMullin	GSN	31600	1E149
2204	DEW Concept Def (FOT DEM/VAL)	Mr Neil Griff	DTD	31568	1E178
2205	Brilliant Pebbles (SBI DEM/VAL) (FOT DEM/VAL)	Lt Col Thomas Fitzgerald	GSG	31612	1E149
2207	Patriot (TMD DEM/VAL) (TMD EMD) (TMD PROC)	MAJ Francis Valentino	GTW	31782	1E1020
2208	ERINT (TMD DEM/VAL)	Lt Col Kip Hansen	GTW	31780	1E1020
2209	ACES (TMD DEM/VAL)	LTC Juan Jimenez	GTW	31781	1E1020
2210	THAAD (TMD DEM/VAL)	MAJ Patrick O Reilly	GTW	31783	1E1020
2212	Corps SAM (TMD DEM/VAL)	LTC (P) Perry Casto	GTW	31781	1E1020
2213	Navy/Marine Corps TMD (TMD DEM/VAL)	CDR John Carey	GTI	36635	1E1044
2300	Command Center (LDS DEM/VAL) (LDS D/V MILCON)	Lt Col Robert Phelps	GMB	31824	1E149

CONGRESSIONAL DESCRIPTIVE SUMMARY (CDS)
POINT OF CONTACT (POC) LIST

CDS REPORTED	PROJECT TITLE (PROGRAM) (ELEMENT)	PROJECT INTEGRATOR	OFC SYM	PHONE NO.	ROOM NO.
2304	Software Eng (LDS DEM/VAL)	Lt Col Jim Sweeder	GMI	31826	1E149
2307	CINC Command Element (LDS DEM/VAL)	Lt Col Robert Phelps	GMB	31824	1E149
3102	System Eng (LDS DEM/VAL)	COL William Hecker	GMI	31594	1E149
3103	SDI Metrology (LDS DEM/VAL)	Mr Allan Leary	GMI	31608	1E149
3104	ILS (LDS DEM/VAL)	Mr Allan Leary	GMI	31608	1E149
3105	Prod & Manu (LDS DEM/VAL)	Mr Greg Stottlemyer	GMI	31826	1E149
3107	Envir Siting & Facil (R&S DEM/VAL) (R&S D/V MILCON)	Mr Michael Aimone	GMT	31743	1E180
3108	Ops Environments (LDS DEM/VAL)	COL Richard Hochberg	GMI	31826	1E149
3109	Sys Sec Eng (LDS DEM/VAL)	Mr Garrett Fitzgerald	GMI	31608	1E149
3110	Surviv Eng (LDS DEM/VAL)	COL Richard Hochberg	GMI	31826	1E149
3111	Surveillance Eng (LDS DEM/VAL)	CDR Burt Upchurch	GMI	31539	1E149
3112	Sys Eng Support (LDS DEM/VAL)	COL Richard Hochberg	GMI	31594	1E149
3113	Ground Common (LDS DEM/VAL)	Mr Allan Leary	GMI	31608	1E149
3114	Launch Common (LDS DEM/VAL)	Mr Allan Leary	GMI	31608	1E149
3115	GPALS Sys Eng (LDS DEM/VAL)	MAJ Geno Dellarocco	GM	31520	1E149

CONGRESSIONAL DESCRIPTIVE SUMMARY (CDS)
POINT OF CONTACT (POC) LIST

CDS REPORTED	PROJECT TITLE (PROGRAM) (ELEMENT)	PROJECT INTEGRATOR	OFC SYM	PHONE NO.	ROOM NO.
3201	Architecture & Anal (LDS DEM/VAL) (R&S DEM/VAL)	Dr Charles Infosino	DR	31086	1E1020
3202	Operations Interface (LDS DEM/VAL) (R&S DEM/VAL)	LTC Art Kreutz	GMX	31084	1E1020
3203	Intel Threat Dev (R&S DEM/VAL)	CAPT Paul Tilson	DSI	46533	1E1062
3204	Countermeasures Integ (R&S DEM/VAL) (TMD DEM/VAL)	Col Robert Swedenburg	DSI	73529	1E1062
3205	TMD Spec Studies (TMD DEM/VAL)	Col Richard Ritter	GTI	36635	1E1044
3206	System Threat (R&S DEM/VAL)	Mr Robert Kranc	DSI	46533	1E1062
3207	System Analysis (LDS DEM/VAL) (TMD DEM/VAL)	Dr Charles Infosino	DR	31086	1E1020
3208	Integ & Balancing (TMD DEM/VAL)	Col Richard Ritter	GTI	36635	1E1044
3210	Counterforce (TMD DEM/VAL)	Maj Richard Osterman	GTI	36635	1E1044
3211	C4I & Ops Anal (TMD DEM/VAL) (TMD EMD)	Maj Rene Ramirez	GTI	36635	1E1044
3212	Passive Defense (TMD DEM/VAL)	Col Richard Ritter	GTI	36635	1E1044
3213	Active Defense (TMD DEM/VAL)	Col Richard Ritter	GTI	36635	1E1044

CONGRESSIONAL DESCRIPTIVE SUMMARY (CDS)
POINT OF CONTACT (POC) LIST

CDS REPORTED	PROJECT TITLE (PROGRAM) (ELEMENT)	PROJECT INTEGRATOR	OFC SYM	PHONE NO.	ROOM NO.
3301	Data Center (LDS DEM/VAL) (FOT DEM/VAL) (R&S DEM/VAL) (TMD DEM/VAL)	Ms Kathleen Ruemmele	GMT	31660	1E180
3302	System Test Envir (LDS DEM/VAL) (R&S DEM/VAL)	Mr Percy Foster	GMN	31594	1E149
3303	System Test Eval (LDS DEM/VAL) (R&S DEM/VAL)	Capt Bob Kelsey	GMT	31660	1E180
3304	Targets (LDS DEM/VAL) (SBI DEM/VAL) (R&S DEM/VAL) (TMD DEM/VAL)	Capt Bob Kelsey	GMT	31660	1E180
3305	Theater Test Bed (TMD DEM/VAL)	MAJ Frank Maressa	GTI	36634	1E1044
3306	Comp Res & Eng (LDS DEM/VAL) (R&S DEM/VAL)	Mr Percy Foster	GMN	31594	1E149
3307	AST (LDS DEM/VAL)	LTC Robert MacMullin	GSN	31600	1E149
3308	Sys Simulator (LDS DEM/VAL)	CDR Burt Upchurch	GMI	31539	1E149
3309	Sys Level T&E (LDS DEM/VAL)	Mr Dan Witener	GMT	31577	1E180
3310	T&E Facil/Launch (LDS DEM/VAL) (R&S DEM/VAL) (TMD DEM/VAL)	Ms Kathleen Ruemmele	GMT	31660	1E180

CONGRESSIONAL DESCRIPTIVE SUMMARY (CDS)
POINT OF CONTACT (POC) LIST

CDS REPORTED	PROJECT TITLE (PROGRAM) (ELEMENT)	PROJECT INTEGRATOR	OFC SYM	PHONE NO.	ROOM NO.
3311	Mobile Test Assets (LDS DEM/VAL) (FOT DEM/VAL) (R&S DEM/VAL) (TMD DEM/VAL)	Ms Kathleen Ruemmele	GMT	31660	1E180
3312	Sys Tst Env Spt (LDS DEM/VAL) (R&S DEM/VAL)	COL Louis Kouts	GMN	31594	1E149
3313	Test Ranges (LDS DEM/VAL) (TMD DEM/VAL)	Ms Kathleen Ruemmele	GMT	31660	1E180
3314	GPALS OT&E (LDS DEM/VAL)	Mr Dan Whitener	GMT	31577	1E180
4000	Operational Support (LDS DEM/VAL) (SBI DEM/VAL) (FOT DEM/VAL) (R&S DEM/VAL) (TMD DEM/VAL)	Mr Don Koval	DPF	31638	1E103
4302	Technology Transfer (R&S DEM/VAL)	Mr Nick Montanarelli	DTI	31671	1E167
4305	Min Acc for PET (FOT DEM/VAL)	Mr Nick Montanarelli	DTI	31671	1E167

FY 1994 BUDGET ESTIMATES

DESCRIPTIVE SUMMARIES

FOR THE

OFFICE OF THE SECRETARY OF DEFENSE/WASHINGTON HEADQUARTERS SERVICE

APRIL 1993

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FY 1994 BUDGET ESTIMATES

Program Element: 0601102D
PE Title: Defense Medical Sciences

Budget Activity: 1
Date: April 1993

A. (U) RESOURCES: ($ in Thousands)

Project Number & Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
P504 Research Sciences	0	0	2,021	Continuing	Continuing

B. (U) BRIEF DESCRIPTION OF ELEMENT: The Armed Forces Radiobiology Research Institute (AFRRI) is the primary DoD resource for expertise on radiation injury. AFRRI is ideally positioned to address new radiobiological concerns as they arise whether they be military, industrial, clinical or environmental. This program element is aimed at defining the underlying biological mechanisms and is continually developing new approaches and models for the investigation of radiation damage. The models of radiation damage based on results of this research will ultimately lead to the development of superior protective agents or casualty treatments designed to minimize the short and long-term deleterious consequences of radiation exposure.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN FY 1994

(U) FY 1994 Planned Program:

(U) Characterize the physiological and biochemical mechanisms responsible for functional deficits in neurons after radiation exposure.

(U) Identify specific structural and functional sites of cellular injury following irradiation.

(U) Evaluate the role of the neuroendocrine system (in particular, the hypothalamic-pituitary-adrenal axis) in the response to radiation exposure.

(U) Evaluate changes in adhesion and signalling of endothelial cells, neutrophils and macrophages in response to inflammation.

(U) Characterize DNA damage, identify major DNA radiation products, and evaluate radiation sensitivity of DNA conformational states.

(U) Using electron spin resonance techniques, investigate the fundamental mechanisms of radiation damage in the gut with special focus on the role of nitric oxide free radicals.

(U) Identify mechanisms for regulating hemopoietic stem cells and characterize the temporal sequence of cytokine expression following radiation exposure.

FY 1994 BUDGET ESTIMATES

Program Element: 0601101D
PE Title: In-House Laboratory Research
Budget Activity: 1
Date: April 1993

A. (U) RESOURCES ($ in Thousands)

Project Number & Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
P503 In-House Laboratory Research	0	0	3,368	Continuing	Continuing

B. (U) BRIEF DESCRIPTION OF ELEMENT: This research program of the Uniformed Services University of the Health Sciences (USUHS) is designed to answer basic medical questions of importance to the mission of the Department of Defense in the areas of Combat Casualty Care, Infectious Diseases, and Systems Biotechnology. The program serves to foster creativity, strengthen scientific competence, aid in recruitment and retention of talented scientific and technical personnel, and generate scientific recognition. Most projects represent unique opportunities for low dollar investments with potential for high payoff. This appropriation is important to the USUHS because the University does not have available to it the wide range of funding support that other medical schools have, such as endowments, state and local funds, hospital related income, and research support from pharmaceutical companies.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN FY 1994

(U) FY 1994 Planned Program:

(U) Develop a physical map of the chromosome for V. cholerae.
(U) Identify determinants of virus virulence using murine coronoviruses.
(U) Identify substance that selectively inhibit or enhance the biosynthesis of bioactive peptides.
(U) Examine role of macrophages in the development of tolerance to endotoxin.

(U) WORK PERFORMED BY: All work is performed in-house. Research activities are coordinated at DoD level to avoid unnecessary duplication of effort with other medical research programs.

(U) RELATED ACTIVITIES: Not applicable

(U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable

FY 1994 BUDGET ESTIMATES

Program Element: # 0601103D
PE Title: University Research Initiative

Budget Activity: 1
Date: April 1993

A. (U) RESOURCES ($ in Thousands)

Project Number & Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
P 103 UNIVERSITY RESEARCH INITIATIVE	219,591	317,144	242,611	Continuing	Continuing

B. (U) BRIEF DESCRIPTION OF ELEMENT: The University Research Initiative (URI) provides new knowledge for the future development of advanced military systems; improves the quality of defense research performed at universities; and promotes education of scientists and engineers in disciplines critical to defense needs. URI's principal component is multidisciplinary research. For questions suited to this approach, multidisciplinary activity can accelerate research progress and transition of research results to application. A non-multidisciplinary, Research Initiation Program broadens URI participation to further build the national infrastructure for science and engineering research and education in defense-critical fields. In FY 1994, URI includes the Defense University Research Instrumentation Program, a competitive program to support the acquisition of larger items of research equipment than can usually be funded within single-investigator research awards. URI also supports "people programs:" fellowships and traineeships, to encourage U.S. citizens to pursue graduate study in science and engineering; young faculty awards; and oceanographic education awards, to attract promising young scientists from other fields into post-doctoral positions in oceanography. URI research areas include: electronics; fluid dynamics; biotechnology; materials; electro-optics; manufacturing-related research; and environmental science. In FY 1992 and FY 1993, URI supports other activities identified in the Department of Defense Appropriations Acts for 1992 and 1993.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1992 Accomplishments: The Services and DARPA conducted competitions for "people" programs. Army, Navy and DARPA began new 5-year multidisciplinary efforts, following a competition during FY 1991. Air Force conducted a competition to begin new 4-year awards in 1993. Technical accomplishments included:

* Researchers at Catholic University embedded shape-memory alloy wires in fiberglass-composite beams and plates. The wires serve two purposes. First, they act as sensors, detecting patterns of harmful vibrations in the structures. Second, when selectively heated by active feedback circuits (using the researchers' theory), the wires serve as actuators to drive a coordinated motion that reduces the vibrations. Controlling vibrations should extend service lives of structures such as helicopter rotor blades.

* Investigators at the University of Rochester designed a new laser cavity for semiconductor lasers, using a surface-grating etched onto the laser's optical waveguide structure. The method reduced laser beam divergences from 30 degrees or more to 1 degree. It also produced circular beam profiles, preferable to the elliptical profiles generated by traditional methods. The improved beam characteristics could yield a hundred-fold increase in optical data storage densities.

* University of Pennsylvania and Ohio State University scientists collaborated with Lockheed on the use of the conducting polymer polyaniline to form welds in thermoplastics, high-density polyethylene, and Nylon. Microwaves are used to heat polyaniline placed at the interface of the pieces to be joined. The conducting polyaniline is a self-regulating heating

Program Element: 0601102D
PE Title: Defense Medical Sciences

Budget Activity: 1
Date: April 1993

(U) Investigate mechanisms underlying synergistic effects of chemically distinct radioprotective agents.

(U) WORK PERFORMED BY: The vast majority of research is done by AFRRI. The remaining research is performed in collaboration with the National Academy of Sciences, Washington, DC; National Aeronautics and Space Administration, Langley Research Center, Hampton, VA; Lawrence Berkeley Laboratory, Berkeley, CA; National Institute of Science and Technology, Gaithersburg, MD; and the Uniformed Services University of Health Sciences, Bethesda, MD.

(U) RELATED ACTIVITIES:
PE 0602787D
PE 0603002D
Research activities are coordinated at DoD level to avoid unnecessary duplication of effort with other medical research programs.

(U) OTHER APPROPRIATION FUNDS: Not applicable

(U) INTERNATIONAL COOPERATIVE AGREEMENTS: AFRRI has the following Memoranda of Understanding: 1) Centre de Recherches du Service De Sante des Armees (DEA 1125), France, to conduct research on the mechanism of radiation damage from nuclear weapons (1982-present); 2) Defense Research Organization, Netherlands, (DEA 0096), to exchange information on physical, biological, and medical aspects of radiations associated with nuclear devices and other radiation sources (1986-present).

FY 1994 BUDGET ESTIMATES

Program Element: # 0601110D
PE Title: Focused Research Initiatives

Budget Activity: 1
Date: April 1993

A. (U) RESOURCES ($ in Thousands)

Project Number & Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
P 509 FOCUSED RESEARCH INITIATIVES	0	0	29,472	Cont.	Cont.

B. (U) BRIEF DESCRIPTION OF ELEMENT: The Focused Research Initiative (FRI) establishes a set of DOD-wide, "flagship" research projects fully integrated with and responsive to the DoD Science and Technology Strategy. Its purpose is to accelerate and amplify research efforts in critical, high-payoff avenues where additional resources and activity are needed and can be expected to demonstrate benefits in 3 to 5 years. FRI will select a few major research projects, provide additional funding, centralized leadership and a joint Service/DARPA execution process for these efforts. It will engage universities, industry, defense laboratories, and other research organizations in focusing on critical research topics selected from areas of high national interest such as information sciences, manufacturing sciences, advanced materials, environmental sciences, energy and storage conversion. Special attention will be given to the dual-use aspects of selected programs.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1992 Accomplishments: This is a new FY 1994 start.

(U) FY 1993 Plans: In preparation for the first year of funding for the program (FY 1994), the DDR&E established a senior study group of DOD scientists to develop and implement plans for the initiative. The group will identify the projects to be funded in FY 1994, and provide centralized, joint oversight for program execution by the Services and DARPA. Selection of research areas will be complete by July 1993.

(U) FY 1994 Plans: The DOD study group, with inputs from the DOD-wide and government research communities, will approve the selected research projects for execution by the services. Approximately 4 to 6 critical research projects will be chosen for expanded funding. Projects will supplement and integrate research to make significant thrusts in areas such as information sciences, manufacturing sciences, advanced materials, environmental sciences, energy and storage conversion. Projects will be geared to 3 to 5 year lifetimes, depending on the specific research problems being addressed and the expectation for success. Projects will be awarded on a competitive basis.

(U) Work Performed By: The program will be performed by academic institutions, industrial research laboratories, DOD and non-profit laboratories, and executed by the research offices of the Services and DARPA. Joint projects will be encouraged. An OSD-chaired steering group will assure coordination.

(U) Related Activities: Complementary activities are funded under the Defense Research Sciences Program Elements of the Army, Navy, Air Force, and DARPA (PE's 0601102A, 0601153N, 0601102F, and 0601101E).

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

element that precludes thermal runaway, providing a major advantage over alternative materials for forming the joints. The new method produced joint strengths in polyethylene up to 80% of those in the pure polymer. A potential application of this emerging technology is in the use of plastics to replace metal components in aircraft fuselages, to reduce weight and increase performance.

* Researchers at Columbia University produced the first resonant tunneling, electronic devices in which the charge carriers were holes rather than electrons. Since the holes tunnel through barriers that are twice as wide as achieved with electron tunneling, the devices yield better signal-to-noise ratios (30-to-1) compared to previous limits (6-to-1). The devices also work at room temperature, while previous devices required liquid-nitrogen cooling.

* University of Illinois scientists made dramatic advances in controlling the behavior of ceramic materials that undergo precise deformations when electric fields are applied. The researchers discovered regions of ceramic composition, microstructure, and temperature in which the shape changes are precisely reproducible and reversible. This is important because potential applications of the materials have been limited previously by the irreversible nature of the energy transfer between electrical and mechanical forms. The scientists also made progress toward optimizing the ceramic microstructure to yield greater deformations for given electric fields. The improved control of the materials' behavior promises major improvements in applications such as adaptive mirror structures for directed energy systems and precision actuators and position sensors for avionics systems.

(U) FY 1993 Plans: URI Research Initiation and "people" programs will continue, with competitions for FY 1993 and FY 1994 starts, respectively. Army, Navy and DARPA multidisciplinary efforts will perform their second year of research. Air Force will initiate new multidisciplinary programs.

(U) FY 1994 Plans: Research Initiation (RIP), Augmentation Awards for Science and Engineering Research Training (AASERT) and other "people" programs will continue, with competitions for new starts. FY 1994 will be the third of five years of effort for Army, Navy and DARPA multidisciplinary programs begun in FY 1992 and the second of four years of effort for Air Force multidisciplinary programs begun in FY 1993. The Services and DARPA will competitively start additional multidisciplinary programs in FY 1994 and conduct a competition under the Defense University Research Instrumentation Program.

(U) Work Performed By: The program is performed by academic institutions and executed by the research offices of the Services and DARPA. An OSD-chaired steering group assures coordination.

(U) Related Activities: Complementary activities are funded under the Defense Research Sciences Program Elements of the Army, Navy, Air Force, and DARPA (PE's 0601102A, 0601153N, 0601102F, and 0601101E).

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

Program Element: #0602222D Budget Activity: 1
PE Title: Counterterror Technical Support (CTTS) Date: April 1993

--Remote Vehicle evaluated; operational with the FBI Hostage Rescue Team.

--Started R&D efforts for the Rapid Confinement, Automobile Laser Tag, Underwater Mini-MIRA, Silent Tactical Boots, Sniper Stabilized Platform, Visual Concealment Techniques, and the Virtual Reality Training projects.

(U) FY 1993 Plans

--Complete the Underwater Mini-MIRA, and Silent Tactical Boots projects.

--Continue R&D efforts on the Rapid Confinement, Automobile Laser Tag, Sniper Stabilized Platform, Visual Concealment Techniques, and the Virtual Reality Training projects.

--Start development of Sniper Window Cutter, Mechanical Rebar Cutter, Sniper Coordination System, and Foreign Commercial Explosives projects.

--Start selected international cooperative projects with NATO and Major Non-NATO Allies in accordance with Congressional direction.

(U) FY 1994 Plans

--Complete the Automobile Laser Tag, Rapid Confinement, and Sniper Stabilized Platform projects.

--Continue the Visual Concealment Techniques, Virtual Reality Training, Vehicle Command, Sniper Window Cutter, Mechanical Rebar Cutter, Sniper Coordination System, and Foreign Commercial Explosives projects.

--Start development of Vehicle Command System, Specialized Breaching Systems, and Less-Than-Lethal Devices projects.

--Continue selected international cooperative projects with NATO and Major Non-NATO Allies in accordance with Congressional direction.

(U) Work Performed By: Sandia National Laboratories, Albuquerque, NM; Hughes Aircraft Company, Los Angeles, CA; EG&G/Remote Sensing Laboratory, Las Vegas, NV; Battelle Columbus Laboratory, Columbus, OH; NASA/Jet Propulsion Laboratory, Pasadena, CA and Talley Industries, Phoenix, AZ. Executive program direction is provided by OASD(SO/LIC), technical oversight by ODDR&E, and program management by the Office of Special Technology, Indian Head, MD.

(U) Related Activities: Program provides a coordinated response to national requirements for technology and rapid prototyping to counter terrorism. Individual Services and other Executive Branch agencies establish follow-on programs for full-scale development (if required), procurement, and fielding. Coordination between OASD(SO/LIC), ODDR&E, and DoD Counternarcotics Program Offices addresses duplication within DoD; and interagency participation addresses duplication of efforts nationally.

(U) Other Appropriation Funds: Department of State.

(U) International Cooperative Agreements: Bilateral technology exchanges and joint execution of projects.

FY 1994 BUDGET ESTIMATES

Program Element: #0602222D
PE Title: Counterterror Technical Support (CTTS)
Budget Activity: 1
Date: April 1993

A. (U) RESOURCES: ($ in Thousands)

Proj No. & Title P484	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
o Hostage Rescue Support	1,000	800	1,100	Cont	Cont
o Personnel Protection/Intrusion Detection	1,400	900	1,000	Cont	Cont
o Chemical/Biological Threats	1,000	1,000	1,000	Cont	Cont
o Explosive Detection/Explosive Ordnance Disposal	1,000	1,100	1,500	Cont	Cont
o Target Security	400	700	700	Cont	Cont
o Surveillance and Threat Assessment	1,712	1,868	869	Cont	Cont
o International Cooperative Projects (all areas above)	0	3,000	Cont	Cont	Cont
Total	**6,512**	**9,368**	**6,169**	**Cont**	**Cont**

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program develops technology and initial prototype equipment having direct operational application in the national effort to counter terrorism. The program concurrently pursues many sub-projects addressing two programmatic objectives: (1) focused technology, developing initial prototypes for evaluation within 12-24 months and (2) less focused, longer timeframe, technology development. Individual projects include technologies to support counterterrorism relative to: hostage rescue support; personnel protection; unconventional (chemical/biological) devices; attack of installations, infrastructure, and the general populace; explosive detection/Explosive Ordnance Disposal; and technology for surveillance and terrorist threat assessment/information processing and dissemination. The program supports and is integrated into the interagency, national response to terrorism. The program specifically avoids duplication of other R&D efforts and is not a substitute for other DoD and Executive Branch programs to counter terrorism. This program's focus is future terrorist threats and multiple agency requirements and is a continuation of the national counterterrorism program that was funded by Department of State (DoS) under the aegis of the Technical Support Working Group (TSWG). TSWG, which is co-chaired by DoD and DoE and has multi-agency membership, is the R&D working group under the auspices of the National Security Council's Policy Coordinating Committee on Terrorism which is chaired by DoS. The TSWG prioritizes requirements on an annual basis which, when approved, become program requirements.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0M IN FY 1994:

1. (U) **Hostage Rescue Support.**

(U) FY 1992 Accomplishments
--Completed design of Police Water Disrupter.
--Completed design and fabrication of simulated diversionary devices; operational by CT teams.

Program Element: #0602222D Budget Activity: 1
PE Title: Counterterror Technical Support (CTTS) Date: April 1993

2. (U) **Personnel Protection/Intrusion Detection:**

(U) FY 1992 Accomplishments
--Completed the Enhanced Body Armor project.
--Continued development of the Iris Pattern Identification, BombCAD On-Site Vulnerability, Advanced Jammer, and Airborne Intrusion Detection projects.
--Started R&D effort on Computerized Voice Identification system.

(U) FY 1993 Plans
--Complete Iris Pattern Identification, BombCad On-Site Vulnerability, Jammer, and Airborne Intrusion Detection projects.
--Continue the Computerized Voice Identification system.
--Start R&D efforts on Transparent Armor Ceramics, Trace Documents Signatures, and Car Bomb effects.

(U) FY 1994 Plans
--Complete the Computerized Voice Identification System.
--Continue the Transparent Armor Ceramics, Trace Documents Signatures, and Car Bomb Effects projects.
--Start R&D efforts on Enhanced Document/Fingerprints Techniques, and Advanced Personnel Screening projects.

(U) Work Performed By: Los Alamos National Laboratory, Los Alamos, NM; Law Enforcement Standards Laboratory, Gaithersburg, MD; Lorron Corporation, Boston, MA, and Electronic Warfare Associates, Vienna, VA. Executive program direction is provided by OASD(SO/LIC), technical oversight by ODDR&E, and program management by the Office of Special Technology, Indian Head, MD.

(U) Related Activities: Program provides a coordinated response to national requirements for technology and rapid prototyping to counter terrorism. Individual Services and other Executive Branch agencies establish follow-on programs for full-scale development (if required), procurement, and fielding. Coordination between OASD(SO/LIC), ODDR&E, and DoD Counternarcotics Program Offices addresses duplication within DoD; and interagency participation addresses duplication of efforts nationally.

(U) Other Appropriation Funds: Department of State.

(U) International Cooperative Agreements: Bilateral technology exchanges and joint execution of projects.

Program Element: #0602222D Budget Activity: 1
PE Title: Counterterror Technical Support (CTTS) Date: April 1993

3. (U) **Chemical/Biological Threats**

(U) FY 1992 Accomplishments
--Completed the Vehicle Protection, Miniature Chemical Vapor Detector, and Adsorbent Tube Material Agent Sampler projects.
--Continued development of the CB In-Canister Detector, and CB Mitigation System projects.
--Started R&D effort on the Rapid Response CT Field Chemical Analysis project.

(U) FY 1993 Plans
--Complete the CB In-Canister Detector, and CB Mitigation projects.
--Continue the Rapid Response CT Field Chemical Analysis project.
--Start R&D efforts on Atmospheric Sampling Mass Spectrometer, CB Aerosol Mitigation, and Remote Chemical Agent Monitor projects.

(U) FY 1994 Plans
--Complete the Rapid Response CT Field Chemical Analysis project.
--Continue the Atmospheric Sampling Mass Spectrometer, CB Aerosol Mitigation, and Remote Chemical Agent Monitor projects.
--Start R&D efforts on the Multi-Spectral Enhancements to Rapid Response Capabilities, Portable Backscatter Adsorption Imaging, and Remote Nuclear Material Detector projects.

(U) Work Performed By: AAI Corporation, Baltimore MD; Battelle Columbus Laboratory, Columbus OH; Microsensors Systems, Incorporated, Bowling Green KY, and Sandia National Laboratory, Albuquerque, NM. Executive program direction is provided by OASD(SO/LIC), technical oversight by ODDR&E, and program management by the Office of Special Technology, Indian Head, MD.

(U) Related Activities: Program provides a coordinated response to national requirements for technology and rapid prototyping to counter terrorism. Individual Services and other Executive Branch agencies establish follow-on programs for full-scale development (if required), procurement, and fielding. Coordination between OASD(SO/LIC), ODDR&E, and DoD Counternarcotics Program Offices addresses duplication within DoD; and interagency participation addresses duplication of efforts nationally.

(U) Other Appropriation Funds: Department of State.

(U) International Cooperative Agreements: Bilateral technology exchanges and joint execution of projects.

Program Element: #0602222D
PE Title: Counterterror Technical Support (CTTS)

Budget Activity: 1
Date: April 1993

4. (U) **Explosive Detection/Explosive Ordnance Disposal**

(U) FY 1992 Accomplishments
--Completed the Taggants project.
--Continued development of the NQR Explosive Detector.
--Started R&D effort on Enhanced Canine Explosive Detection, Advanced Taggants and Detectors Enhancement, and Detonator Tag projects.

(U) FY 1993 Plans
--Complete the NQR Explosive Detector.
--Continue the Enhanced Canine Explosive Detection, Advanced Taggants and Detectors Enhancement, and Detonator Tag projects.
--Start R&D efforts on NQR for Other Explosives, Vapor/Particle Transfer and Advanced Biosensors projects.

(U) FY 1994 Plans
--Complete the Advanced Taggants and Detectors Enhancement, Detonator Tag, and Database of Explosives projects.
--Continue Enhanced Canine Explosive Detection, Vapor/Particle Transfer and Advanced Biosensors projects.
--Start R&D efforts on Multi-Sensor Explosive Detection, Aircraft Blast Effects, IED Specialized Tools.

(U) Work Performed By: EG&G Special Technologies Laboratory, Santa Barbara, CA and Auburn University, Auburn, AL. Executive program direction is provided by OASD(SO/LIC), technical oversight by ODDR&E, and program management by the Office of Special Technology, Indian Head, MD.

(U) Related Activities: Program provides a coordinated response to national requirements for technology and rapid prototyping to counter terrorism. Individual Services and other Executive Branch agencies establish follow-on programs for full-scale development (if required), procurement, and fielding. Coordination between OASD(SO/LIC), ODDR&E, and DoD Counternarcotics Program Offices addresses duplication within DoD; and interagency participation addresses duplication of efforts nationally.

(U) Other Appropriation Funds: Department of State.

(U) International Cooperative Agreements: Bilateral technology exchanges and joint execution of projects.

Program Element: #0602222D
PE Title: Counterterror Technical Support (CTTS)

Budget Activity: 1
Date: April 1993

5. (U) **Target Security**

(U) FY 1992 Accomplishments
--Started R&D effort on the Timer Detector, Facial Identification and Target Stand-off Protection projects.

(U) FY 1993 Plans
--Complete the Timer Detector, and Target Stand-off Protection projects.
--Continue the Facial Identification project.

(U) FY 1994 Plans
--Continue the Facial Identification project.
--Start R&D efforts on Infrastructure Protection Techniques.

(U) Work Performed By: Sandia National Laboratory, Albuquerque, NM and EG&G Remote Sensing Laboratory, Las Vegas, NV. Executive program direction is provided by OASD(SO/LIC), technical oversight by ODDR&E, and program management by the Office of Special Technology, Indian Head, MD.

(U) Related Activities: Program provides a coordinated response to national requirements for technology and rapid prototyping to counter terrorism. Individual Services and other Executive Branch agencies establish follow-on programs for full-scale development (if required), procurement, and fielding. Coordination between OASD(SO/LIC), ODDR&E, and DoD Counternarcotics Program Offices addresses duplication within DoD; and interagency participation addresses duplication of efforts nationally.

(U) Other Appropriation Funds: Department of State.

(U) International Cooperative Agreements: Bilateral technology exchanges and joint execution of projects.

Program Element: #0602222D
PE Title: Counterterror Technical Support (CTTS)

Budget Activity: 1
Date: April 1993

6. (U) **Surveillance and Threat Assessment:**

(U) FY 1992 Accomplishments

--Completed the Terrorist Watch List Database Enhancement (Fuzzy Finder) and Enhanced Imaging Radar projects.

--Started R&D efforts on the CACTIS Sorter, Wideband Antenna, Signal Intelligence Collector, and Automobile Countermeasures projects.

(U) FY 1993 Plans

--Complete CACTIS Sorter and Automobile Countermeasures projects.

--Continue the Wideband Antenna and Signal Intelligence Collector projects.

--Start R&D efforts on Passive Coatings, Laser Access System, Radar Tagging, Multi-Lingual Name Search System, and Enhanced Laser Microphone projects.

(U) FY 1994 Plans

--Complete the Wideband Antenna, and Signal Intelligence Collector projects.

--Continue the Passive Coatings, Laser Access System, and Radar Tagging, Multi-Lingual Name Search System, and Enhanced Laser Microphone projects.

(U) Work Performed By: V Analysis Corporation, Arlington, VA; General Dynamics, Pomona, CA; and EG&G Remote Sensing Laboratory, Las Vegas, NV. Executive program direction is provided by OASD(SO/LIC), technical oversight by ODDR&E, and program management by the Office of Special Technology, Indian Head, MD.

(U) Related Activities: Program provides a coordinated response to national requirements for technology and rapid prototyping to counter terrorism. Individual Services and other Executive Branch agencies establish follow-on programs for full-scale development (if required), procurement, and fielding. Coordination between OASD(SO/LIC), ODDR&E, and DoD Counternarcotics Program Offices addresses duplication within DoD; and interagency participation addresses duplication of efforts nationally.

(U) Other Appropriation Funds: Department of State.

(U) International Cooperative Agreements: Bilateral technology exchanges and joint execution of projects.

FY 1994 BUDGET ESTIMATES

Program Element: #0602227D
PE Title: Medical Free Electron Laser

Project Number: P483
Budget Activity: 1
Date: April 1993

A. (U) RESOURCES ($ in thousands)

Project Title: Medical Free Electron Laser

Popular Name	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
MFEL	23,000	18,755	19,248	Cont	Cont

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: The Medical Free Electron Laser (MFEL) program seeks to develop and enhance free electron laser technology and to assess how the unique characteristics of FELs may be exploited for applications in medical, biophysical, and materials science research.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1992 Accomplishments:

- Duke University Mark III FEL became operational in the second quarter of 1992.
- Increased biophysical and materials research on existing FELs.
- Added another FEL center at the University of California, Santa Barbara to operate in the far infrared region unattainable by existing lasers.

(U) FY 1993 Plans:

- The MFEL program efforts will continue to be focused on developing applications of FEL technology in medicine, photobiology, surgery, diagnosis, and materials science.
- Completion of the 1 GeV storage ring at Duke University with continuing development of an x-ray FEL.

(U) FY 1994 Plans:

- Continue Biophysical and materials research on existing FELs.
- Continue focus on developing applications of FELs technology in medicine, photobiology, surgery, and materials science.

Program Element: #0602227D
PE Title: Medical Free Electron Laser

Project Number: P483
Budget Activity: 1
Date: April 1993

D. (U) WORK PERFORMED BY:

Massachusetts General Hospital, Boston, MA
University of Utah, Salt Lake City, UT
Baylor Research Foundation, Dallas, TX
University of California, Irvine, CA
University of California, Santa Barbara, CA
Duke University, Durham, NC
Stanford University, Palo Alto, CA
Vanderbilt University, Nashville, TN
Fiske University, Nashville, TN
Rice University, Houston, TX
Purdue University, Lafayette, IN
University of Colorado, Boulder, CO

E. (U) COMPARISON WITH PREVIOUS DESCRIPTIVE SUMMARIES: Corresponds to previous summaries.

F. (U) PROGRAM DOCUMENTATION: None

G. (U) RELATED ACTIVITIES: PE No. 0603221C; PMA 1301, Free Electron Laser. There is no unnecessary duplication of effort within DoD.

H. (U) OTHER APPROPRIATION FUNDS: None.

I. (U) INTERNATIONAL AGREEMENTS: None.

J. (U) FY 1993 MILESTONE SCHEDULE:

- Completion of phase one of the 1GeV storage ring at Duke University: commissioning at reduced energy completed.
- Recompetition of entire program with peer review and site visits.
- Completion of the IR microscope on the Stanford FEL coupled with a synchronized tunable dye laser for two-color experiments.

(U) FY 1994 MILESTONE SCHEDULE:

- Demonstration of Compton backscattering capability at Vanderbilt FEL.
- Production of hard UV radiation from Duke FEL.
- First animal experiments performed with FEL radiation.

FY 1994 BUDGET ESTIMATES

Program Element: 0602756D
Title: DoD Software Technology Initiative

Budget Activity: 1
Date: April 1993

A. (U) RESOURCES ($ in Thousands)

Project Number & Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
P501 DoD Software Technology Initiative	0	0	43,304	Continuing	Continuing

B. (U) BRIEF DESCRIPTION OF ELEMENT: Current DoD Science and Technology (S&T) software programs contain numerous technologies of potentially great value to the S&T Thrust Area Advanced Technology Demonstrations (ATDs), and to DoD legacy and future mission-critical systems. These recipients will require significantly increasing levels of flexibility, interoperability, autonomy, and information processing performance. The evolving technologies offer the promise of substantial benefit to the ATDs, but at present they are often not sufficiently mature to be incorporated for use directly. This new initiative, which begins in FY 1994, will: (1) support the DoD Thrust Areas by proving significant and timely boosts to ATDs through experimental use of technologies on ATD applications; and (2) address current technology voids in the DoD software S&T program. Implementation of this program will help strengthen ATD capabilities, reduce ATD software risks, and improve the scalability, maintainability, portability, and "shelf-life" of software products. Providing explicit evidence of the utility of emerging technology is a key element. This program will also address complementary science efforts and provide technology for DoD systems (both legacy and future). Projects identified as representative of potential candidates for consideration include: megaprogramming technology; intelligent database mediator technology for interoperability of heterogeneous databases; assured computing technology for survivable computation; smart tools and environments for high performance computing applications; Ada 9X acceleration; and software science-base investments stimulated by ATD applications experience.

C. (U) WORK PERFORMED BY: In-house work, including management and support will be performed by the Services and DARPA, as determined by an approved DoD Software Technology Initiative Plan. Contractor work will be performed by those contractors selected by the Services and DARPA as a result of a FY 1993 Call for Proposals to accomplish the efforts in support of this initiative.

D. (U) RELATED ACTIVITIES: The work performed under Program Element #0602756D is complementary to the work performed in the program elements cited below. There will be no unnecessary duplication of effort within the Services or DARPA.

- PE #0601102A Defense Research Sciences
- PE #0602783A Computer and Software Technology
- PE #0602789A Army Artificial Intelligence Technology

Program Element: 0602756D
Title: DoD Software Technology Initiative

Budget Activity: 1
Date: April 1993

- o PE #0603722A Advanced Tactical Computer Science & Sensor Tech
- o PE #0601153N Defense Research Sciences
- o PE #0602234N Materials, Electronics, and Computer Technology
- o PE #0601102F Defense Research Sciences
- o PE #0602702F Command, Control, and Communications
- o PE #0603728F Advanced Computer Technology
- o PE #0601101E Defense Research Sciences
- o PE #0602301E Computing Systems and Communications Technology
- o PE #0603756D Consolidated DoD Software Initiative (Ada)

E. (U) OTHER APPROPRIATION FUNDS: None

F. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: None

FY 1994 BUDGET ESTIMATES

Program Element: 0602787D
PE Title: Defense Medical Technology

Budget Activity: 1
Date: April 1993

A. (U) RESOURCES: ($ in Thousands)

Project Number & Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
P505 Medical Technology	0	0	6,737	Continuing	Continuing

B. (U) BRIEF DESCRIPTION OF ELEMENT: The Armed Forces Radiobiology Research Institute (AFRRI)is the only DoD in-house research laboratory uniquely concerned with the biomedical effects of ionizing radiation, and dedicated to support the medical and operational requirements of the Armed Forces. The proliferation of countries with nuclear capabilities, the identification of U.S. military personnel with "Desert Storm" injuries involving depleted uranium munitions all require study. Also increased appreciation of the threats posed by biological and chemical warfare agents have added to the demand for biomedical information on radiation effects. Additionally, the likely increased presence of personnel in outer space, a naturally high radiation environment, will further increase the requirement for models of radiation damage. The dedicated AFRRI research program is comprehensive; from biochemical to behavioral, from genes to whole organisms, and from acute to chronic or late effects. The goals of the program are to "harden" the human component against the deleterious effects of radiation damage and thereby sustain combat capability, increase survival, and minimize long-term health problems.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN FY 1994

(U) FY 1994 Planned Program:

(U) Initiate studies of the radiological and chemical toxicity of depleted uranium fragments imbedded in tissues.
(U) Complete the studies to determine the radiation levels required to neutralize relevant biological warfare agents.
(U) Identify brain and central nervous system susceptibility to dose, dose rate, and radiation type (e.g. neutrons).
(U) Develop *in vivo* models for analyzing radiation effects on vascular integrity and function.
(U) Identify biological effectiveness of neutrons for hemopoietic and gastrointestinal syndromes in large animal models.

Program Element: 0602787D | Budget Activity: 1
PE Title: Defense Medical Technology | Date: April 1993

(U) Use pharmacologic approaches to prevent or correct radiation-induced damage to cell structures and

(U) Elucidate novel treatment protocols for radiation-induced bone marrow aplasia and gastrointestinal injury.

(U) Assess the motor performance and cognitive effects of different radiations (e.g. neutrons, gamma rays, charged particles), dose rates, and the cumulative effects of multiple exposures.

(U) Continue with studies aimed at quantifying the hemopoietic stem cell compartment of various species in order to develop a sound basis for extrapolation of animal radiation survival data to man.

(U) Determine effects of gamma and neutron radiation dose and dose-rate on non-neuronal cells of the brain.

(U) WORK PERFORMED BY: The vast majority of research is done by AFRRI. The remaining research is performed in collaboration with the National Academy of Sciences, Washington, DC; National Aeronautics and Space Administration, Langley Research Center, Hampton, VA; Lawrence Berkeley Laboratory, Berkeley, CA; National Institute of Science and Technology, Gaithersburg, MD; and the Uniformed Services University of Health Sciences, Bethesda, MD.

(U) RELATED ACTIVITIES:
PE 0601101D
PE 0603002D
Research activities are coordinated at DoD level to avoid unnecessary duplication of effort with other medical research programs.

(U) OTHER APPROPRIATION FUNDS: Not applicable

(U) INTERNATIONAL COOPERATIVE AGREEMENTS: AFRRI has the following Memoranda of Understanding: 1) Centre de Recherches du Service De Sante des Armees (DEA 1125), France, to conduct research on the mechanism of radiation damage from nuclear weapons (1982-present); 2) Defense Research Organization, Netherlands, (DEA 0096), to exchange information on physical, biological, and medical aspects of radiations associated with nuclear devices and other radiation sources (1986-present).

FY 1994 BUDGET ESTIMATES

Program Element: #0602790D
PE Title: SMALL BUSINESS INNOVATIVE RESEARCH (SBIR) & SMALL BUSINESS TECHNOLOGY TRANSFER PILOT PROGRAM (STTR)

Budget Activity: 1
Date: April 1993

A. (U) RESOURCES ($ in thousands)

Project Number & Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	Cost To Complete	Total Program
P502	0	15,249	24,703	Cont.	Cont.

B. (U) DESCRIPTION: The SBIR and STTR programs are statutorily mandated programs designed to help small businesses better compete for government research funding. In previous years, SBIR has been reprogrammed (via DD Form 1415 or 1416) into separate line item during the year of budget execution. This has been a cumbersome process that delays the provisions of funds to small businesses. The establishment of this program element demonstrates the extent to which DoD resources are devoted to this program. STTR is a new program beginning in FY 1994. These programs will be redirected toward dual use and defense reinvestment efforts.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1992 ACCOMPLISHMENTS: Not Applicable

2. (U) FY 1993 PROGRAM: Funds will be transferred to DARPA for projects resulting from the 1993 solicitations. These projects will be derived from DARPA topics (Phase I -Feasibility Studies and Phase II - Research & Development).

3. (U) FY 1994 PLANS: Continue the efforts conducted in FY 1993 and begin the efforts associated with the STTR program. The STTR program will require the small business to perform work in conjunction with universities, Federally Funded Research and Development Centers (FFRDCs), or non-profit organizations. Funds will be transferred to DARPA for projects resulting from the 1993 solicitations. These projects will be derived from DARPA topics (Phase I -Feasibility Studies and Phase II - Research & Development).

(U) Prior Accomplishments:
- SBIR funds were transferred from individual accounts based on statutorily defined percentages of extramural RDT&E budgets.
- STTR is a new program that will be initiated in FY 1994.

Program Element: #0602790D
PE Title: SMALL BUSINESS INNOVATIVE RESEARCH (SBIR) & SMALL BUSINESS TECHNOLOGY TRANSFER PILOT PROGRAM (STTR)

Budget Activity: 1
Date: April 1993

D. (U) WORK PERFORMED BY: Small Businesses selected by DARPA based on evaluations and proposals in response to solicitations.

E. (U) COMPARISON WITH PREVIOUS DESCRIPTION: Not Applicable

1. (U) TECHNOLOGY CHANGES: Not Applicable

2. (U) SCHEDULE CHANGES: Not Applicable

3. (U) COST CHANGES: Not Applicable

F. (U) PROGRAM DOCUMENTATION: Not applicable

G. (U) RELATED ACTIVITIES: Not Applicable

FY 1994 BUDGET ESTIMATES

Program Element: 0603002D
PE Title: Medical Advanced Technology

Budget Activity: 2
Date: April 1993

A. (U) RESOURCES: ($ in Thousands)

Project Number & Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
P506 Medical Advanced Technology	0	0	4,701	Continuing	Continuing

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program element is the sole in-house Department of Defense (DoD) effort to develop new strategy treatment protocols for correcting radiation-induced damage to the hemopoietic and gastrointestinal organ systems. Based on plausible new world order nuclear scenarios involving terrorist and/or regional conflicts, one would expect a manageable number of radiation casualties treatable at medical facilities capable of administering new generation treatment protocols. These conflict scenarios also predict the utility of providing a combination of radioprotective pharmaceuticals in the case of adequate forewarning or for use by rescue personnel entering areas contaminated by radioisotopes. With this in mind, it is possible that recovery may be induced after a broad range of radiation doses associated with hemopoietic and gastrointestinal damage. Research efforts are focused on developing and testing new generation protocols for treatment of marrow aplasia, infection, and gastrointestinal injury as well as the assessment of exposure using cytogenetic techniques. These efforts include the evaluation of new combinations of compounds that confer radioprotection against low dose effects and multiple exposures, while remaining free of performance degrading toxicity.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN FY 1994

(U) FY 1994 Planned Program:

(U) Evaluate radioprotective compounds for efficacy in chronic and low dose exposure models.
(U) Recommend the best treatment strategies for prevention of infection and enhancing recovery from radiation-induced marrow aplasia in preclinical animals models.
(U) Design and evaluate therapeutic strategies for treatment of radiation damage to the hemopoietic and gastrointestinal system.

Program Element: 0603002D
PE Title: Medical Advanced Technology

Budget Activity: 2
Date: April 1993

(U) Develop and validate an integrated system to perform biological dosmetry measurements based on analyses of chromosome aberrations using the fluorescent in situ hybridization technique.

(U) WORK PERFORMED BY: The vast majority of research is done by AFRRI. The remaining research is performed in collaboration with the National Academy of Sciences, Washington, DC; National Aeronautics and Space Administration, Langley Research Center, Hampton, VA; Lawrence Berkeley Laboratory, Berkeley, CA; National Institute of Science and Technology, Gaithersburg, MD; and the Uniformed Services University of Health Sciences, Bethesda, MD.

(U) RELATED ACTIVITIES:
PE 0601101D
PE 0602787D
Research activities are coordinated at DoD level to avoid unnecessary duplication of effort with other medical research programs.

(U) OTHER APPROPRIATION FUNDS: Not applicable

(U) INTERNATIONAL COOPERATIVE AGREEMENTS: AFRRI has the following Memoranda of Understanding: 1) Centre de Recherches du Service De Sante des Armees (DEA 1125), France, to conduct research on the mechanism of radiation damage from nuclear weapons (1982-present); 2) Defense Research Organization, Netherlands, (DEA 0096), to exchange information on physical, biological, and medical aspects of radiations associated with nuclear devices and other radiation sources (1986-present).

Program Element: # 0603225D
PE Title: Joint DoD/DOE Munitions Technology Development

Budget Activity: 2
Date: April 1993

(U) We have demonstrated the existence of a new class of high energy materials using chemical species that normally produce high energy, but at a low rate of reaction which is limited by particle size. The new materials are finely mixed (nanoscale) resulting in reaction rates up to 1000 times faster than in the normal coarse material. Careful fabrication of the materials permits us to tune the reaction rate. We will continue our studies of fabrication variables and characterization of the resulting materials.

(U) We have initiated a program to understand the metallurgy of tantalum for SADARM production. A better understanding is expected to yield significant savings during procurement of this munition and other munitions that utilize tantalum, such as the TOW2B.

FY 1993 Planned Program:

(U) Continue development of all-solid-state initiation systems toward smarter, less costly, and more compact units. Continue the transition of the technology to fielded weapons systems. Emphasis will be on the development of new initiation mechanisms, such as laser initiation.

(U) Continue the pursuit of ultra-high energy density materials. Produce trace amounts of a new energetic, metastable phase of carbon or nitrogen. Continue our study of nanoscale materials.

(U) Build prototypes of a new neural net computer chip that has been jointly conceived by DOE researchers and engineers at the Naval Air Warfare Center at China Lake.

(U) Transition the 3D ALE Code to DoD users.

(U) Continue the implementation of simulation codes to massively-parallel computer architecture. Incorporate turbulent mixing with chemical reactions into the working hydrocodes as a first step in the development of a design tool for warheads that utilize reactive materials.

(U) Continue programs to test and develop methods for demilitarization of conventional high-explosive materials.

(U) Initiate new projects in response to requests by the DoD service laboratories and other service components.

FY 1994 Planned Programs:

(U) Continue investigations into application of advanced technologies that exist in the DOE Laboratories to the solution of conventional munitions problems.

(U) Transition the neural nets technology under development in the '93 program.

(U) Transition massively-parallel versions of CTH and MESA to DoD users.

(U) Continue the development of advanced initiation systems for new and fielded munitions.

Program Element: # 0603225D
PE Title: Joint DoD/DOE Munitions Technology Development

Budget Activity: 2
Date: April 1993

(U) Continue programs to test and develop methods for demilitarization of conventional high-explosive materials. In this period, we expect to have developed pilot plants and to be transitioning the technology to DoD and its contractors.

(U) Continue to respond to urgent DoD needs for investigations in support of critical munitions problems, such as metallurgy of production materials and new warhead concepts.

D. (U) WORK PERFORMED BY: Lawrence Livermore, Los Alamos, and Sandia National Laboratories.

FY 1994 BUDGET ESTIMATES

Program Element: 0603704D
PE Title: Special Technology Support

Project Number: P 704
Budget Activity: 2
Date: April 1993

A. (U) RESOURCES ($ in Thousands)

Project Title	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	To Complete	Total Program
Special Technology Support	9,677	8,743	8,841	ongoing	ongoing

B. (U) BRIEF DESCRIPTION OF ELEMENT: Special Technology Support to Intelligence and Light Forces emphasizes the rapid development of equipment and systems to satisfy worldwide intelligence, secure communications and light forces requirements. Initiatives under this program will provide for the research, design, development, integration, test and evaluation of new or upgraded equipment/systems for US and allied/friendly forces. By Congressional direction for FY 1990 and beyond, this program element combines two projects previously funded under other program elements -- the Counter Insurgency Special Technology Program which was part of the Force Enhancements-Active Program (PE 1110011D), and a portion of the Equipment Upgrade Program (PE 0203745A).

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN FY 1994

FY 1992 Program Development/demonstration of:
- CINCFOR Intelligence Enhancement Program
- Tactical Application of Imagery
- Low Cost Weather Avoidance System
- Man Portable SOCRATES
- Tactical Data Collection and Analysis Management System

FY 1993 Program Planned development/demonstration of:
- Infrared and Low Light Fusion
- Threat Data Paging
- Pattern Correlation and Analysis
- Integration of 4D and TACFAST/LANTDIS Technology
- Foliage Penetration Radar SAR Data Processing
- Remote Intelligence Transmission System

Program Element: 0603704D
PE Title: Special Technology Support

Project Number: P 704
Budget Activity: 2
Date: April 1993

FY 1994 Planned Program This is a rapid prototyping program which fields technology to meet the requirements of the Intelligence and Light Forces communities. Projects are nominated by the communities in response to specific criteria established by OASD(C3I). The proposed projects are reviewed for technical feasibility and to ensure there is no duplication of effort within DoD. For additional information, please refer to the Classified Congressional Budget Justification Book.

Program to Completion This is a continuing program.

D. (U) **WORK PERFORMED BY:** The Office of Special Technology located at the Naval Explosive Ordnance Disposal Technology Center, Indian Head, MD, manages the overall program and provides project/task oversight. Subprojects/tasks are performed by numerous DoD and other R&D activities (most notably: Stanford Communications, Annapolis, MD; EG&G, Goleta, CA; Harris Corporation, Melbourne, FL; Southwest Research Institute, San Antonio, TX; S-TRON, Redwood City, CA; Air Force Rome Air Development Center, Rome, NY; Los Alamos National Laboratories, Los Alamos, NM; Motorola, Scottsdale, AZ; Research Design Resources, Fairfax, VA; Hilton Systems, Inc., Indian Head, MD; and RDR, Inc., Fairfax, VA).

E. (U) **RELATED ACTIVITIES:** The program provides a coordinated response to individual J-2, Defense Intelligence agencies and Service requirements for rapid prototyping of equipment. The individual Services/Unified and Specified Commands establish follow-on programs for full-scale development, procurement and fielding and logistical support.

F. (U) **OTHER APPROPRIATION FUNDS:** None

G. (U) **INTERNATIONAL COOPERATIVE AGREEMENTS:** N/A

FY 1994 BUDGET ESTIMATES

Program Element: 0603705D | Budget Activity: 2
PE Title: Manufacturing Science and Technology (MS&T) | Date: April 1993

A. (U) RESOURCES: ($ in Thousands)

Project Number & Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	Cost to Complete	Total Program
P475 Manufacturing S&T	18,694	0*	147,733	Cont.	Cont.
TOTAL	18,694	0*	147,733	Cont.	Cont.

* See Para H.

B. (U) DESCRIPTION: This program element consolidates the Service and Defense Logistics Agency (DLA) Manufacturing Technology (ManTech) programs with the DoD Science and Technology (S&T) program. The new Manufacturing Science and Technology (MS&T) program will provide a seamless flow of process technology covering the full life cycle spectrum, including weapon system development, acquisition, repair and remanufacturing. The program strategy will provide support for process technologies to assure a balance of product and process technologies in the R&D program. It will focus on critical components for DoD weapon systems, and makes possible dealing with affordability issues in the pre-acquisition (S&T) phases of development where process issues can be addressed less expensively. The program rounds out other affordability investments in 6.2 tech base and 6.3a Advanced Technology Development.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1992 ACCOMPLISHMENTS: Per Congressional direction, funds were transferred to the Services for execution. Examples of activity follow:

- (U) Work was initiated on: Navy's Materials Joining Center and Gear Manufacturing Center.

- (U) Work was completed on: Air Force shot peening, thermoplastic airframe manufacturing, and propulsion initiative; Army's testing process for monolithic microwave integrated circuits.

- (U) Work continued on: Air Force metal matrix composites; Navy's spray metal forming, and laser material processing; and Army's dewars for focal plane arrays.

2. (U) FY 1993 PROGRAM: Not applicable.

3. (U) FY 1994 PLANS:

Program Element: 0603705D Budget Activity: 2
PE Title: Manufacturing Science and Technology (MS&T) Date: April 1993

a. (U) Manufacturing Systems: The support functions which plan, schedule, and control all factory and supplier processes and operations (i.e., production management and manufacturing engineering) are estimated to comprise over one-third of total corporate costs and over fifty percent of in-plant costs. Reduction of these costs will significantly improve the affordability of DoD systems and components. This sub-thrust will invest in initiatives that decouple the cost/quantity relationship, such as tools and methodologies for standard data exchange and interoperability; creating synthetic environments for planning, designing, and analyzing factory and process flow/strategies; developing new "rules and tools" for integrated product/process development (IPPD); continuing enterprise integration activities; and integrating data bases and networks across flexible, dual-use manufacturing enterprises. Examples of sub-thrust activities:

- (U) Demonstrate the utility and affordability of networked data exchange among prime contractors and suppliers, including the interoperability of information system products from multiple vendors.

- (U) Design a computer based modeling system which enables the capture of manufacturing knowledge and best practices that can be applied to the design process and thus enable affordability and improve cost engineering.

- (U) Demonstrate virtual manufacturing simulation for the factory environment to enable pre-hardware validation of processes and validate both military and commercial user needs across a dual-use manufacturing sector.

- (U) Develop feature-based design tools with Computer Aided Design (CAD) models for affordability assessments in the conceptual stage of product design.

b. (U) Precision Machining: DoD systems are becoming more dependent on high precision machined parts and components to maintain technological and performance superiority. For example, high tolerance components are required to achieve tracking and pointing accuracies for surveillance satellites, and smoothness requirements for stealth systems. The ability to provide affordable, repeatable, precision components is beyond the capability of today's machining practices. This sub-thrust has a goal of enabling producibility of weapons systems and improving life cycle affordability through MS&T investments in advanced metalworking technologies. The range of manufacturing processes to be addressed include mechanical and structural processing, material removal, heat treatment, chemical processing, finishing, joining, welding, casting and forming. The accuracy and repeatability of precision tools will be demonstrated through open architecture machine controllers, development of next generation machine tools, and sensor development and integration. Examples of sub-thrust activities:

Program Element: 0603705D Budget Activity: 2
PE Title: Manufacturing Science and Technology (MS&T) Date: April 1993

- (U) Demonstrate and create advanced work cells and computer controlled tools which improve precision, and offer major affordability improvements to military and dual-use hardware.

- (U) Develop common open architecture for machine tool controllers to permit seamless transfer of process standards and specifications between workcells and work stations.

- (U) Develop advanced machine tool components and processes which provide improved tolerances, higher accuracy, and yield significant improvements in precision.

- (U) Demonstrate technologies that lower the sensitivity of unit costs to changes in demand through improved techniques for machine setup, dual-use manufacturing, and process equipment that performs multiple functions.

c. (U) Composite Materials Processing & Fabrication: The use of composites in both military and commercial applications to date has been driven primarily by material performance issues, not by affordability. For example, the cost of a typical aerospace component made from a standard graphite/epoxy material ranges from $300 to $1500 per pound, compared to $150 to $300 per pound for aluminum. This sub-thrust will provide the process investments necessary to overcome cost hurdles that now prevent affordable application of all types of composite materials in military and dual-use products. Examples of sub-thrust activities:

- (U) Complete development and demonstration of an integrated capability for design and manufacture of low cost composites, with measurable reductions in cost and cycle time over current organic composites.

- (U) Develop affordable processes for automated composites assembly to overcome tolerance and alignment problems in components and subassemblies for both military and commercial use.

- (U) Demonstrate in-situ process control systems that will increase the affordability of composite products and provide a standard benchmark for improvements in inspection and fabrication costs.

- (U) Continue development of process technologies for advanced fiber placement, resin transfer molding, composite avionics housings, high thermal conductivity fibers, low observable honeycomb cores, and non-destructive inspection for damage and repair.

Program Element: 0603705D Budget Activity: 2
PE Title: Manufacturing Science and Technology (MS&T) Date: April 1993

d. (U) Electronics Manufacturing: The fabrication, testing, and repair of electronic components are cost drivers on all new and remanufactured DoD systems. For example, electronic components comprise 70 percent of the cost of tactical missiles, avionics makes up 35 percent of the cost of new aircraft. This sub-thrust complements DARPA investments in electronics with targeted life cycle affordability investments in automatic test methods and equipment; in-process controls and sensors; and assures availability of critical components for depot repair and support. Examples of sub-thrust activities:

- (U) Continue development of quality process improvement technologies using statistical process control metrics for soldering, packaging and other electronics material, test, and inspection techniques.

- (U) Continue development and enhancement of cluster tool manufacturing processes and equipment for devices, sensors, and optical components leading to low volume, low cost, high quality manufacturing for critical technologies having dual-use applications.

- (U) Develop the techniques and methods for assembly and test of subsystem components such as tactical grade fiber optics gyroscopes, cryogenic enclosures, integrated transmit-receive module arrays, and high voltage power supplies.

- (U) Develop standard process solutions for the next-generation of automatic test systems (ATS) to provide a common layer of technology suitable for both factory floor/depot test equipment and field test equipment. Re use of test software, and more affordable test software rehosting from older hardware, for both DoD and commercial manufacturing and repair applications are a high priority.

e. (U) Pilot Demonstrations: A new concept of modern manufacturing pilot projects has been developed jointly by the S&T labs, the acquisition community, and industry. This sub-thrust will designate pilot projects for systems currently in acquisition to direct and accelerate implementation of: (1) cost-saving, high impact process technologies for design, manufacture and support; and (2) innovative policies and business practices, such as integrated product/process development, quality processes, and supplier relationships. Examples of sub-thrust activities:

- (U) Continue joint military service/agency programs that serve as models for near-term, affordability demonstrations of critical manufacturing processes.

Program Element: 0603705D Budget Activity: 2
PE Title: Manufacturing Science and Technology (MS&T) Date: April 1993

- (U) Design a prototype, Service-wide program that ensures best manufacturing practices and benchmarking techniques from industry are captured in the design and development of Advanced Technology Demonstrations (ATDs) and MS&T programs.

- (U) Demonstrate the feasibility of changing DoD procurement or policy practices that will provide for a measurable improvement in the affordability of a DoD process or product application.

- (U) Develop a "pathfinder" that addresses affordability across a specific industry sector, process application, or product of the industrial base. Integration of commercially, affordable practices will be stressed.

f. (U) Service/Agency Programs: Each of the military services and the Defense Logistics Agency has projects aimed at solving unique process problems that provide the enabling technologies to support critical mission or core industrial base needs for acquisition, remanufacturing, or repair (for example, low observables, nuclear propulsion). Sub-thrust priorities and resources allocations will be structured according to each component's requirements as they meet the broader objectives of the MS&T program. Examples of Service projects are:

- (U) Continue process improvement in the application of cast ductile iron for ammunition and armored vehicles (Army).

- (U) Continue shipbuilding and ship repair programs (Navy).

- (U) Continue cost reduction investments in titanium welding for advanced aircraft structural applications (Air Force).

4. (U) PROGRAM TO COMPLETION: This is a continuing program.

D. (U) WORK PERFORMED BY: Contractors will be determined by competitive selection. In-house work, including management and support of contractual efforts, will be performed by: Department of the Army, U.S. Army Materiel Command; Department of the Navy, Office of Naval Research; Department of the Air Force, Wright Laboratories; and the Defense Logistics Agency.

E. (U) COMPARISON WITH PREVIOUS DESCRIPTIVE SUMMARY:

1. (U) TECHNOLOGY CHANGES: Not applicable.
2. (U) SCHEDULE CHANGES: Not applicable.
3. (U) COST CHANGES: Not applicable.

Program Element: 0603705D Budget Activity: 2
PE Title: Manufacturing Science and Technology (MS&T) Date: April 1993

F. (U) PROGRAM DOCUMENTATION: Not applicable.

G. (U) RELATED ACTIVITIES: PE 0603739E, Electronics Mfg. Technology

H. (U) OTHER APPROPRIATION FUNDS: This program is the result of the PE consolidation and realignment in September 1992. The FY 1992 and FY 1993 funding, as shown in Service and Defense Agency PEs 0708045A, and 0708011N/F/S, was $197M and $138.5M, respectively.

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable.

J. (U) MILESTONE SCHEDULE: Not applicable.

FY 1994 BUDGET ESTIMATES

Program Element: #0603716D
PE Title: Strategic Environmental Research and Development Program

Project Number: P470
Budget Activity: 2
Date: April 1993

A. (U) RESOURCES ($ in thousands)

Project Title: Strategic Environmental Research and Development Program

Popular Name	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
SERDP	77,612	169,940	97,958	Cont	Cont

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: The Strategic Environmental Research and Development Program (SERDP) is designed to address environmental matters of concern to the DoD and DoE through basic and applied research and development to meet departmental obligations. It shall identify research and other information developed by DoD/DoE that is useful to government and private organizations. It shall furnish these activities with enhanced data collection and analytical capabilities for use by organizations in the conduct of research, including that on global environmental change. Furthermore, SERDP shall identify private technologies useful to DoD/DoE related to environmental restoration, hazardous and solid waste minimization and prevention and hazardous material substitution.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1992 Accomplishments:

- Program formulation completed.
- FY 1991/1992 funds were received and distributed in the fourth quarter.
- Phase I/II Strategic Investment Plans were submitted to Congress.

(U) FY 1993 Plans:

- Execution of Phase I/II projects in the areas of Installation Restoration and Waste Minimization, Remote Sensing and Clean/ Alternative Energy.
- Develop and execute FY 1993 Investment Strategy focused on six technology thrust areas: Global Environmental Change, Pollution Prevention, Installation Restoration, Compliance, Conservation, and Clean/Alternative Energy.
- Develop plans for FY 1994 Program integrating and prioritizing needs for environmental technology for the DoD/DoE and using assets of DoD/DoE/EPA to resolve these problem areas.

(U) FY 1994 Plans:

- Fund environmental technology development and demonstration projects that meet the highest priority needs of the DoD/DoE.

Program Element: #0603716D
PE Title: Strategic Environmental Research and Development Program

Project Number: P470
Budget Activity: 2
Date: April 1993

D. (U) WORK PERFORMED BY:

Tri-agency research and development laboratories and contractors:

Department of Defense - Army, Navy, Air Force, DARPA, DSPO

Department of Energy

Environmental Protection Agency

E. (U) COMPARISON WITH PREVIOUS DESCRIPTIVE SUMMARIES: Not applicable

F. (U) PROGRAM DOCUMENTATION: SERDP Phase I Strategic Investment Plan

G. (U) RELATED ACTIVITIES: Tri-Service S&T RELIANCE Program and the DoD Environmental Strategic Plan Program

H. (U) OTHER APPROPRIATION FUNDS: None

I. (U) INTERNATIONAL AGREEMENTS: None

J. (U) FY 1993 MILESTONE SCHEDULE:

- Accept proposals for FY 1993 program - DEC 1992
- Review and select proposals and develop overall program - APR 1993
- Process/team build for FY 1994 program - AUG 1993

(U) FY 1994 MILESTONE SCHEDULE:

- Review FY 1993 program results - OCT 1993
- Finalize FY 1994 Program - NOV 1993
- FY 1994 IPR - JUN 1994
- FY 1995 process/team build - AUG 1994

FY 1994 BUDGET ESTIMATES

Program Element: 0603736D
PE Title: Computer-aided Acquisition and Logistic Support (CALS)
Project Number: #457
Budget Activity: 2
Date: April 1993

A. RESOURCES: ($ IN Thousands)

Project Title: Computer-aided Acquisition and Logistic Support

Popular Name	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
CALS	15,116	15,206	10,424	Continuing	Continuing

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: The purpose of the CALS Initiative is to transition DoD's current paper intensive weapon system support processes to a highly automated and integrated mode of operation in the 1990s and beyond. The transition will result in a fundamental change in the way DoD and industry use and distribute technical information, improving the quality and productivity of weapon system development and support. The CALS Initiative will increase the use of advanced automation technologies to produce engineering, manufacturing and logistic data products; and rapidly increase the ability of DoD to receive, distribute and use logistic technical information in digital form. Projected benefits are increased readiness and mission effectiveness through improved reliability of weapon systems; improved timeliness, accuracy and reduced cost of technical data; and reduced lead times for both weapon systems and spares procurement. The Defense CALS Executive provides policy and oversight in the accomplishment of the tasks described in this summary. This program element is to (1) coordinate implementation of standards that will provide a common interface for exchange of technical information among government and industry systems; (2) conduct demonstrations of advanced automation technologies and data exchange standards used to improve design, manufacturing and logistic functions; (3) develop integration plans, contractual approaches, architectural guidelines, validation routines, and test bed programs to support acquisition and exchange of digital technical information in support of the full acquisition life-cycle process; and (4) conduct functional analyses of designated programs to further define the CALS Integrated Weapon System Data Base (IWSDB) architecture and to map architectural interfaces. These activities are required to achieve compatibility with ongoing ADP modernization efforts in industry and DoD.

Program Element: 0603736D
PE Title: Computer-aided Acquisition and Logistic Support (CALS)

Project Number: #457
Budget Activity: 2
Date: April 1993

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS

1. FY 1992 PROGRAM ACCOMPLISHMENTS

o Product Data Exchange using STEP (Standard Exchange of Product Model Data) (PDES)) development continued with initial proof of concept testing at the PDES national test bed. Work on level 1 and 2 implementation in FY 92 continued.

o Development, verification and validation testing of PDES/STEP continued.

o Initial CALS architecture was completed and has been approved as the DoD framework by which CALS implementation will be managed.

o Revision B to the MIL-HDBK-59 was planned and initiated.

o Draft functional requirements for the CITIS were released for extensive community review.

o Conformance testing was performed on those CALS Core Standards which were stable.

2. FY 1993 Planned Program

o Identification of functional requirements for product data standards and supporting information processing standards will continue.

o PDES/STEP will begin Phase II Architecture efforts focused on accelerating the developing release 1.0 of the integrated joint service requirements.

o The remaining CALS Core Standards will be stabilized and conformance testing will be completed.

o Revision "B" of MIL-HDBK-59 will be formally coordinated in FY 1993 encompassing all validated processes and procedures for inclusion of CALS requirements as integral contractual elements will be in place.

o Near term, tri-service information management architectures for technical manual automation and technical data repository will be stabilized and ready for initial infusion into the development of the Joint CALS Program in FY 1994.

o Publish initial updated version of the Interactive Electronic Technical Manual (IETM) specifications.

o Formal coordination of the specification for the CITIS in FY 1993 and initial application to contracts in FY 1994.

Program Element: 0603736D
PE Title: Computer-aided Acquisition and Logistic Support (CALS)

Project Number: #457
Budget Activity: 2
Date: April 1993

o Release 1.0 implementation of PDES/STEP will be updated. Development of Versions 2 and 3 of PDES/STEP will continue.

o Development, verification and validation of functional requirements for PDES/STEP will continue. Architecture work will continue as the Version 1.0 integrated Joint Service functional requirements undergo refinement to expand requirements.

o Process improvement architecture will be demonstrated in FY 1993.

o CALS technologies will be demonstrated on the M-1 Abrams Tank, and other candidates such as the F-22, and the Aegis Class ships. These demonstration projects may last 1-3 years.

o Initial version of IETM specification will be upgraded based on early implementation activities.

o Publish formal technology management and development planning documentation.

FY 1994 Planned Program

o Near term development sequence will conclude at the end of FY 1994 with routine delivery mechanisms for digital technical data fully operational

o Near term CALS core specifications will be fully mature and transitioned to the appropriate acquisition guidance statements.

o Processes and procedures for inclusion of CALS requirements as integral contractual elements will be in place.

o Continue performance testing of specifications, standards and systems.

o Release 2 of PDES/STEP will be released. Development of Release 3 will continue.

o Development, verification and validation of PDES/STEP application protocols will continue

o Identification of functional requirements for product data and information processing standards will continue

o Final draft of DoD Architectural framework will be released for DoD and industry review.

o Issuance of DoD Architectural framework.

o Revise plans for long range management and development of technologies within the CALS framework.

o Integration of science and technology strategy into weapon systems acquisition process.

o Prototypes of CALS technologies will continue to be demonstrated on the Army M-1 Abrams Tank, and the Air Force F-22 programs.

o CALS technology prototype demonstrations will be initiated on one or more additional platforms.

Program Element: 0603736D
PE Title: Computer-aided Acquisition and Logistic Support (CALS)

Project Number: #457
Budget Activity: 2
Date: April 1993

D. (U) WORK PERFORMED BY: Funds are provided to: Program Offices in the Services for prototype demonstrations; the National Institute of Standards and Technology (NIST); DoD/Government organizations and/or laboratories; Federally Funded Research and Development Centers; and Defense Contractors.

E. (U) PROGRAM DOCUMENTATION: Not Applicable.

F. (U) RELATED ACTIVITIES: Demonstration of selected technologies applicable to CALS is planned in each Military Service and the Defense Logistics Agency under a variety of program elements. A senior DoD CALS Steering Group and Defense CALS Executive Office ensure integration of these efforts and prevent unnecessary duplication of effort.

G. (U) OTHER APPROPRIATION FUNDS: None.

H. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: None

I. (U) MILESTONE SCHEDULE: Not Applicable.

FY 1994 BUDGET ESTIMATES

Program Element: #0603755D Budget Activity: 2
PE Title: High Performance Computing (HPC) Modernization Date: April 1993

A. (U) RESOURCES ($ in Thousands)

Project Number & Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	Cost To Complete	Total Program
P507 HPC Modernization	0	0	122,819	Cont.	Cont.

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: High Performance Computing has become a vital enabling force in the conduct of science and engineering research. To keep its forces and systems' capabilities on the leading technological edge, the Department of Defense (DoD) Science and Technology (S&T) Program requires computing performance in the many trillions of operations per second (teraops) by the mid to late 1990s. Indeed, a number of computing problems require teraops computing performance today. This program provides for modernization of the HPC capabilities of the DoD laboratories, putting their computing capabilities on a growth path toward teraops performance, and sustaining DoD leadership in HPC capability. The program employs a vision of providing access to the most capable and most advanced HPC systems, advanced scientific and visualization workstations, special purpose and experimental systems by all DoD scientists and engineers through high performance computer networks.

(U) The program consists of three integrated and coordinated components: Networking, Early Access to Newest Systems, and Stable HPC Systems. These three components work together to sustain modernization of Defense R&D HPC assets, accelerate Defense R&D use of new scalable high performance computing technology, and promote widespread shared use of the emerging high performance computing environment throughout Defense R&D. Networking is the integrating component that makes the assets of the other two components available to scientists and engineers across DoD and enables them to apply these assets to solving important science and technology challenges. The Early Access to Newest Systems component allows the scientists and engineers to explore the use of the most advanced HPC technologies. The Stable HPC Systems component provides DoD researchers access to robust, reliable, high-availability HPC systems to solve defense

problems in their science and technology thrust areas. Success of the HPC Modernization Program, depends on strong complementary local infrastructures, including workstations, high resolution visualization devices, local area networks, and intermediate scale HPC systems which complement the large scale systems provided under this program.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1992 Program: Not applicable

(U) FY 1993 Planned Program: This is a new program that will be initiated in FY 1994.

(U) FY 1994 Planned Program: The program will: acquire large stable HPC systems to alleviate immediate and projected shortfalls in engineering and scientific computing capability; acquire and provide early access to new scalable HPC systems to permit early evaluations, software maturation and applications conversions; and, provide interim high performance computing network connectivity to the above HPC resources for engineers and scientists DoD-wide, and initiate efforts toward competitive acquisition of the Defense Research and Engineering Network (DREN), the planned advanced high performance science and technology network.

D. (U) WORK PERFORMED BY: Performers will be determined by a competitive review process, based on criteria established by the Joint Services/Defense Agencies DoD High Performance Computing Working Group.

E. (U) COMPARISON WITH PREVIOUS DESCRIPTIVE SUMMARY:
No descriptive summary was submitted for FY 1993.

F. (U) PROGRAM DOCUMENTATION: The High Performance Computing Modernization Plan (HPC-MP), a five year master plan, was submitted to Congress in May 1992. The FY 1994 HPC Implementation Plan will be completed by December 1993.

Program Element: #0603755D Budget Activity: 2
PE Title: High Performance Computing (HPC) Modernization Date: April 1993

G. (U) RELATED ACTIVITIES: Congress appropriated Procurement Funds for Supercomputers in FY 1992 and FY 1993 prior to the completion of the HPC-MP. An FY 1993 HPC Implementation Plan was prepared for use of the combined FY 1992 and FY 1993 funds for early initiation of the above described program. These funds were allocated as follows: (M - millions)

- $40.3M (46.6%) - for acquiring stable HPC capability in the DoD Labs. [One very large system. Various other options were considered, but one very large system was preferred because it will serve a wider set of users.]
- $28.3M (32.8%) - for acquiring new scalable HPC capability for experimentation, evaluation and application conversion in DoD Labs.
- $12.0M (13.9%) - for acquiring the newest scalable HPC capability in a collaborative arrangement with national HPC consortia for experimentation, evaluation, and conversion of DoD applications.
- $5.8M (6.7%) - for acquiring high performance networking capability to tie all DoD Labs into the stable and new scalable HPC capability.

H. (U) OTHER APPROPRIATION FUNDS:

1. PROCUREMENT, DEFENSE AGENCIES (Major Equipment)
Supercomputers ($ in Thousands)

FY 1992	FY 1993	FY 1994
42,000	44,402	0

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not Applicable

J. (U) MILESTONE SCHEDULE:

- o Issue IFP to Services/Defense Agencies May 93
- o Complete Eval. of Services/Agencies Proposals Oct 93
- o Complete FY 1994 Implementation Plan Dec 93

FY 1994 BUDGET ESTIMATES

Program Element: 0603756D
PE Title: Consolidated DoD Software Initiative

Budget Activity: 2
Date: April 1993

A. (U) RESOURCES ($ in Thousands)

Project Number & Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
P452 Ada Language System Navy ALS/N	8,600	5,817	1,015	Continuing	Continuing
P453 DoD Common Programming Language (Ada)	6,531	8,905	5,263	Continuing	Continuing
P454 Ada Technology Insertion (ATIP)	10,763	17,218	2,873	Continuing	Continuing
TOTAL	25,894	31,940	9,151	Continuing	Continuing

B. (U) BRIEF DESCRIPTION OF ELEMENT: This Science and Technology program is part of the total DoD effort to introduce and implement life-cycle support for Ada, the DoD common high order programming language for mission critical computers. It provides resources to meet those language support requirements which are common to the DoD Services and Agencies. It provides for configuration control of the Ada language, enforcement of standardization via compiler validation, education/promotion, and development of Ada Programming Support Environment (APSE) technologies. Project 452, ALS/N implements Ada on the Navy's standard embedded computers (AN/UYK-43, AN/UYK-44 and AN/AYK-14). Project 453, Ada is part of the total DoD effort to introduce and implement life-cycle support for Ada. Project 454, ATIP was initiated in FY 1988, to provide risk reduction for accelerated use of Ada technology in DoD systems. These projects include funding for travel by OSD and Service personnel in support of the management and technical objectives.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN FY 1994

(U) Project #452, Ada Language System Navy (ALS/N): This project implements Ada on the Navy's standard embedded computers (AN/UYK-43, AN/UYK-44 and AN/AYK-14). Support software tools being developed include compilers, runtime executives, runtime libraries, debuggers, linkers, and exporters. Maximum use is being made of Ada-based software developed by other services; new Ada software will be developed to meet unique Navy hardware requirements.

(U) FY 1992 Accomplishments:

- Continued the enhancement of the ALS/N products for the Enhanced Processor (EP) AN/UYK-44, and Very High Speed Integrated Circuit (VHSIC) AN/AYK-14
- Started the enhancement of the ALS/N products to support the Enhanced EMR Processor (EEP) AN/UYK-43

Program Element: 0603756D
PE Title: Consolidated DoD Software Initiative

Budget Activity: 2
Date: April 1993

(U) FY 1992 Accomplishments (continued):
- o Started the development of the ALS/N Rehost to POSIX

(U) FY 1993 Plans:
- o Complete enhancements to EP AN/UYK-44 and VHSIC AN/AYK-14
- o Complete Ada run-time environment for the AN/UYK-43, AN/UYK-44, and PPPI AN/AYK-14 multi-programming
- o Continue enhancement to support the EEP AN/UYK-43
- o Continue ALS/N rehost to the POSIX operating system

(U) FY 1994 Plans:
- o Complete enhancement of EEP AN/UYK-43
- o Complete Ada run-time distributed software environment
- o Continue the ALS/N rehost to POSIX operating system

(U) Work Performed By: In-house work, including management and support will be performed by: Office of the Director, Defense Research and Engineering (ODDR&E) and Department of the Navy at Fleet Combat Direction Systems Support Activity, San Diego CA; Naval Underwater Systems Center, Newport RI. Major contractors are: Control Data Corporation, Minneapolis MN; SYSCON Corporation, Washington DC.

(U) Related Activities: The work performed under Program Element #0603756D is complementary to the work performed in the program elements below. There is no unnecessary duplication of effort within the Service/Agency or the Department of Defense. Related program elements are:

- o Program Element #0604740F, Computer Resource Management Technology
- o Program Element #0603728F, Advanced Computer Technology
- o Program Element #0603723A, Command and Control
- o Program Element #0602746A, Tactical Automated Data Processing
- o Program Element #0603526N, Advanced Computer Technology

(U) Other Appropriated Funds: None.

(U) International Cooperative Agreements: None.

(U) Project #453, DoD Common Programming Language (Ada): DoD computer software life-cycle costs are measured in the billions of dollars. Transition to this single, modern, high-order language in defense systems will derive significant benefits to DoD in the areas of training, compiler and programming tool availability, software maintainability and reduction of other software development costs. Under this project the Ada Joint Program Office (AJPO) will: (1) ensure the implementation and maintenance of Ada as a consistent unambiguous standard recognized by the DoD and also by the widest possible community; (2) ensure smooth introduction and acceptance of Ada in the DoD as early as possible and consistent with needs of individual components.

(U) FY 1992 Accomplishments:
- o Completed the Ada9X Transition and Maintenance Plans
- o Continued to coordinate Ada implementation through the Software Executive Officials
- o Initiated NATO study of commercial software development environments specifications
- o Delivered Ada Compiler Evaluation Capability (ACEC) Version 3.0
- o Continued work on secondary standards and bindings

Program Element: 0603756D
PE Title: Consolidated DoD Software Initiative

Budget Activity: 2
Date: April 1993

(U) FY 1992 Accomplishments (continued):
- o Initiated effort to implement Ada in Service Academies
- o Began development on Ada Semantic Interface Specification
- o Obtained ISO approval of draft Ada 9X baseline

(U) FY 1993 Plans:
- o Complete Ada9X Specification revision with delivery to ANSI and ISO Standards Committees
- o Continue Ada9X transition efforts with development of three Ada9X compilers
- o Continue NATO study on environments specifications
- o Continue implementation of Ada in Service Academies
- o Complete ACEC and Ada Evaluation Systems Merger to enhance compiler evaluation technology
- o Continue ASIS work with call for public comment

(U) FY 1994 Plans:
- o Complete development of three Ada9X Compilers and transition Ada9X into the DoD
- o International Standards approval of Ada9X Specification
- o Initiate study on Ada language revisions for 1998
- o Complete NATO study on environments specifications and begin specification development
- o Continue implementation of Ada in Service Academies
- o Continue ASIS work with delivery of draft specification

(U) Work Performed By: In-house work, including management and support will be performed by: Office of the Director, Defense Research and Engineering (ODDR&E) and Departments of the Army, Navy and Air Force organizations as appropriate. Major contractors are: Softech, Waltham, MA; IIT Research Institute (IITRI), Chicago, IL; Boeing Military Airplane Co., Wichita, KS.

(U) Related Activities: The work performed under Program Element #0603756D is complementary to the work performed in the program elements below. There is no unnecessary duplication of effort within the Service/Agency or the Department of Defense. Related program elements are:

- o Program Element #0604740F, Computer Resource Management Technology
- o Program Element #0603728F, Advanced Computer Technology
- o Program Element #0603723A, Command and Control
- o Program Element #0603526N, Advanced Computer Technology

(U) Other Appropriated Funds: None.

(U) International Cooperative Agreements: Memorandum of Understanding (MOU) for the use of Ada with Germany, France, Sweden and United Kingdom and the establishment of Ada validation facilities with Germany, France and United Kingdom.

(U) Project #454, Ada Technology Insertion Program: This project will reduce the risk associated with accelerating the insertion of Ada technology in DoD weapon systems. Unprogrammed costs and risks exist in a number of programs which did not initially plan for, but could now reasonably convert to Ada. Cost and risk sharing incentives have been established to reduce the initial impact of acquiring Ada compilers, tools, education, and associated items and apply them to new and major upgrades to weapon systems programs.

Program Element: 0603756D
PE Title: Consolidated DoD Software Initiative

Budget Activity: 2
Date: April 1993

Criteria has been established for selection of programs based on expected overall long term benefits. The project will address all DoD component projects currently developing products in areas such as simulation, avionics, fire control, missiles, command, control, communication, and intelligence (C3I), electronic warfare, undersea warfare, and land warfare. As of FY 1991 this program has been expanded to include projects in the area of management information and business systems. The project will accelerate the incorporation of Ada and therefore develop a broader Ada technology base for DoD components. In addition productivity data will be collected on each participating program if the collection is determined to be cost effective.

(U) FY 1992 Accomplishments:
- o Completed and demonstrated FY 1991 ATIP awards
- o Initiated contract to provide Ada Compilers to universities that do research for DoD
- o Awarded contract to develop Free Software Foundation (GNU) UNIX compiler

(U) FY 1993 Plans:
- o Select new efforts for FY 1993
- o Complete merger of ACEC with AES further enhancing compiler evaluation technology
- o Complete delivery of Ada Compilers to universities

(U) FY 1994 Plans:
- o Select new efforts for FY 1994
- o Review progress on previous programs and demonstrate new Ada technology breakthroughs
- o Complete GNU Ada Compiler with delivery to universities

(U) Work Performed By: Same as Project Number 453. Contractors will vary according to Service programs selected for ATIP.

(U) Related Activities: Same as Project Number 453

(U) Other Appropriated Funds: None.

(U) International Cooperative Agreements: None.

FY 94 BUDGET ESTIMATES

Program Element: #0603832D
PE Title: Joint Simulation Office

Project Number: P476
Budget Activity: 2
Date: April 1993

A. (U) RESOURCES ($ in Thousands)

Project Title Popular Name	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
Defense Modeling and Simulation Office (DMSO)	13,831	57,122	67,152	Continuing	Continuing

B. (U) BRIEF DESCRIPTION OF ELEMENT:

The Deputy Secretary of Defense approved the Modeling and Simulation (M&S) Management Plan on June 21, 1991, which established the DMSO. The DMSO's objective is to promote the effective and efficient use of M&S within the Department of Defense (DoD). Consequently, the DMSO sponsored several initiatives aimed at strengthening the use of M&S within the Services and Defense Agencies.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. FY 1992 Program Accomplishments:

The DMSO's mission continued to evolve in FY 1992. Substantial effort was focused on gaining overall control of M&S activities by coordinating and formalizing DoD-wide M&S policy and investment guidance. DMSO, in consonance with policy and investment efforts, developed a comprehensive procedure for determining the Department's M&S needs. DMSO identifled specific investment opportunities that yielded significant advancements to the effectiveness and interoperability of the Department's M&S applications. A clearinghouse for M&S information was initiated to support the functional communities, Services, Joint Staff, OSD Staff, and Defense Agencies. Specific accomplishments include:

- Established an M&S operational management structure
- Established an M&S operational support structure
- Approved an Investment Guidance Plan
- Defined technology deficiencies
- Developed an investment evaluation process
- Conducted baseline assessments of critical core technologies supporting future M&S

Program Element: #0603832D
PE Title: Joint Simulation Office

Project Number: P476
Budget Activity: 2
Date: April 1993

2. FY 1993 Planned Program:

The DMSO will continue to influence the Department's M&S plan, policies, and procedures. A communication network and information sharing clearinghouse shall be made available to support the Department's efforts to design, develop, test, and manage M&S activities. Interoperability standards and protocols will be identified and approved for implementation within the Department's M&S applications. The DMSO shall sponsor advanced technology reviews and prototype demonstrations for possible inclusion into the M&S Master Plan. The Services and Defense Agencies shall continue to reorganize by developing and/or implementing individual policies and procedures based on the DMSO's sponsored directives. DMSO will re-evaluate Services and Defense Agency M&S proposals and assign executive management responsibility for specific developmental activities in accordance with the approved investment strategy and M&S Master Plan. DMSO will sponor an initiative to integrate modeling and simulation throughout the acquisition process. Specific activities include:

- Implementing the Distributed Simulation Internet
- Establishing DIS as an interim interoperability protocol
- Implementing the M&S Clearinghouse
- Conducting assessments of Service and Defense Agency proposals and critical core technologies
- Establish an Acquisition Task Force

3. FY 1994 Planned Program:

The DMSO will insure that M&S continues to play a greater role in all aspects of ensuring readiness and the superiority of U.S. military forces through the use of new and existing models and simulations. The M&S applications will be based on evolving mission needs, technological advances, and associated methodological developments. In order to achieve this goal, the DMSO will ensure that M&S applications support DoD mission needs, incorporate approved interoperability standards, are readily available to users worldwide, adapt readily to new scenarios and allow for a wide range of excursions, accurately represent systems, behavior, and environments to reproduce real-world situations, and promote close interaction between individual Service and Defense Agency missions. To accomplish these goals, the DMSO will:

- Promulgate standards to promote interoperability of Component's M&S environment
- Support development of standard databases, tools, and methodologies for community-wide use

Program Element: #0603832D
PE Title: Joint Simulation Office

Project Number: P476
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Date: April 1993

- Sponsor advanced technology analyses and demonstrations
- Facilitate community-wide coordination and information sharing of M&S design, development, and operational activities

The infrastructure would also ensure future M&S applications improve the acquisition process through the evaluation and maturation of associated technologies, policies and procedures.

4. Program to Completion: This is a continuing program.

D. (U) WORK PERFORMED BY:

This work is to be managed by the Director, Defense Modeling and Simulation Office through the Director, Defense Research and Engineering (DDR&E). DMSO funding will support an in-house technical service contract, office administrative costs, and Federally Funded Research and Development Centers participation. The remaining funds will be forwarded to individual Service and Defense Agencies as executive agents to perform designated analytical, technical, developmental, and/or implementation efforts. A mixture of Service, Defense Agency, and in-house OSD representatives are required to provide technical and contractual expertise. The following is not all inclusive but is a representative sampling of organizations currently performing work on behalf of the DMSO: Harry Diamond Laboratories, Adelphi MD; Army Program Manager for Training Devices, Orlando FL; the Defense Advanced Research and Project Agency, Washington DC; the Defense Technical Information Center, Alexandria VA; the Naval Training Systems Command, Orlando FL; Aerospace Corp, El Segundo CA; Institute for Defense Analysis, Alexandria VA; Lincoln Laboratories, Lexington MA; Logistics Management Institute, Vienna VA; The MITRE Corp, Vienna VA; RAND, Santa Monica CA; Software Engineering Institute, Pittsburgh PA.

E. (U) COMPARISON WITH PREVIOUS DESCRIPTIVE SUMMARY:

1. TECHNICAL CHANGES: There are no technical changes associated with this program. The DMSO has maintained a steady progress between what was projected and what was accomplished.

2. SCHEDULE CHANGES: There are no schedule changes associated with this program. The DMSO has maintained a steady progress between what was projected and what was accomplished.

Program Element: #0603832D
PE Title: Joint Simulation Office

Project Number: P476
Budget Activity: 2
Date: April 1993

3. COST CHANGES: There are no cost changes associated with this program. The DMSO has maintained steady progress between what was projected and what was accomplished.

F. (U) PROGRAM DOCUMENTATION:

The following list identifies program documentation associated with the DMSO mission:

1. Modeling and Simulation Management Plan, 21 June 1991
2. Vision Statement (Draft)
3. EXCIMS Charter (Draft)
4. Defense Modeling and Simulation Initiative Plan, 6 January 1992 (Draft)
5. Investment Guidance, 15 January 1992
6. Technical Working Group Reports - Baseline Assessment and Technology Working Gaps, 7 January 1992
7. Letter report to Congressional Defense Committees, October 1991
8. Letter report to Congressional Defense Committees, February 1992
9. Integrated Priority List, May 1992
10. Senate Armed Services Committee Hearing, May 1992

G. (U) RELATED ACTIVITIES:

There are Service, Defense Agency, and OSD program elements supporting complementary studies, research, tests, analyses, evaluations, resource assessments, policies, and plans. However, the DMSO was established, in part, to reduce duplication of efforts within the Department.

H. (U) OTHER APPROPRIATION FUNDS: ($ in Thousands): N/A

FY 1994 BUDGET ESTIMATES

Program Element: #0604704D
PE Title: Rocket Motor Demilitarization

Project Number: P486
Budget Activity: 2
Date: April 1993

A. (U) RESOURCES ($ in thousands)

Project Title: Rocket Motor Demilitarization

Popular Name	FY 1992	FY 1993	FY 1994	To	Total
RokMoDemil	Actual	Estimate	Estimate	Complete	Program
	26,377	15,847	12,267	-0-	54,491

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:
The Rocket Motor Demilitarization Program seeks to develop new technologies to enable demilitarization of large rocket motors to take place in an environmentally-benign manner. Cost effective alternatives will be sought to open burning and open detonation of rocket motors.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1992 Accomplishments:

o Technology Downselection Criteria - Safety, environment, and economics are the major considerations for the technology downselection criteria. An evaluation contractor, National Institute of Standards and Technology (NIST), has been selected to assist in the technology downselection procedure. To accomplish technology downselection the NIST will independently develop system integration and a cost analysis, using computer assisted process simulation methodology. The project will be completed in FY 1994.

o High Pressure Water Washout - Determined the sensitivity of Class 1.1 propellant materials to high pressure waterjet impact, determined the threshold reaction, and determined optimum cutting parameters for effective propellant removal.

o Cryogenic Washout - Conducted safety analysis on small samples of Class 1.1 propellant, demonstrations of prototype system using scaled down rocket motors, and completed final report.

o Critical Fluid Removal/Reclamation - Completed critical experiments for characterization of hazards, process safety, propellant removal, ingredient recovery, and hazardous waste minimization; and established system requirements for engineering development. Completed bench scale demonstration for removal, separation, and recovery of ingredients from Class 1.1 propellants. Awarded contract to transition technology from research to pilot plant design and construction for Class 1.1 and 1.3 rocket motors.

Program Element: #0604704D
PE Title: Rocket Motor Demilitarization

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o Biodegradation - Designed and constructed a subscale system for demonstration and optimizing the process design parameters. Continued testing Class 1.1 waste water containing ammonium perchlorate (AP) and nitramines for investigating the co-metabolism of nitrate esters and AP.
Patent application filed with the United States Patent Office.

o Supercritical Water Oxidation - Built a bench scale, 1 gallon per hour, pipe reactor to optimize the process design parameters for the prototype reactor. Demonstrated the disposal of nitramines and nitrate esters under supercritical conditions.

o Contained Burn with Scrubber - Performed tests in the subscale contained burn facility using subscale motors to develop engineering design criteria for full scale facility. Conducted open air full scale nozzleless burn tests on motor configurations. Designed, procured, and delivered for use, a full scale simulated firing chamber without scrubbing capability.

o Characterization of Reclaimed AP - Prepared and tested subscale samples from reclaimed/recrystallized AP, cast two full scale LRMs for validation testing.

(U) FY 1993 Plans:

o High Pressure Water Washout - Complete waste streams analysis, waterjet impact sensitivity testing, nitroglycerine safety analysis, and initiate development of waste streams treatment systems.

o Cryogenic Washout - Design and begin construction of prototype system to remove Class 1.1 propellants from solid rocket motor casings.

o Critical Fluid Removal/Reclamation - Demonstrate optimum methods for propellant removal, ingredient separation and reclamation, and hazardous waste minimization. System design requirements for Class 1.3 pilot scale-up using commercially available equipment will be established.

o Biodegradation - Assemble and evaluate prototype biotreatment system (100 times larger than subscale) for cleaning waste water contaminated with AP from the water washout of solid rocket motors.

o Supercritical Water Oxidation - Design and begin assembly of prototype system that integrates a safe removal method with supercritical water reactor for the destruction of Class 1.1 solid rocket motors.

o Contained Burn with Scrubber - Continue testing in the subscale facility to develop parameters for the full scale facility. Conduct tests to characterize the ballistic behavior of full-scale motors in the low pressure

confined environment.

o Characterization of Reclaimed AP - Continue to prepare and cast LRMs from reclaimed/recrystallized AP for static fire validation testing and aging studies, continue characterization analysis for Class 1.3 propellants.

(U) FY 1994 Plans:

o High Pressure Water Washout - Complete development of waste streams treatment system. Complete ingredient recovery/reuse research (commercial explosives), production waste stream treatment system facility design, and perform ingredient recovery/reuse facility design.

o Cryogenic Washout - Complete demonstration/validation of prototype system to remove Class 1.1 propellants from the motor casing.

o Critical Fluid Removal/Reclamation - Demonstrate large scale demilitarization unit operations, complete design modifications for Class 1.1 and 1.3 pilot plant systems integration. Finalize Class 1.1 full scale LRM plant design criteria and complete economic assessments. Complete ingredient recovery process technology design, demonstration, and evaluation of reclaimed propellant ingredients for reuse.

o Biodegradation - Complete demonstration/validation of the prototype biotreatment system for the safe disposal of waste water contaminated with nitrate esters, nitramines and AP.

o Supercritical Water Oxidation - Complete demonstration/validation of prototype system for the environmentally safe disposal of Class 1.1 propellant ingredients. Dispose of two Class 1.1 rocket motors.

o Contained Burn with Scrubber - Complete sub-scale testing. Complete engineering design criteria for the full scale facility. Deliver and complete planned testing of the full scale confined burn chamber. Investigate post processing techniques for the liquid, gaseous and solid waste streams resulting from the contained burn with scrubbing.

o Characterization of Reclaimed AP - Complete full scale validation testing with reclaimed AP in LRM propellants.

Program Element: #0604704D
PE Title: Rocket Motor Demilitarization

Project Number: P486
Budget Activity: 2
Date: April 1993

D. (U) WORK PERFORMED BY:

High Pressure Water Washout	NAVSURFWARCENDIV/ Crane Rock Mechanics & Explosives Research Center, Univ of Missouri-Rolla/ Technology Development Inc./ NAVSURFWARCENDIV Indian Head Aerojet
Cryogenic Washout	General Atomics/Hercules/Eldorado Engineering/ Thiokol Corp/Ecowaste Flour Daniels
Critical Fluid Removal/ Reclamation	MICOM (in-house)/Army Corps of Engineers (Huntsville Division/ Hercules Aerospace/ Atlantic Research Corp./Bechtel National Inc./Foster Wheeler Corp./M.W. Kellog Co./ Olin Ordnance/ Phasex Corp./ Stone Engineering/Stone & Webster Engineering/ United Space Booster, Inc.
Biodegradation	Advanced Sciences, Inc.
Supercritical Water Oxidation	Los Alamos National Laboratory/ Modell Development Corp./General Atomics/ Hercules, Inc./Thiokol Corp./Ecowaste/ El Dorado Engineering/ Flour Daniels
Confined Burn with Scrubber	Lockheed M/S Co./ Bechtel Environmental/ Hercules, Inc./Thiokol Corp.
Characterization of Reclaimed AP	Thiokol Corp./Aerojet Phillips Laboratories/WECCO/Kerr McGee/TRW

E. (U) COMPARISON WITH PREVIOUS DESCRIPTIVE SUMMARY:

o High Pressure Water Washout - Late FY 1992 funding and delays in contract award resulted in slippage of two quarters for prove out of high pressure washout technology and expanded scope to perform propellant reclamation/reuse research exploring reformulating the reclaimed Class 1.1 propellant for commercial explosive applications.

o Cryogenic Washout - No significant changes from FY 1993 descriptive summary.

Program Element: #0604704D
PE Title: Rocket Motor Demilitarization

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o Critical Fluid Reuse/Reclamation - No significant changes from FY 1993 descriptive summary with exception of expanded scope to establish suitability of recovered ingredients for reuse and process technology for ordnance qualification.

o Biodegradation - No significant changes from FY 1993 descriptive summary.

o Supercritical Water Oxidation - No significant changes from FY 1993 descriptive summary.

o Contained Burn w/scrubber - Description reflects progress made in accordance with FY 1993 descriptive summary and plans, including completion of planned testing and delivery of the full scale confined burn chamber. Additional effort has been planned for FY 1994 to investigate post processing techniques for the liquid, gaseous, and solid waste streams resulting from the contained burn with scrubbing.

o Characterization of Reclaimed AP - No significant changes from FY 1993 descriptive summary.

F. (U) PROGRAM DOCUMENTATION: None

G. (U) RELATED ACTIVITIES: None

H. (U) OTHER APPROPRIATION FUNDS: None.

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: None

J. (U) FY 1993 MILESTONE SCHEDULE:

o High Pressure Water Washout - Complete waterjet impact sensitivity testing, determination of cutting parameters and nitroglycerine safety assessment for Class 1.1 propellants. Washout subscale motors and initiate development of process streams treatment.

o Cryogenic Washout - Complete engineering design and begin construction of the prototype system.

o Critical Fluid Removal/Reclamation - Complete propellant removal demonstrations, Class 1.3 pilot plant designs, and Class 1.1 sub-scale demonstrations.

o Biodegradation - Complete construction of prototype system and begin demonstration/validation on Class 1.3 wastewater.

Program Element: #0604704D
PE Title: Rocket Motor Demilitarization

Project Number: P486
Budget Activity: 2
Date: April 1993

o Supercritical Water Oxidation - Complete engineering design and begin construction of the prototype system.

o Contained Burn with Scrubber - Demonstration of full scale motor burns in a simulated confined chamber (without exhaust scrubbing).

o Characterization of Reclaimed AP - Conduct test with LRMs to evaluate reused AP in the propellant formulation.

(U) FY 1994 Milestone Schedule:

o High Pressure Water Washout - Complete process streams treatment development, perform ingredient reformulation and reuse research, perform a large scale washout demonstration, design production process streams treatment facility. Complete documentation and issue final report.

o Cryogenic Washout - Complete construction and begin demonstration/validation of prototype system. Complete program efforts and issue final report.

o Cryogenic Fluid Removal/Reclamation - Construct/demonstrate a Class 1.1 and 1.3 demilitarization pilot plant, perform large scale component demonstrations for Class 1.1 propellant demilitarization, integrate Class 1.1 and 1.3 pilot designs, and establish design criteria and develop economic analyses for demilitarization production facilities. Establish suitability of recovered propellant ingredients for reuse and demonstrate required chemical process technology for ordnance qualification. Complete ingredient recovery process technology design, demonstration, and interim qualification of reclaimed propellant ingredients for reuse efforts. Conclude program and issue final report.

o Biodegradation - Complete demonstration/validation on Class 1.3 wastewater and begin testing with Class 1.1 wastewater. Complete program efforts and issue final report.

o Supercritical Water Oxidation - Complete construction and begin demonstration/validation of prototype system. Complete program efforts and issue final report.

o Contained Burn with Scrubber - Complete engineering design package for full scale facility. Complete program efforts and issue final report.

o Characterization of Reclaimed AP - Complete program efforts and issue final report.

FY 1994 BUDGET ESTIMATES

Program Element: #0603228D
PE Title: Physical Security Equip.
Project Number: P228
Budget Activity: #4
Date: April 1993

A. (U) RESOURCES ($ in Thousands)

Popular Name	FY 1992 Actual	FY 1993 Est.	FY 1994 Est.	To Complete	Total Program
DoD Physical Security Equipment					
	56,473	25,233	20,676	Continuing	Continuing

B. (U) BRIEF DESCRIPTION OF ELEMENT: The purpose of this program is to develop physical security equipment (PSE) systems and to safeguard DoD acquisition information for all DoD components. This program supports the protection of Nuclear Weapons, tactical and nuclear weapons systems, DoD personnel and DoD weapon systems in the acquisition process. This program element is the sole source of funding for the DoD RDT&E for a physical security program of 84,000 military and civilian personnel with expenditures exceeding $2.3 billion annually. Funding for critical RDT&E security improvements within service channels has fluctuated widely over the years and prompted the consolidation of the Services and Defense Nuclear Agency (DNA) PSE RDT&E funds into the single OSD controlled program element.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS: This program was originally formed by the Congressional consolidation of the three military departments and the DNA RDT&E physical equipment security budget submissions for FY 1989. The funds are currently being used to provide PSE RDT&E for individual service and joint PSE requirements. The funds will be directly employed in support of the DNA exploratory development PSE effort for the protection of nuclear weapons by expanding technology and techniques (through proof-of-concept) to improve nuclear security. This program element supports the Army's advanced and engineering development of Interior Detection, Exterior Detection, Security Lighting, Security Barriers and Security Display Units. In a like manner, the program element also supports the Air Force's PSE RDT&E effort in the area of Exterior Surveillance, Entry Control and Airborne Intrusion. Finally, the program will support Navy RDT&E efforts in the areas of Shipboard Security, Waterside Security, Explosive Detection, Locks and anti-compromise/emergency destruction of classified material

Program Element: #0603228D
PE Title: Physical Security Equip.
Project Number: P228
Budget Activity: #4
Date: April 1993

equipment. Recent concerns regarding the protection of DoD weapon systems acquisition information at DoD RDT&E facilities has lead to an expanded role for this Program Element during FY92.

(U) FY 1992 Accomplishments:

- Continued development of the Shipboard Physical Security Program and continued Waterside Security RDT&E.
- Completed the RDT&E portion of the Secure Storage Area (SSA) program.
- Completed all remaining SSA tasks, fielded SAFER full scale production sets, continued Active Denial exploratory research and conducted a Sticky Foam Dispensing System production In-progress Review (IPR). Continued EMD on the Portable Reconfigurable Line Sensor (PRLS) and began on DISS.
- Provided RDT&E support for the Pre-Planned Product Improvement Program (P3I) for upgrading and replacing sensor systems, many of which are 1960's and early 1970's technology and have exceeded their design life.
- Began implementation of the DoD Acquisition Systems Protection Master Plan to improve security at DoD RDT&E facilities and throughout the acquisition process.
- Continued support to waterside security RDT&E for a second generation of equipment-sonar, radar and barrier systems and software to integrated sensor systems.

(U) FY 1993 Plans:

- Continue RDT&E on Active Denial, and Advanced Sensor Technology and Security Storage and Transport systems. Continue the upgrade of RDT&E for Shipboard Physical Security Program and the Waterside Security RDT&E effort. Continue DISS Program effort.
- Award the contract for Dispersal Integrated Security System (DISS).

Program Element: #0603228D
PE Title: Physical Security Equip.
Project Number: P228
Budget Activity: #4
Date: April 1993

- Continue research into the Secure Storage Area and improve the security of the weapon sites. Continue the PLRS Program.
- Develop prototype multi-channel video motion detection system.
- Continue RDT&E on the Mobile Detection Assessment Response System (MDARS) Interior work and initiate MDARS exterior program and Barrier Technology.
- Conduct the WSS Operational Evaluation and support the P3I upgrade of the system.
- Continue the development of a standard communication protocol for DoD PSE. Continue requirements and mission analysis to incorporate new technologies as they become available.

(U) FY 1994 Plans:

- Transition RDT&E effort on active Denial Systems from DNA 6.2 to USAF 6.3 development.
- Begin upgrade of exterior sensors including thermal, video, and embedded versions.
- Continue P3I of WSS to include improved underwater sensors, communications link and integrating annunciator system.
- Continue the work on MDARS exterior program and Barrier Technology.
- Initiate a P3I program on DISS to enhance equipment portability.
- Use DNA 6.2 RDT&E to study and prototype innovative means of improvement for existing PSE systems, examine new technology to support the nuclear mission.

(U) WORK PERFORMED BY: The RDT&E effort is executed by the three military departments and the Defense Nuclear Agency. The actual RDT&E work is accomplished in service laboratories, in US Government agencies, and to a lesser degree, through commercial contractors. A selection of these are: Analytical Systems

Program Element: #0603228D
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Engineering Corp, E-Systems, Radian Inc., Magnavox, Teledyne controls Corp, Sanders Associates, ISC Corp., SAIC, B-K Dynamics, Westinghouse, General Electric Field Services, Computer Science Corp., Plessey Marine Systems, BDM Corp., Diversified Data Corp., Tetra Tech Inc., Canadian Commercial Corp., and other contractors that are currently in the bid and proposal cycle.

(U) RELATED ACTIVITIES: There are no related activities within the DoD to develop physical security equipment. However, there are related programs within other government agencies in which the DoD is working to establish commonality in requirements and specifications. The services are improving security at RDT&E facilities within program availabilities.

(U) OTHER APPROPRIATION FUNDS: None.

(U) INTERNATIONAL COOPERATIVE AGREEMENTS: None.

FY 1994 BUDGET ESTIMATES

Program Element: #0603709D
PE Title: Joint Robotics Program
Project Number: P709
Budget Activity: #4
Date: April 1993

A. (U) RESOURCES ($ in Thousands)

Popular Name	FY 1992 Actual	FY 1993 Est.	FY 1994 Est.	To Complete	Total Program
Joint Robotics Program (Unmanned Ground Vehicles)					
	20,106	18,399	22,125	Continuing	Continuing

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: This program element was established in response to Congressional guidance and consolidated DoD robotics programs on unmanned ground systems and related robotics technologies in order to increase focus of the Services robotics programs on operational requirements. The program will demonstrate maturity of robotics technologies for their application to the formal acquisition process of land systems and subsystems. Emphasis will be on the development of robotics technologies that are: amenable to multi-service applications; provide capability in high hazard environments; provide improved battlefield efficiency through supervised autonomous operational capability; reduce or enhance force manpower and support; and are affordable. This PE consolidates the DoD robotics program for unmanned ground vehicles (UGV) into two groups of activities: (1) advancement of UGV concepts into EMD and enhancement and (2) exploitation of robotic technologies to provide the critical robotic technologies to provide the critical robotic technologies for today's and future UGV acquisition requirements. Three UGV projects that have Service commitment and POM funds for EMD are being pursued: (1) the Tactical Unmanned Ground Vehicle (TUGV) - a joint Army/Marine Corps effort to develop a telerobotic UGV for the forward observer mission, scheduled to go into EMD in 1996 and into production in 1999; (2) the Rapid Runway Repair (RRR) UGV - an Air Force effort to develop a telesupervised robotic capability to survey and repair runway damage quickly without exposing human resources to hazardous environments (EMD) is scheduled for FY94 and production in 1997); and (3) the Remote Ordnance Neutralization System (RONS) - a Navy effort to develop an ordnance neutralization system that performs explosive ordnance disposal (EOD) tasks robotically and by teleoperations in chemical, radiation and explosive environments.

Program Element: #0603709D
PE Title: Joint Robotics Program
Project Number: P709
Budget Activity: #4
Date: April 1993

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1992 Accomplishments:

o (U) Feasibility demonstration of robotic manipulator functions for removing debris, break-up and remove upheaved pavement, backfill, compact backfill materials, and level grade has been completed for the RRR. Program plan for RRR acquisition and design specifications has been established.

o (U) RONS has conducted a market survey, completed a System Requirements Review and initiated preliminary design. Conducted Preliminary Design Review (PDR) and developed appropriate subsystems.

o (U) Conducted a technology maturation demonstration of UGV components for low data rate communication, improved navigation (including computer-aided remote driving and retrotraverse), enhanced peripheral, stereo, and night visions, and observer mission module, using BMMWVs modified for telerobotic driving.

o (U) Completion of RRR design and fabrication of RRR demonstrators.

o (U) The TUGV JPO conducted a Concept of Employment Evaluation (COEE) at Fort Hunter Liggett to refine operational and organizational concepts for both the Army and Marine Corps.

o (U) The Test and Evaluation Master Plan (TEMP) for TUGV was approved.

o (U) RRR has completed design of sensor and communication subsystems followed by a communication demonstration using a prototype telerobotic excavator.

(U) FY 1993 Plans:

o (U) The TUGV JPO will begin Development Test and Evaluation to obtain hands-on-user experience to classify the operational role, and requirements of TUGV; start of COEA; development of TUGV employment concepts; complete design requirements, and continue test and evaluation of technology base developed components for UGV improvements/new capability.

Program Element: #0603709D
PE Title: Joint Robotics Program
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Budget Activity: #4
Date: April 1993

- (U) Continue acquisition of TUGV with MSII in 1stQ FY96. Completion of the accelerated technology integration, providing the telerobotic technology enhancements required for the EMD.

- (U) Test and evaluation of brassboard RRR design and establishment of specifications for EMD, starting in 4Q FY94.

- (U) Completion of advanced development of EOD UGV, with EMD starting in FY94.

- (U) Continue technology development towards supervised autonomous UGV's with significantly reduced operator burden.

- (U) RONS will conduct System Design Review (SDR), integrate subsystems and fabricate Advanced Development Model (ADM).

- (U) RRR will conduct a navigation demonstration and develop a new testbed vehicle in order to verify contract architecture and subsystem integration.

D. (U) WORK PERFORMED BY: In-house efforts are carried out by NOSC, Honolulu, HI; TACOM, Warren, MI; MICOM, Huntsville, AL; LABCOM, Adelphi, MD; CECOM, Ft. Monmouth, NJ; AFESC/RDCP, Tyndall AFB, FL; DARPA, Arlington, VA. Primary contractual efforts are conducted by: Battelle, Columbus, OH; FMC, Santa Clara and San Jose, CA; Engineering Technology, Orlando, FL; OAO Corp., Greenbelt, MD; Hughes Res. Lab, Malibu, CA; AT&T Lightware Applications, Greensboro, NC; SAIC, San Diego, CA; Tension Member Technology, Los Angeles, CA; JPL, Pasadena, CA; AAI, Baltimore, MD; Odetics, Anaheim, CA; Carnegie Mellon University; University of Massachusetts; Martin Marietta, Baltimore, MD; MKI, Dumfries, VA; Honeywell Inc., Edina, MN; NIST, Gaithersburg, MD.

E. (U) COMPARISON WITH PREVIOUS DESCRIPTIVE SUMMARY:

1. Technical Changes - None
2. Schedule Changes - None
3. Cost Changes - None

Program Element: #0603709D
PE Title: Joint Robotics Program
Project Number: P709
Budget Activity: #4
Date: April 1993

F. (U) PROGRAM DESIGN:

RONS	RRR	TUGV	TECH BASE
OR 4/87	SON 6/79	O&O 11/90	MASTER PLAN 7/92
TEMP 6/91	TEMP 8/91	ISOR 1/91	
		OR 5/93	

G. (U) RELATED ACTIVITIES:

PE# 03065141D (Joint Unmanned Aerial Vehicle).

Program coordinates with UAV joint program office, NIST and DOE's national laboratories to ensure maximum government resource utilization, standardization and interoperability.

H. (U) OTHER APPROPRIATION FUNDS: ($ in 000) Not applicable.

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: DEAs with Germany and UK are in effect.

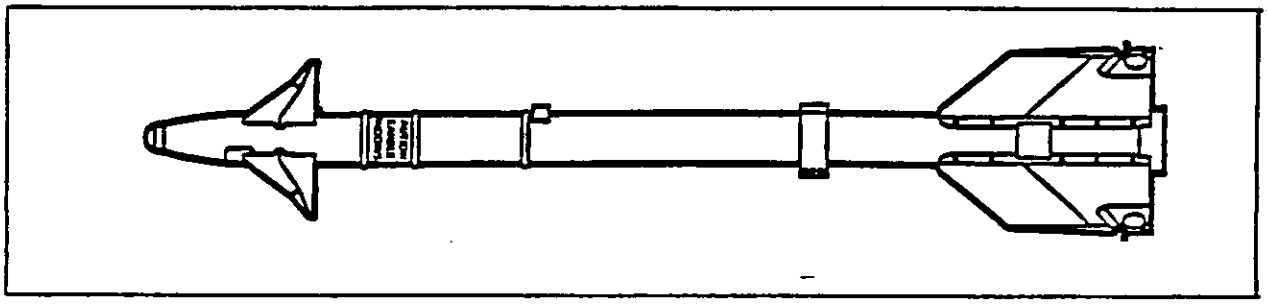
J. (U) MILESTONE SCHEDULE:

RONS	RRR	TUGV	TECH BASE
FY90 Initiation	FY90 Initiation	FY91 MS O	FY92 DEMO I
FY94 MS II	FY94 MS II	FY96 MS I/II	FY95 DEMO II
FY96 OT&E	FY96 OT&E	FY98 OT&E	
FY97 MS III	FY97 MS III	FY99 MS III	

FY 1994 BUDGET ESTIMATES

Program Element: #0603715D
Title: AIM-9 CONSOLIDATED PROGRAM
Project Title: AIM-9 (Sidewinder) Consolidated Program

Project Number: P473
Budget Activity: 4
Date: April 1993



POPULAR NAME: AIM-9 Sidewinder

A. (U) SCHEDULE/BUDGET INFORMATION: ($ in Thousands)

BUDGET ($000)	FY 1992	FY 1993	FY 1994	Program Total (To Complete)
Major Contract	3,400	0	9,593*	Continuing
Support Contract	668	0	0	Continuing
In-House Support	33,591	14,281	0	Continuing
GFE/ Other	0	0	0	Continuing
Total	37,659	14,281	9,593	Continuing

* PBD 123 provided funds for Loral contract (REA and Target-to-Ceiling).

SCHEDULE	FY 1992	FY 1993	FY 1994	To Complete
Program Milestones			9X MSIV	NA
Engineering Milestones		9M-8/9 CDR Complete		NA
T&E Milestones	9M-8/9 Complete DT-IIIC	9M-8/9 Complete OT-IIIC		NA
Contract Milestones			9X DEV Contract Award	NA

Program Element: #0603715D
Title: AIM-9 CONSOLIDATED PROGRAM

Project Number: P473
Budget Activity: 4
Date: April 1993

B. (U) BRIEF DESCRIPTION OF MISSILE REQUIREMENT AND SYSTEM CAPABILITIES: The consolidated AIM-9 Sidewinder program is a joint USAF/USN effort to continue the evolutionary development of the AIM-9 missile. The current program includes the AIM-9M, AIM-9M-8/9 and AIM-9X. The AIM-9M-8/9 enhances the current infrared countermeasures of the AIM-9M. The AIM-9X is a long term evolution of the AIM-9 that will produce a series of upgrades to the AIM-9 including seeker/guidance and kinematics that will be fielded in post-2000 timeframe. Funding for AIM-9X activities beyond FY 1992 will be provided equally by the USAF and the USN. The AIM-9R was cancelled by the FY 1993 Congressional language.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1992 PROGRAM:

- AIM-9M-8/9
  -- Completed development
  -- Began joint service operational test (16 live launches)(OT-IIIC)

- AIM-9R
  -- Obtained, evaluated, cataloged and archived technical data package
  -- Closed REA's

- AIM-9X
  -- Began cost and operational effectiveness analysis (COEA), system engineering studies and operational analysis to define optimum systems characteristics.

2. (U) FY 1993 PLANNED PROGRAM:

- AIM-9M-8/9
  -- Complete joint operational testing (OT-IIIC)

- AIM-9X
  -- Continue COEA requirements development, engineering and other concept definition/planning activities.

3. (U) FY 1994 PLANNED PROGRAM:

- AIM-9R
  -- Negotiate Target-to-Ceiling debt

Program Element: #0603715D
Title: AIM-9 CONSOLIDATED PROGRAM

Project Number: P473
Budget Activity: 4
Date: April 1993

- AIM-9X
  -- Complete government concept definition
  -- MSIV Decision
  -- Competitively award at least two development contracts

D. (U) WORK PERFORMED BY: The Navy (PMA-259) has lead of all short-range air-to-air missile programs. Technical expertise for all Sidewinder models is provided by the Naval Air Warfare Center Weapons Division at NAS China Lake, CA. Production of the AIM-9M-8/9 modification kits is anticipated to be by the current AIM-9M mobilization base contractors: Raytheon and Loral. FY 1993 AIM-9X activity will be limited to government engineering studies coordinated through the Naval Air Warfare Center Weapons Division.

E. (U) COMPARISON WITH PREVIOUS DESCRIPTIVE SUMMARY:

1. (U) Technology changes: NA

2. (U) Schedule changes: Congressional language directing an AIM-9X COEA delayed DEM/VAL contract award until early CY 1994.

3. (U) Cost changes: NA

F. (U) PROGRAM DOCUMENTATION:

AIM-9M-8/9 JORD - 10/91
AIM-9M-8/9 TEMP - 5/92
AIM-9M-8/9 AP - 5/92
AIM-9X JORD - In coordination
AIM-9X TEMP - In coordination

G. (U) RELATED ACTIVITIES: None.

H. (U) OTHER APPROPRIATION FUNDS: NA

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: None.

J. (U) TEST AND EVALUATION DATA: DT-IIIC for the AIM-9M-8/9 consisted of six air-to-air firings and was completed April 1992. OT-IIIC will include 16 air-to-air firings and will be used to support full rate production decision.

FY 1994 BUDGET ESTIMATES

Program Element: #0603724D
PE Title: DoD Biological Defense Development

Project Number: P508
Budget Activity: 4
Date: April 1993

A. (U) RESOURCES ($ in thousands)
Project Title: DoD Biological Defense Program (BDP)

Popular Name	FY 1992	FY 1993	FY 1994	To	Total
DoD BDP	Actual	Estimate	Estimate	Complete	Program
	0	0	26,355	Cont	Cont

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:
The DoD Biological Defense Program (BDP) will develop detection systems to meet urgent requirements to detect, identify, warn, and verify a biological agent attack has occurred. No systems are in the field or are available to be fielded at present. DoD BDP will provide critical advanced development of promising technologies using UV and near-IR lasers to perform tactical and strategic standoff detection, antibody-based and mass spectroscopy/mass spec technologies to perform area point detection in a Biological Integrated Detection System (BIDS). This is a new start.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1994 PLANS:

o Initiate advanced development of Biological Integrated Detection System and award 6.3b development contract.

o Initiate advanced development of Strategic Standoff Detection System and award of 6.3b development contract.

o Initiate advanced development of Tactical Standoff Detection System and award 6.3b development contract.

D. (U) WORK PERFORMED BY:

Edgewood Research, Development and Engineering Center, Aberdeen Proving Ground, MD
Los Alamos National Laboratory, Los Alamos, NM
Science and Technology Corp., Hampton, VA
US Army Dugway Proving Ground, Dugway, UT
US Army White Sands Missile Range, NM
Gichner Shelter Systems, Dallastown, PA
Battelle, Columbus, OH
Environmental Technologies Group, Baltimore, MD
New Horizons Diagnostics, Columbia, MD

Program Element: #0603724D
PE Title: DoD Biological Defense Development

Project Number: P508
Budget Activity: 4
Date: April 1993

Molecular Devices Corp., Menlo Park, CA
Advanced Systems Technology, Lawton, OK
Bruker Instruments, Billerica, MA
US Army Munitions and Chemical Command Life Cycle Software Engineering Center, Dover NJ
US Army Research Laboratory's Human Research and Engineering Directorate, Aberdeen Proving Ground, MD
US Army Belvoir Research, Development, and Engineering Center, Fort Belvoir, VA

E. (U) COMPARISON WITH PREVIOUS DESCRIPTIVE SUMMARY: None, this is a new start program.

F. (U) PROGRAM DOCUMENTATION: Mission Need Statement, Vice Chairman, Joint Chiefs of Staff, August 31, 1992.

G. (U) RELATED ACTIVITIES:

PE 0603806A NBC Defense Systems - Advanced Development:

This PE will conduct Army Advanced Development of two components to be inserted into the Biological Integrated Detection System (BIDS), the Biological Detector (using Light Addressable Photometric Sensing technology) and the Chemical-Biological Mass Spectrometry (using mass spec/mass spec technology).

H. (U) OTHER APPROPRIATION FUNDS:

1. PROCUREMENT:

In FY 1994, procurement of 38 non-developmental items BIDS and 3 Strategic Standoff Detection Systems will be initiated with Other Procurement (Army) funds.

2. MILITARY CONSTRUCTION: None.

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: None.

J. (U) FY 1994 MILESTONE SCHEDULE:

o Prepare Milestone 0 documentation and conduct Milestone 0 In-Process Review.

o Award competitively contracts for Standoff Detection programs and BIDS.

o Establish Test Integration Working Group.

FY 1994 BUDGET ESTIMATES

Program Element: 0604771D
Project Title: Joint Tactical Information Distribution System (JTIDS)

Budget Activity: 4
Date: April 1993

A. (U) RESOURCES ($ in thousands)

Project Number & TitleActual	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
P771	JTIDS 89,680	40,137	33,253	Continuing	Continuing
P773	MIDS-LVT 16,500	29,579	33,800	Continuing	Continuing
TOTAL	106,180	69,716	67,053	Continuing	Continuing

B. (U) BRIEF DESCRIPTION OF ELEMENT:

The JTIDS Class 2 program will acquire a highly jam-resistant, secure, high capacity, digital (voice and data) information distribution terminal system which will provide integrated communications, navigation, and identification for use in a tactical combat environment. The system will provide sufficient connectivity and capacity to permit rapid exchange of command and control(C2) and unit status information among tactical C2 units.

The MIDS-Low Volume Terminal (MIDS-LVT) is an international (U.S., France, Italy, Germany, and Spain) cooperative development program for space constrained tactical fighter aircraft. MIDS-LVT is functionally identical to the JTIDS Class 2 terminal, but through the use of VHSIC and MMIC technology is one-half the weight and one-third the size of the Class 2 terminal. MIDS-LVT will be interoperable with the U.S. JTIDS program as the ratified STANAGS 4175 and 5516 apply.

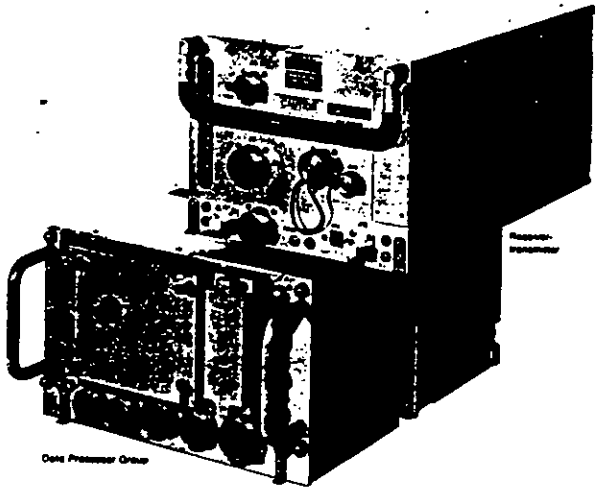
C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN 1994 : N/A

FY 1994 BUDGET ESTIMATES

Program Element: 0604771D

Project Number: P771
Budget Activity: 4
Date: April 1993

PE Title: Joint Tactical Information Distribution System(JTIDS)
Project Title: Joint Tactical Information Distribution System



POPULAR NAME: JTIDS

A. (U) SCHEDULE/BUDGET INFORMATION ($ in Thousands):

BUDGET (000)	Program Total FY 1992	FY 1993	FY 1994	To Complete
Major Contract	52,795	18,317	13,415	CONTINUING
Support Contract	22,484	9,153	8,483	CONTINUING
In-House Support	7,794	7,248	5,940	CONTINUING
GFE/ Other	6,607	5,419	5,415	CONTINUING
Total	89,680	40,137	33,253	CONTINUING

SCHEDULE	FY 1992	FY 1993	FY 1994	To Complete
Program Milestone			MS IIIB CLS 2/2H/2M	Interoperability Support
Engineering Milestone			AF FCA/PCA	FCA/PCA ARMY/NAVY
T&E Milestones		MS-OT III Navy	OPEVAL Navy	Complete Testing and Integration
Contract Milestones	BLK II Navy Lot 3	Lot 4	Full Rate Production	Complete Procurement

Program Element: 0604771D

Project Number: P771
Budget Activity: 4
Date: April 1993

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENTS AND SYSTEM CAPABILITIES:
The objective of this program is to provide command and control of air defense resources, pilot situational awareness, avoiding fratricide and dual targeting. It is a highly jam resistant, secure, digital information distribution system for use in a tactical combat environment. The Joint Tactical Information Distribution System (JTIDS) is a joint development employing Time Division Multiple Access (TDMA), and spread spectrum techniques. The system will permit rapid and secure exchange of essential command, control and status information among all terminals in the tactical theater.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1992 Program:
   a. Conduct further AF, Navy and joint service multi-platform testing.
   b. Deliver Navy Block II and LRIP Lot 1 terminals.
   c. Award contract for LRIP Lot 3 production.
   d. Continue CSSA and ISSA activation.
   e. Continue depot activation.
   f. Obtain expanded spectrum certification.
   g. Complete CDT&E of JTIDS Class 2/2H/2M terminals

2. (U) FY 1993 Planned Program:
   a. Conduct further AF, Navy and joint service multi-platform testing.
   b. Continue depot activation for Class 2 terminals.
   c. Award contract for LRIP Lot 4(Navy,E-3, E-8) terminals.
   d. Complete Navy operational testing (OPEVAL).
   e. Accept delivery of LRIP Lot 2(Navy and E-3) terminals.
   f. Continue CSSA activation.
   g. Complete Class 2/2H/2M Preplanned Product Improvement program.

3. (U) FY 1994 Planned Program:
   a. Accept delivery of LRIP Lot 3 terminals.
   b. Complete DAB MS IIIB Full Rate Production(FRP) decision.
   c. Award FRP contract for Navy, E-3, E-8 and Army terminals.
   d. Continue activation of hardware and software activities.

4. (U) Program to Completion:
   a. Accept delivery of LRIP Lot 4 terminals.
   b. Award next annual buy of JTIDS terminals.
   c. Continue testing of JTIDS in JSTARS and MCE platforms.

Program Element: 0604771D

Project Number: P771
Budget Activity: 4
Date: April 1993

d. Continue activation of hardware depots, CSSA and ISSA.
e. Complete activation of hardware depots, CSSA,ISSA.
f. Continue interoperability support.
g. Complete procurement of all JTIDS terminals for Services.
h. Complete testing and integration with platforms.

D. (U) WORK PERFORMED BY: The Joint Program Office, located at the Electronic Systems Division (ESD), Hanscom AFB, MA. Work is also being done at the Aeronautical System Center (ASC), Wright-Patterson AFB, OH; US Army Communications Electronics Command (CECOM), Fort Monmouth, NJ; and the Electromagnetic Compatibility Analysis Center (ECAC), Annapolis, MD. The major contractors are: GEC-Marconi Electronic Systems Corp (formerly Plessey Electronic Systems Corp (Class 2 terminal lead developer)), Wayne, NJ; Rockwell-Collins (Class 2 terminal follower), Cedar Rapids, IA; McDonnell Douglas Aircraft Corp (F-15 integration), St. Louis, MO; and MITRE Corporation (system engineering support), Bedford, MA.

E. (U) COMPARISON WITH PREVIOUS DESCRIPTIVE SUMMARY:

TYPE OF CHANGE	Impact on System Capabilities	Impact on Schedule	FY1993 Cost
SCHED	None	None	None
COST	None	None	None

NARRATIVE DESCRIPTION OF CHANGE

1. (U) TECHNICAL CHANGES: None

2. (U) SCHEDULE CHANGES: None

3. (U) COST CHANGES: Funds reflect transition to Services' LCC support

F. (U) PROGRAM DOCUMENTATION:

- MROC 8/89
- Air Force SORD 11/89, TAF SORD 11/91
- JTIDS Program Baseline 10/89
- Joint ILS Plan 7/90
- Milestone IIIA ADM 10/89
- TEMP 2/93

G. (U) RELATED ACTIVITIES:

- Program Element #0205604N, Tactical Command System
- Program Element #0604754F, Joint Tactical Information Dist System

Program Element: 0604771D

Project Number: P771
Budget Activity: 4
Date: April 1993

- Program Element #0604702A, Army Data Distribution System
- Program Element #0604719M, Marine Corps C3 Systems (Eng)

JTIDS development is managed by a jointly manned program office with the Air Force as the lead. This Program Element #0604771D funds: development, prototype fabrication, establishment of a joint structure to support the ILSP, and testing of terminal equipment for all Service applications. Individual Service program elements fund unique Service platform integration efforts. There are no unnecessary duplication of efforts regarding JTIDS within the Services/Agency or the Department of Defense.

H. (U) OTHER APPROPRIATION FUNDS ($ In Thousands): None

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: The UK and France have verbally indicated an interest in purchasing JTIDS Terminals beginning in FY 1991. A Memorandum of Understanding (MOU) between the UKG and USAG is in effect and is currently under review by both UKG and USAG.

J. (U) TEST AND EVAUATION DATA:

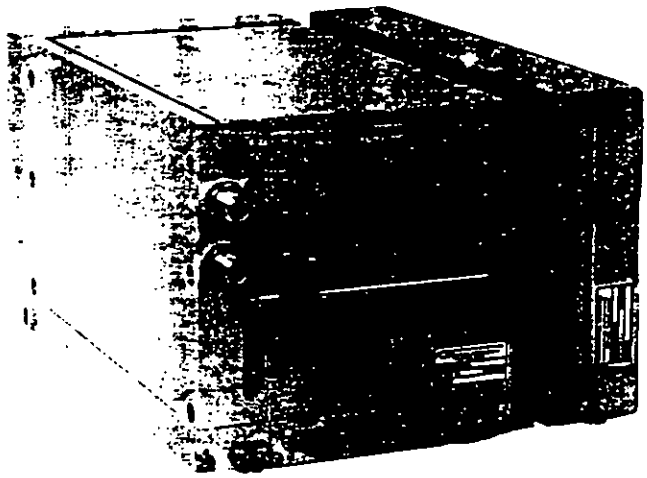
EVENT	DATE
JSTARS First JTIDS Flight	1/90
TEMP	11/90
Navy DT IID	7/90-9/90
Navy OT IIA	10/90
POST DAB Phase I DT/OT	1/90-2/91
Army 2M Technical Test	6/90-3/91
Navy DT IIE	6/91-1/92
Joint AF/Navy OT&E I/II	3/92, 6/92-10/92
Multi-Services OT III	8/93
Joint AF/Army OT&E	8/93

FY 1994 BUDGET ESTIMATE

Program Element: 0604771D

Project Number: P773
Budget Activity: 4
Date: April 1993

PE Title: Joint Tactical Information Distribution System
Project Title: Multifunctional Information Distribution System-Low Volume Terminal (MIDS-LVT)



POPULAR NAME: MIDS-LVT

A. (U) SCHEDULE/BUDGET INFORMATION (S in Thousands):

BUDGET (000)	FY 1992	Program Total FY 1993	FY 1994	(To Complete)
Major Contract	11,336	26,009	33,800	CONTINUING
Support Contract	863	894	923	CONTINUING
In-House Support	2,454	2,474	2,681	CONTINUING
GFE/ Other	1,847	202	1,232	CONTINUING
Total	16,500	29,579	33,800	CONTINUING

SCHEDULE	FY 1992	FY 1993	FY 1994	To Complete
Program Milestones		DAB II 3 QTR		DAB III 1/01
Engineering Milestones			PDR 3/94 - 9/94	CDR 3/95 - 9/95
T&E Milestones				DT/OT FY97-99
Contract Milestones	Release EMD RFP 3/92	Award EMD Contract 6/93		

Program Element: 0604771D

Project: P773
Budget Activity: 4
Date: April 1993

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENTS AND SYSTEM CAPABILITIES: MIDS Low-Volume Terminal (LVT) is an international (U.S., France, Germany, Italy, and Spain) cooperative development program to acquire a highly jam-resistant, secure, digital (voice and data) information distribution system providing integrated communications, navigation, and identification for use in a tactical combat environment. The system will provide sufficient connectivity and capacity to permit rapid exchange of command, control and status information among tactical command and control units. MIDS LVT will be interoperable with the U.S. JTIDS Class 2 terminal program, STANAGs 4175 and 5516 apply. This program element will fund (in accordance with the U.S. Cost Share) development, prototype fabrication, and test of common terminal equipment, in conjunction with integration schedules for the host platforms.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. FY 1992 Program:
   - Continued MIDS-LVT risk reduction activities
   - Issue EMD RFP to MIDSCO

2. FY 1993 Planned Program:
   - Sign PMOU/Supplement 2 (EMD Phase)
   - Stand Up International Program Office (IPO)
   - Complete EMD risk reduction activities
   - Evaluate MIDS EMD Contract proposals
   - Conduct MS II DAB
   - Award EMD Contract to MIDSCO

3. FY 1994 Planned Program:
   - Continue MIDS-LVT EMD
   - Conduct Preliminary Design Review (PDR)
   - Begin MIDS Critical Design Review (CDR)

4. Program Plan to Completion:
   - Continue MIDS-LVT EMD
   - Complete MIDS CDR

D. (U) WORK PERFORMED BY: Space and Naval Warfare Systems Command, Crystal City VA; Multifunctional Information Distribution System Consortium (MIDSCO); Naval Ocean Systems Center, San Diego, CA; Fleet Combat Direction System Support Activity (FCDSSA), Dam Neck, VA; Naval Air Development Center, Warminster PA; GEC-Marconi Electronics System Co., Wayne, NJ; and MITRE Corporation (systems engineering support), Bedford, MA.

E. (U) COMPARISON WITH PREVIOUS DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. TECHNICAL CHANGES: Not Applicable
2. SCHEDULE CHANGES: EMD Contract slip to 6/93
3. COST CHANGES: Inflation, additional year of US and contract costs

Program Element: 0604771D

Project: P773
Budget Activity: 4
Date: April 1993

F. (U) PROGRAM DOCUMENTATION:
MIDS Mission Needs Statement (MNS) #JORCN-031-90 dated 4/13/90
JTIDS Multi-Service Required Operational Capability(MROC) 8/89

G. (U) RELATED ACTIVITIES:

Program Element 0603790D, NATO R&D, funded FY 1990 - 1991 efforts. Program Element 0205604N, Tactical Command System funds Navy-unique MIDS and JTIDS platform integration and test requirements.. Program Element 0604771D funds development, prototype fabrication, and test of common JTIDS terminal equipment.

H. (U) OTHER APPROPRIATION FUNDS: N/A

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: This program is a Nunn Cooperative Development Initiative. The participating nations are the US, France, Italy, Germany, and Spain. The program is currently in the pre-EMD phase.. To date, a Program Memorandum of Understanding (PMOU) establishing the general principles to be applied throughout all the collaborative phases of the program and a Supplement 1 covering specific arrangements for the pre-EMD phase have been signed by the participating nations. Total financial commitment for the pre-EMD phase under Supplement 1 is $1.75 million. Share percentage and funding commitment by country are as follows: US-41% ($718K), France-26.5% ($464K), Italy-18% ($315K), Germany-7.5% ($131K), Spain-7.0% ($122K). The Supplement 2 to the PMOU, which covers the EMD phase of the program, is in National staffing and is expected to be signed in early FY93. The EMD phase cost share percentages are the same as in the pre-EMD phase. The MIDS-LVT will be developed by MIDSCO, a consortium of designated companies of the participating nations: GEC-MARCONI(US), THOMSON-CSF(France), ITALTEL(Italy), SIEMANS(Germany), INISEL(Spain).

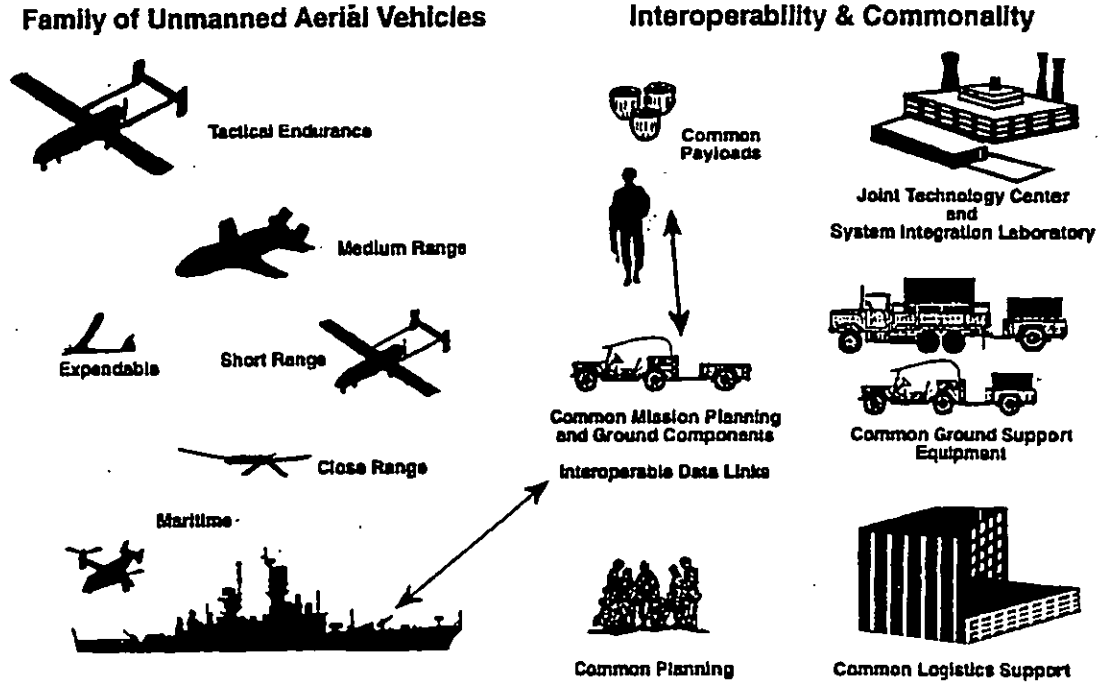
J. (U) TEST AND EVALUATION DATA: None available.

FY 1994 BUDGET ESTIMATES

Program Element: #0305141D
P.E. TITLE: UNMANNED AERIAL VEHICLES
JOINT PROGRAM (UAV)

Budget Activity: 4
Date:April 1993

FAMILY of UAVs
INTEROPERABILITY & COMMONALITY



POPULAR NAME: UNMANNED AERIAL VEHICLES JOINT PROGRAM (UAV)

A. SCHEDULE/BUDGET INFORMATION ($ IN THOUSANDS):

SCHEDULE	FY92	FY93	FY94
PROGRAM MILESTONES		SR-MS-LRP CR-MS I/II MR-MS PR	
ENGINEERING MILESTONES		MR-CDR	SR-PCA

Program Element: #0305141D
P.E. TITLE: UNMANNED AERIAL VEHICLES JOINT PROGRAM (UAV)

Budget Activity: 4
Date: April 1993

A. SCHEDULE/BUDGET INFORMATION ($ IN THOUSANDS):

SCHEDULE	FY92	FY93	FY94
T&E MILESTONES	SR-TET SR-LUT I	MR-CDR SR-LUT II	SR-FAT
CONTRACT MILESTONES	SR-DOWNSEL MR-CONTRACT DEFINITIZED	SR-OPII	

LEDGEND: CR = CLOSE RANGE, SR = SHORT RANGE, MR = MEDIUM RANGE

BUDGET ($000)	FY92	FY93	FY94
1. SHORT RANGE			
MAJOR CONTRACTS	0	13,444	27,530
SUPPORT CONTRACTS	709	494	500
IN-HOUSE SUPPORT	14,391	12,623	12,945
GFE/OTHER	0	0	0
TOTAL	15,100	26,561	40,975
2. MEDIUM RANGE (INCLUDES USAF EFFORTS ON ATARS AND MARS)			
MAJOR CONTRACTS	27,300	49,100	89,775
SUPPORT CONTRACTS	4,300	1,900	1,500

Program Element: #0305141D
P.E. TITLE: UNMANNED AERIAL VEHICLES JOINT PROGRAM (UAV)

Budget Activity: 4
Date: April 1993

BUDGET ($000)	FY92	FY93	FY94
IN-HOUSE SUPPORT	7,000	8,600	600
GFE/OTHER	0	0	0
TOTAL	38,600	59,600	91,875
3. CLOSE RANGE			
MAJOR CONTRACTS	0	7,000	26,775
SUPPORT CONTRACTS	1,200	800	1,000
IN-HOUSE SUPPORT	3,200	2,800	1,100
GFE/OTHER	0	0	0
TOTAL	4,400	10,600	28,875
4. VERY LOW COST (EXDRONE/POINTER)			
MAJOR CONTRACTS	300	100	0
SUPPORT CONTRACTS	0	0	0
IN-HOUSE SUPPORT	200	0	0
GFE/OTHER	0	0	0
TOTAL	500	100	0

Program Element: #0305141D
P.E. TITLE: UNMANNED AERIAL VEHICLES JOINT PROGRAM (UAV)

Budget Activity: 4
Date: April 1993

BUDGET ($000)	FY92	FY93	FY94
5. INTEROPERABILITY/COMMONALITY			
MAJOR CONTRACTS	6,600	3,200	3,700
SUPPORT CONTRACTS	0	0	0
IN-HOUSE SUPPORT	2,300	5,500	7,500
GFE/OTHER	0	0	0
TOTAL	8,900	8,700	11,200
6. JOINT TECHNOLOGY CENTER			
MAJOR CONTRACTS	0	335	500
SUPPORT CONTRACTS	0	0	0
IN-HOUSE SUPPORT	338	1,265	1,100
GFE/OTHER	0	0	0
TOTAL	338	1,600	1,600
7. PROJECT MANAGEMENT			
SUPPORT CONTRACTS	2,200	4,485	4,400
IN-HOUSE SUPPORT	2,389	700	1,187

Program Element: #0305141D
P.E. TITLE: UNMANNED AERIAL VEHICLES JOINT PROGRAM (UAV)

Budget Activity: 4
Date: April 1993

BUDGET ($000)	FY92	FY93	FY94
TOTAL	4,589	5,185	5,587
8. VTOL			
MAJOR CONTRACTS	10,000	15,100	0
SUPPORT CONTRACTS	0	0	0
IN-HOUSE SUPPORT	7,300	3,600	0
GFE/OTHER	0	0	0
TOTAL	17,300	18,700	0
9. PROJECTS AND DEMONSTRATIONS (TILT ROTOR)			
MAJOR CONTRACTS	7,900	0	0
SUPPORT CONTRACTS	0	0	0
IN-HOUSE SUPPORT	1,700	0	0
GFE/OTHER	0	0	0
TOTAL	9,600	0	0
GRAND TOTAL	99,327	131,046	180,112

Program Element: #0305141D
P.E. TITLE: UNMANNED AERIAL VEHICLES JOINT PROGRAM (UAV)

Budget Activity: 4
Date: April 1993

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: The non-lethal UAV mission is to provide complementary capabilities to manned systems in the functional areas of electronic warfare, intelligence, reconnaissance, surveillance, target acquisition, and command, control and communications. This Joint Program Office provides management oversight of DoD non-lethal UAVs to assure cost-effective approaches to fielding a needed capability expeditiously. Principal RDT&E objectives include UAV technology initiatives and the near term elimination of duplication among programs through development of common components and subsystems for non-lethal UAVs.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS: Continued support of UAV (Pioneer and Pointer) activities and involvement in Operation Desert Shield/Storm. Completed Technical Evaluation Test (TET) and Limited User Test (LUT I) of the Short Range UAV System. Procured SR UAV hardware for the Joint Technology Center/Systems Integration Laboratory (JTC/SIL). Obtained approval of the Short Range UAV Test, Evaluation Master Plan, Acquisition MSIII Strategy and Exit Criteria by Office of the Secretary of Defense. Implemented a risk reduction program for the Close Range system for a 200 pound class air vehicle and lightweight forward looking infrared (FLIR) payload. Prepared a Vertical Takeoff and Landing UAV Development Option Paper in response to Office of the Chief of Naval Operations Maritime Tentative Operational Requirement. Conducted operational demonstration of the CL-227 aboard a USN frigate with participation of the Navies of Canada, Germany, the Netherlands, France and the United Kingdom. Awarded competition contracts to Bell Helicopter Textron and Science Applications International Corporation for studies of a Tilt Wing/Rotor UAV. Obtained approval of the redefined Medium Range UAV Program by the Assistant Secretary of the Navy (Research, Development & Acquisition). Signed multi-Service Medium Range interfacing program memorandums of agreement. Conducted successful captive carry of the new composite Medium Range vehicle. Continued support of UAV counternarcotic activity with the Drug Enforcement Administration. Awarded a competitive contract to BAI Aerosystems, Inc. for 110 EXDRONES for operational demonstration. Prepared the capstone specification to establish standard UAV systems architecture. Prepared design guidance for UAV air vehicles. Documented and verified the Joint Integration Interfaces for UAV air vehicles and avionics. Continued development of modular avionics and millimeter wave radar autoland technology demonstrations.

1. FY 1992 Accomplishments: SHORT RANGE: Completed TET and conducted Limited User Test (LUT) I. Competitively selected prime contractor. CLOSE RANGE: Demonstrated a 200 lb class air vehicle and lightweight FLIR payload sensors. VTOL: Award the contract option(s) for the Tilt Wing/Rotor risk reduction demonstration. Formalized and initiated negotiations for North Atlantic Treaty Organization (NATO) cooperative VTOL UAV program. Completed successful demonstrations of MAVUS on the USS Doyle. MEDIUM Range: Completed first Composite Vehicle Contractor Flight Test (CFT 1). Completed preliminary design review (PDR). INTEROPERABILITY/COMMONALITY: Finalized and published

Program Element: #0305141D
P.E. TITLE: UNMANNED AERIAL VEHICLES JOINT PROGRAM (UAV)

Budget Activity: 4
Date: April 1993

the UAV family capstone specification. Prepared development specifications for heavy fuel engines, modular avionics and automatic recovery systems for UAV family application. Complete JII documents which ensures operational interoperability of UAV family systems. PIONEER: Purchased spares and equipment to replace those expended in Southwest Asia. Established a Joint Logistics Center of Excellence at MICOM, Huntsville, AL. Pointer is continuously demonstrated to Army Battalions with great success.

2. FY 1993 Plan: SHORT RANGE: DAB approval to continue Low Rate Production and proceed with Block II upgrades was received 19 Jan 93. Conduct Limited User Testing (LUT) II and Logistics Demonstration; exercise second production option; continue Block II upgrade, and begin Physical Configuration Audit (PCA) of the Prime Contractor. Exercise contract options for Block effort, conversion of system software to Ada, and Heavy Fuel Engine effort. CLOSE RANGE: Award Ground Control Station/Ground Data Terminal (GCS/GDT); common hardware; and EMD contract. MEDIUM RANGE: Conduct Critical Design Review (CDR); conduct DAB Program Review, commence DTIIB; and commence Government Flight Test (GFT-1). INTEROPERABILITY/COMMONALITY: Identify and develop additional JIIs, complete MR-UAV Independent COEA for DAB Program Review, complete VTOL Independent COEA for MSI/II, complete SERCES project, complete Short Range CARS applications study, commence VTOL and Close Range CARS applications study, initiate technology demonstration for Radio Freqency (RF) isolation in UAVs, simulate and integrate low cost data link hardware, and initiate 30 lb class engine technology demonstration program.

3. FY 1994 Plan: SHORT RANGE: Complete Physical Configuration Audit. Conduct First Article Test of the Short Range hardware, and continue Block II upgrade and payload integration efforts. Exercise contract options for logistics support. CLOSE RANGE: Test the downsize GCS/GDT, procure system design, commence contractor testing for equipment and conduct Critical Design Review. MEDIUM RANGE: Conduct DTIIB/C, conduct Contractor Flight Test (CFT-II), commence Government Flight (CFT-1), and commence Multi-Service Operational Assessment (MSOA). INTEROPERABILITY/ COMMONALITY: Initiate multi-function payload technology efforts for Synthetic Aperture Radar/ Motion Target Indicator/Inverse Synthetic Aperture Radar (SAR/MTI/SAR) and EO/IR. Coordinate data link technology for high data rate payloads. Initiate jamming technology for payloads. Develop and demonstrate brass board low cost data link and downsized RF sensor technology for incorporation in the family UAV systems.

4. Program Plan to completion: This is a continuing program.

Program Element: #0305141D
P.E. TITLE: UNMANNED AERIAL VEHICLES JOINT PROGRAM (UAV)

Budget Activity: 4
Date: April 1993

D. (U) WORK PERFORMED BY:

CONTRACTORS	IN-HOUSE
Teledyne Ryan Aeronautical, San Diego, CA	Army Missile Command, Huntsville, Al
Sierra Nevada Corp., Reno NV	NAWC/AD, Warminster, PA
Israel Aircraft Industries, Israel	NAWC/AD, Patuxent River, MD
AAI Corp, Hunt Valley, MD	USMC R&D COMM, Quantico, VA
TRW INC (MEAD), San Diego, CA	NAWC/AD, Trenton, NJ
	NAWC/WPN, Point Mugu, CA
	EPG, FT. Huachuca, AZ

E. (U) COMPARISON WITH PREVIOUS DESCRIPTIVE SUMMARY: This program's total obligational authority is essentially unchanged from the FY1992 President's Budget.

F. (U) PROGRAM DOCUMENTATION:

CATEGORY	MISSION NEED STATEMENT	ACQ PLAN	IPS	TEMP	ILSP
CLOSE RANGE	Jan-90	May-93	Jul-93	Dec-91	
MEDIUMRANGE	Aug-89	May-93	Jun-93	Jun-93	Jun-92
SHORT RANGE	Dec-88	Feb-93	Feb-93	Jan-93	Jul-92

- DOD UAV Master Plan updated and approved 15 April 1992
- JROCM-009-91, Service Review of UAV System Rqmts, 4 April 1991
- JROCM-008-91, UAV Program Restructure, 4 April 1991
- JROCM-001-93, Short Range Parameters, 12 January 1993
- UAV JPO Charter Updated and Signed 16 Oct 89
- Acquisition Decision Memorandum Approving Close Range MSO signed 9 Mar 90
- Acquisition Decision Memorandum for Medium Range Restructure UAV of 24 Jun 91
- Acquisition Decision Memorandum (ADM) of 19 January 1993 from the DAB approved Short Range Low Rate Initial Production

Program Element: #0305141D
P.E. TITLE: UNMANNED AERIAL VEHICLES JOINT PROGRAM (UAV)

Budget Activity: 4
Date: April 1993

G. (U) RELATED ACTIVITIES:

. Program Element #027217F Joint Services Imagery Processing System (JSIPS)
- ATARS: Joint USAF/USN development of Advanced Tactical Air Reconnaissance system (ATARS) using USAF developed RECCE sensor package to work with the Joint Medium Range System's air vehicles.

. Program Element #060513D, Foreign Comparative Test
- Maritimized VTOL UAV System
- Foreign Weapons Evaluation (Sprite/CL-227/Raven)

. Program Element, #03999I, OSD C3I
- UAV Imagery Interpretation Study (RADC)

. Program Element, 064770A, JSTARS
- SASS Low Intensity Target Exploitation (U.S. Army PEO IEW)

. Program Element, 0604707N, TAMPS
- Tactical Aircraft Mission Planning System

. Program Element, 063226E, DARPA
- Advance Dist Simulation Tech

H. (U) OTHER APPROPRIATION FUNDS: Procurement, Defense Agencies

FY1992	FY1993	FY1994	FY1995	PROGRAM TOTALS (1996-1999)
$129,392	137,106	69,300	283,500	1,237,200

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Data Exchange Agreement between U.S. and Germany, Israel, United Kingdom, Canada and Netherlands. MICOM has a Data Exchange Agreement with Korea that is being transferred to the UAV JPO for administrative management.

J. (U) TEST AND EVALUATION DATA: Not Applicable.

FY 1994 BUDGET ESTIMATES

Program Element: 0305190D
PE Title: C3I Intelligence Programs

Project Number: P 481
Budget Activity: 5
Date: April 1993

A. (U) RESOURCES ($ in Thousands)

Project Title	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	To Complete	Total Program
ISSO	8,001	12,084	6,754	ongoing	ongoing

B. (U) BRIEF DESCRIPTION OF ELEMENT: PE includes all resources in support of projects managed by the Intelligence Systems Support Office (ISSO) as directed by the ASD(C3I). ISSO was established on 5 July 1990 by the direction of the Deputy Secretary of Defense.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN FY 1994

Project Number and Title: ISSO provides program management for:
- Linked Operations Intelligence Centers Europe (LOCE) for USEUCOM
- Battlefield Information Collection and Exploitation System (BICES) Development Efforts
- Command and Management System (CMS) for SOUTHCOM
- Foreign Commercial Purchasing Program (FCP)
- National Drug Intelligence Center (NDIC) for DoD
- Gulf States Counter-Narcotics Initiative

Prior Accomplishments:
- ISSO began operations in July 1990
- Assumed program management responsibilities for LOCE after disestablishment of the Joint Tactical Fusion Program
- Expanded LOCE network into US and supported USEUCOM/NATO military operations during Provide Comfort
- Provided program management support for the SOUTHCOM CMS and completed transition for CMS operations and maintenance to the Army
- Executed FCP program
- Initiated BICES National Interface Development Module (IDM) for US national segment to BICES
- Developed and executed the NDIC program as directed by Congress
- Provided program and technical assistance to USEUCOM/USAREUR for restructuring US overt Humint/CI initiative in Europe
- Began efforts in behalf of Gulf States Counter-Narcotics Initiative

Current Year Plans:
- Continue management of the FCP program

Program Element: 0305190D
PE Title: C3I Intelligence Programs

Project Number: P 481
Budget Activity: 5
Date: April 1993

- Continue system support of NDIC by upgrading and enhancing the hardware and software system
- Upgrade LOCE to meet USEUCOM mobility support requirements to restructured NATO and US forces
- Complete move of LOCE to RAF Molesworth Joint Analysis Center (JAC) as directed by the SecDef under the intelligence reorganization plan (additional funding was added to complete the migration of the LOCE system capability at JAC in Molesworth and reconfigure Ramstein LOCE correlation center for descoped role)
- Complete negotiations and signing of six additional BICES MOU's with SHAPE, Germany, Norway, Netherlands, Denmark and SACLANT
- Continue support to overt Humint activities in Europe
- Continue installation of Gulf States Counter-Narcotics Initiative C3I System

FY 1994 Plans:
- Continue management of the FCP program
- Continue management of the NDIC by upgrading and enhancing the hardware and software system, pending availability of funds
- Continue LOCE development as US segment to NATO BICES
- Continue LOCE system support by enhancing hardware and software components to provide US/Allied coalition contingency support
- Continue LOCE SATCOM enhancements
- Support expansion of LOCE network in response to bilateral negotiations
- Develop and field new sensor feeds and interfaces with US NATO and Allied OPS/INTEL systems
- Continue support to overt Humint activities in Europe
- Continue installation of Gulf States Counter-Narcotics Initiative C3I System

D. (U) **WORK PERFORMED BY:**

Pacific Missile Test Center - Point Mugu, California
BETAC Corporation - Alexandria, Virginia
MITRE - McLean, Virginia
Orion Scientific, Inc. - Arlington, Virginia
US Air Force (ESD) - Hanscom AFB, Massachusetts
TITAN Systems - Vienna, Virginia
Vector Data Systems - Alexandria, Virginia
SHAPE Technical Center - The Hague, Netherlands
BDM International, Inc. - McLean, Virginia
CSI, Inc. - Alexandria, Virginia and San Juan Capistrano, CA
GTE Government Services - Chantilly, Virginia and Westlake, California

Program Element: 0305190D
PE Title: C3I Intelligence Programs

Project Number: P 481
Budget Activity: 5
Date: April 1993

E. (U) RELATED ACTIVITIES:

- NATO BICES
- NMOS (NATO Maritime OPS/INTEL Systems)
- USEUCOM Command Intelligence Architecture Program (CIAP) - funded under USEUCOM's GDIP O&M
- DIA Integrated Data Base (IDB)

F. (U) OTHER APPROPRIATION FUNDS:

OPERATIONS AND MAINTENANCE
PE 0901598D (WHS O&M, Defense Agencies)

	FY1992	FY1993	FY1994
Project LOCE	4,180	4,250	4,323

G. (U) INTERNATIONAL COOPERATIVE AGREEMENTS:

- MOU (France) - provides French forces access to LOCE network in exchange for French intelligence input. France funds all related communications costs.

- BICES Team MOU - establishes international team of experts to guide BICES development and to ensure interoperability between NATO and national segments. Signatories are U.S., UK, Norway, France, Germany, Italy, Greece, Turkey, Canada, Denmark, Spain, Portugal, Belgium, and the Netherlands. Each nation contributes funding for the team on a percentage basis.

- MOU (Canada) - permits Canada access to LOCE network based on exchange of intelligence. Canada funds all required communications.

FY 1994 BUDGET ESTIMATES

Program Element: 0603708D
Title: Integrated Diagnostics Technology Demonstration

Budget Activity: 6
Date: April 1993

A. (U) RESOURCES ($ in Thousands)

Project Number and Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
P708 Integrated Diagnostics Demonstration	6,861	10,624	10,441	Continuing	Continuing

B. (U) BRIEF DESCRIPTION OF ELEMENT: Funding in this Program Element is intended to accelerate the transition of high leverage, existing laboratory and commercial diagnostic technologies into integrated operational diagnostic and maintenance products. In the Integrated Diagnostics approach, weapon system diagnostic components (built-in test, test equipment, technical manuals, training) are provided as a "package", designed to work together. Improving maintenance capability will potentially reduce the estimated 25-35% of fielded system ownership costs attributable to maintenance. In addition, DoD must reduce its reliance on voluminous, "per weapon system" deployment logistics tails, and requirements for large numbers of highly skilled technicians. The integrated diagnostics approach potentially will permit improved troubleshooting with less external equipment and fewer technicians. Technology products and concepts are selected which can be quickly applied to fielded systems for payoffs now, and for new weapon system designs, and establishes technical methodologies and standards for DoD wide new/modified maintenance operations. Feasibility to rapidly transition the technology is largely accomplished through large scale demonstration on fielded systems. Strong user involvement in the demonstration; a plan to transition to use; and identified payoffs are conditions for selecting sub-projects. On-going and planned sub-projects are discussed in detail in the following section.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN FY 1994 (STARTED IN PRIOR YEARS):

1. (U) Navy DD963 Shipboard Mechanical Diagnostics Demonstration (FY 1992 Start): Ship mechanical systems (turbine engines, air compressors, pumps, etc.) are maintained through a manual, manpower intensive "watchstanding" concept. This sub-project is using the best of commercial technology and DoD prototype research to outfit mechanical equipment with new maintenance sensors and links equipment via a fiber-optic bus to an automated diagnostics processor. This will provide real-time monitoring capability for local (at-equipment) and

central (shipboard) maintenance decision and action. The increased automation and accuracy is expected to show potential for substantial reductions in watchstanding man-hours, support improved failure "prediction" to reduce catastrophic failures, and reduce removals of still-good assets. The Navy has developed technical and contract strategy and documents and awarded the contracts. The Navy will complete Shipboard installation by February 94 followed with a six-month demonstration on a DDG963 class destroyer.

2. (U) Naval Aviation Integrated Diagnostics Demonstration (FY 1992 Start):
This sub-project's operational goal is to increase aircraft availability by improving diagnostic accuracy, improving the control of costly aircraft components, and lengthening the useful life of aircraft components while reducing the maintenance manhours devoted to paperwork. The demonstration will integrate applications such as guided diagnostics techniques and algorithms, field-level structural fatigue prognostics, and serialized item tracking and configuration management to demonstrate the technologies on the F/A-18 aircraft platform for six months. The field demonstration will validate new DoD diagnostics specifications and standards for application to other programs. The Navy has released the Request For Proposal and expects contract award May 93. The system development will be complete in January 95 with the six-month field demonstration beginning in February 95.

3. (U) Army Patriot Integrated Diagnostics Demonstration (FY 1993 Start):
Weapon systems operated and maintained in remote locations (eg. DESERT STORM) can benefit from the ability to diagnose the system via satellite from a centralized CONUS location, virtually eliminating the need to deploy highly skilled system support personnel and external equipment in field locations. Likely maintenance manpower reductions also indicate the need for centralization of system diagnostics capabilities and maintenance data analysis that are accurate and timely. This effort will demonstrate the use of centralized diagnostics support to rapidly and accurately diagnose system failures via satellite around the world. Remaining field level maintenance activities will be enhanced by the use of expert systems, electronic technical manuals, and advanced maintenance data analysis and handling. Improvements in the accuracy and timeliness of the diagnostics and maintenance will result in improved weapon system availability. The Patriot missile which already communicates operational information via satellite was chosen as the vehicle for the demonstration. In January 93 the Army initiated the technology requirements and the maintenance process analysis. The Army will complete the support center and expert system plans by September 93. In FY 1994, the Army will begin the prototype end-to-end development test followed by a three month CONUS and a six month OCONUS field demonstrations in January 95.

Program Element: 0603708D
Title: Integrated Diagnostics Technology Demonstration

Budget Activity: 6
Date: April 1993

4. (U) Joint Service Automated Test System Integrated Diagnostics Demonstration (Air Force Lead) (FY 1993 Start):
Presently, the development process for test software lacks a framework environment to structure and integrate the test design elements. The absence of a framework environment results in the generation of test software that does not take advantage of the integrated diagnostics approach and does not allow for reuse on other systems or reapplication on equipment upgrades. This program will provide the technology to integrate weapon system design and Built-In-Test information with automated test equipment software. Using existing software technology and engineering automation technology, and building upon existing standards work in the engineering and test areas, this project will define a framework environment that will support generation of test software. Automatic test system software represents a high cost test software that is the first target of this demonstration. This sub-project will demonstrate the new software environment approach on the DoD Automatic Test System (ATS) families, the Army's Integrated Family of Test Equipment (IFTE) and the Navy's Consolidated Automated Support System (CASS). In FY 1994 the current DoD and commercial test software practices will be identified and the draft system architecture will be complete in January 94. The test architecture will be developed and validated prior to a demonstration in May 95 on a DoD standard ATS.

(U) Work Performed By: The developments and demonstrations will be managed by the appropriate service technical managers and performed by contractors.

(U) Related Activities: These are applications of technology to DoD system diagnostics requirements. They are not duplicative. The demonstrations are carefully designed to take full advantage of the latest commercial technology such as satellite data transmittance and display/processing. The demonstrations specifically build upon previous DoD research and developments for diagnostics, maintenance data analysis, Integrated Electronic Technical Manuals, and other technologies.

(U) Other Appropriation Funds: The appropriate service representatives will sign agreements to budget and transition of the products/concepts of the demonstration to operational use, upon their successful demonstration. Demonstration products/standards will be made available to other applicable DoD system applications.

(U) International Cooperative Agreements: Not Applicable.

FY 1994 BUDGET ESTIMATES

Program Element: 0603790D
PE Title: NATO Cooperative R&D Program

Budget Activity: 6
Date: April 1993

A. (U) RESOURCES ($ in Thousands):

Project Number & Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
P 790 NATO Cooperative R&D Program	10,881*	60,180	57,641	Continuing	Continuing

B. (U) BRIEF DESCRIPTION OF ELEMENT: These funds will be used by the Services and Defense Agencies to initiate cooperative research and development programs with the NATO and major non-NATO allies. The program was established by Section 1103 of the FY 1986 Defense Authorization Act (Nunn-Roth-Warner Amendment) which was codified in 1988 by Title 10 U.S. Code, Section 2350a. This program recognized the excessive cost and lack of interoperability because each country independently developed its own weapons systems. The purpose of the program is to improve the interoperability by jointly developing military equipment with our allies. This will not only share research and development cost, but will improve operations by fielding of interoperable equipment. Special attention is given to improving the interoperability of future equipment. The program is designed to provide "Venture Capital" to the Services and Agencies to initiate planned projects through international cooperation with the Service/Agencies providing follow-on funding. The funds are used to support all associated R&D costs including the identification of cooperative opportunities and administration of the program.

C. (U) JUSTIFICATION FOR PROJECTS:

(U) FY 1992/93 Accomplishments:
The following projects have been successfully transitioned to the Services

AV-8B, APG-65 INTEGRATION
MULTIFUNCTIONAL INFORMATION DISTRIBUTION SYSTEM
SAXON
SURFACE SHIP TORPEDO DEFENSE
ADA PROGRAMMING SUPPORT
DIGITAL CHART OF THE WORLD
EFM-X31
ELECTRONIC GUN FOR VEHICLE INTEGRATION
INFRARED MISSILE COUNTERMEASURES
NON-ACOUSTIC ASW
POST 2000 TACTICAL AREA COMMUNICATION
SENSOR FUSION SYSTEM DEVELOPMENT
F-16 DERIVATIVE (MLU)
J-STARS
AIRBORNE RADAR DEMO SYSTEM
COMBAT VEHICLE COMMAND AND CONTROL
HAWK MOBILITY ENHANCEMENT (HME)
MULTI-MODE SEEKER DEMONSTRATION
RADAR UPGRADE FOR FIGHTER AIRCRAFT
RIM 166A/ROLLING AIRFRAME MISSILE (RAM) 166A IMPROVEMENTS

Program Element: 0603790D
PE Title: NATO Cooperative R&D Program

Budget Activity: 6
Date: April 1993

(U) FY 1994 Plans:
This program will provide continuing opportunities for cooperative research and development projects with the NATO and major non-NATO allies. To date, 24 cooperative programs have been transitioned to Service/Agency support and 20 more are underway. An additional 11 programs have been identified as candidates. Continued cooperation in research and development will lead to deployment of increased numbers of interoperable items. There is a greater concentration on joint research programs that will improve interoperability in the field.

(U) WORK PERFORMED BY:
These funds are utilized by the Services and Defense Agencies for pursuit and initiation of cooperative research and development projects with the NATO and major non-NATO allies.

(U) RELATED ACTIVITIES:
The Foreign Comparative Testing (FCT) Program was established as a companion program by the same legislation that initiated the Cooperative R&D Program. Funds for the FCT are in Program Element 0605130D.

(U) OTHER APPROPRIATION FUNDS:
Once each new cooperative project is initiated, outyear funding will transition to program elements of the sponsoring Service or Agency in the appropriate mission areas.

(U) INTERNATIONAL COOPERATIVE AGREEMENTS:
This program establishes the funding for the first years of selected programs with International Cooperative Agreements.

FY 1994 BUDGET ESTIMATES

Program Element: #0605104D
PE Title: Technical Studies, Support and Analysis

Budget Activity: 6
Date: April 1993

A. (U) RESOURCES: ($ in Thousands)

Project Number & Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Prog
P421 Technical Support to the Office of the Secretary of Defense	36,509	30,799	37,434	Contg	Contg

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program element funds studies and analysis support efforts related to the research, development, evaluation, operation, and support of military forces. Specific projects address a variety of complex issues and dynamic problems facing the Under Secretary of Defense for Acquisition (USD(A)), Under Secretary of Defense for Policy (USD(P)), the Joint Staff, the Commanders-in-Chief of the Unified and Specified Commands (CINCs), the Assistant Secretaries of Defense for: Program Analysis and Evaluation (PA&E), Force Management and Personnel (FM&P), Command, Control, Communications and Intelligence (C3I), and Production and Logistics (P&L). Studies examine the implications and consequences of current and alternative policies, plans, operations, strategies and budgets; understanding and gaining insight into the complex multi-faceted technological, economic, military, and acquisition environments in which defense decisions and opportunities take place. With the defense budget declining, the need for objective analyses and forward-looking planning for the long-term becomes greater. To accomplish goals set up in the newly defined Science and Technology Strategy Plan this program element cannot absorb any further cuts.

C. (U) JUSTIFICATION FOR PROJECTS IN FY 1994:

P421 The Office of the Under Secretary of Defense (Acquisition): Funds are used to: analyze the technical, economic, and military worth of programs in the acquisition system; develop systems for managing the acquisition process; perform analyses to assist the management of basic and applied research design and engineering, and the development of weapon systems; provide analytical assistance in the management of the science and technology aspects of DOD programs.

Examples of Tactical Systems Accomplishments are:

- Evolving National Security Strategy
  This study was instrumental in determining the implications on defense acquisition and future arms control policy of political, military, social and economic developments in the former Soviet Union
- Crisis Gaming & Path Gaming
  This study featured a review or existing or candidate major weapons systems in the context of a rapidly changing world with a wide spectrum of possible threats and regional employment scenarios, all in an era of declining DOD budgets. The study contributed to our understanding of potential improvements in technology development, systems acquisition, force structure planning, training and simulation

Program Element #0605104D
PE Title: Technical Studies, Support and Analysis

Budget Activity: 6
Date: April 1993

- Light Ground Force Options
  This effort provided definition of light ground force options as well as a review of alternative assignments of functions, organizations and doctrine for ground forces by very senior retired and serving ground commanders. The final deliverable was a preliminary description of opportunities for innovation with respect to light ground forces
- Common Avionics for ATF/LX/A-X
  This study reexamined common integrated avionics prospects for ATF, LH and A-X in light of source selection decisions
- Electronic Combat Master Plan Development
  This study was a continuation of a contract effort to provide systems engineering support to the DoD's electronic combat (EC) planning management process. This year's effort focused on completing the electronic combat programs automation effort for program planning, EC initiatives with allies, and assessments of optical, radar, infrared, ultraviolet, and communications systems
- Follow-On Forces Attack/Joint Precision Interdiction Integration
  This effort provided support for preparation of the Congressionally directed Standoff Weapons Master Plan and a NATO releasable report on Joint Precision Interdiction
- Conventional Munitions Master Plan Support
  This study supported preparation of the annual Conventional Munitions Master Plan requested by Congress. The study discussed: linkage of munitions inventories to force capability; capability voids and opportunities; leveraging capabilities via advanced munitions development
- Near-Real-Time Targeting Strategy
  This study was initiated in response to a requirement to review the technical capability of existing or proposed major systems to perform the theater ballistic missiles defense mission, including pre-launch and active defense components. The FY 1992 effort provided analytical support to OUSD(A) and the Air Force in addressing how DOD should verify systems capabilities to locate, identify, and engage critical mobile targets in near real time
- Integrated Joint Precision Interdiction Scenario Analysis
  This study complemented other FY 1992 efforts to assess technical and operational capabilities to engage mobile or time-sensitive targets. The focus of this particular was the further development of specialized analytical tools, specifically a prototype combat effectiveness estimation node to be integrated into a distribution simulation network
- Armor/Antiarmor Technology
  The contractor employed computational schemes to gain insight as to the interaction of explosively formed penetrators (EFP) with thin stationary metallic plates, thin moving metallic plates, and laminar reactive armor systems. Of particular note is the understanding as to why EFP are not very effective against laminar reactive armor systems which are designed to defeat the dynamically formed jets of shaped charge

warheads. The data produced in this study will be of value to designers and developers of reactive armor technology for top surface protection of armored fighting vehicles
- Tactical Aircraft Modernization Schedules
  Due to DOD budget constraints, more tactical aircraft programs will undergo modifications and improvements to keep them in service longer and to upgrade their capabilities. This study provided information and methods to assess the time required to modify and improve in-service aircraft
- Alternative Power Plants for Submarines
  Congressional direction prompted the Department to further its understanding of and to capitalize on the potential offered by improvements in power density. This study evaluated the utility of leveraging emerging technologies in other programs toward advanced propulsion/power plants for submarine application
- Anti-Ship Weapons for Naval Helicopters
  The Desert Storm experience again demonstrated the value of arming ship-based helicopters and anti-ship weapons. This study assessed the cost-effectiveness of various alternative approaches to arming the Navy's helicopter fleet

Examples of program plans are:
- Science and Technology Initiative
- US/Soviet Compliance Issues Verification Measures & Specific Arms Control Initiatives
- Strategic and Theater Force Assessment
- Evolving National Security Strategy
- Options for Light Ground Forces
- Long Range Planning for DOD Launch Systems
- Conventional Munitions Master Plan
- Nuclear Weapons Stockpile Analysis
- Joint Micro-Electronics
- Development of the Defense Executive Fact Sheet (DEFS)
- Development of the Consolidated Acquisition Reporting System (CARS)
- Strategies for Employment of Near-Real-Time Targeting Capabilities
- Development of the Force Acquisition Cost System
- Effects of Future Force Reduction on the Industrial Base
- Systems Definition of Defense Acquisition Regulations (DAR) System
- Completion of Militarily Critical Technologies List (MCTL) Draft and distribution
- Development of COCOM Core List Proposals
- Completion of priority foreign technology assessments
- Supported multi-lateral negotiations in COCOM
- Continue work to update MCTL and addendums thereto
- Develop technical parameters in technology intensive mission areas such as space, LO/CLO
- Support International Cooperation Programs
- Complete studies related to international cooperation opportunities

Program Element: #0605104D
PE Title: Technical Studies, Support and Analysis

Budget Activity: 6
Date: April 1993

- Analysis of key technologies and international implementation
- Analysis of key technologies and international implementation
- Specific future studies are largely event-driven

P440 Joint Staff: As the immediate military staff of the Secretary of Defense, the Joint Staff uses these funds to provide analytical assistance in: providing strategic direction for Armed Forces; reviewing plans, programs and requirements; developing statements of military requirements and strategic guidance for use in the development of budgets, military aid programs, industrial mobilization plans, and weapon systems acquisition, providing modeling and simulation support to the Chairman and the unified and specified commanders (CINCs). Modeling and simulation plays a critical role in the development of defense policy and validation of contingency plans for the warfighting CINCs.

Examples of program accomplishments and plans are:
- Operational test and evaluation of strategic missiles
- Methodologies for Joint Logistics and Strategic Mobility Analysis
- Joint Distributed Modeling and Simulation Support
- Stochastic Force Deployment Estimator
- Research of Measures of Combat
- Defining Conflict Elements as a Framework for Threat Analysis
- Communications security modernization
- Force planning
- Specific future studies are largely event-driven

P441 The Comanders-in-Chief Study Support: To assist the CINCs in the accomplishment of military missions assigned to them, these funds are used to perform studies and analysis on critical joint warplanning and warfighting issues. These analyses contribute to the improved integration of war plans among the CINCs and the increase in joint warfighting capabilities of the forces assigned to them.

Examples of program accomplishments and plans are:
- Multinational Forces Issues Implementation Study
- Special Operations Forces Decision Support Analysis
- Due to the FY93 reductions in PE 0605104D funding for the Joint Staff, the CINCs received no allocations in FY93

P710 General Support for USD(P):

Examples of program accomplishments are:
- Completed research on the Operational Implications of Proliferation
- Conducted analysis of the Southeast Asia security environment
- Developed a handbook for researching POW/MIA Cases
- Examined varying POW/MIA issues in U.S. North Korean Relations
- Explored alternate scenarios for Cuba in the post Cold War Era
- Analyzed alternative U.S.-Japan security relationships after the Cold War
- Provided data concerning Defense conversion activities in Eastern Europe and the former Soviet Union
- Analyzed options for building and independent, civil-military air defense system for Eastern Europe
- Assessed the correlation of political forces in the Ukraine and the domestic and international consequences of any shifts in the prevailing balance of power

Program Element: #0605104D
PE Title: Technical Studies, Support and Analysis

Budget Activity: 6
Date: April 1993

- Examined the long-term trends and future prospects in the Asia-Pacific Region--ongoing effort
- Analyzed the prospects for and implication of ethnic conflict in Central and Eastern Europe
- Examined the implications of the changing security environment for future U.S. and DOD space policy
- Analyzed alternative regimes for limiting arms transfers to the Persian Gulf and Other Regions
- Analyzed policies and programs for deterring and defending against biological warfare--continuing effort
- Explored U.S. nuclear force options in light of the strategic drawdown
- Analyzed the economic and political benefits of the NATO Infrastructure Conversion Strategy
- Supported the development of an OSD/Joint Staff review process for the DOD Key Asset Protection Program
- Developed and analyzed data to enable the revision of the NATO Industrial Security Instruction
- Assisted in the development of a Continuity of Operations Plan
- Assisted in the analysis of U.S. policy for the protection of NATO classified information
- Analyzed some of the factors for limiting the spread of dangerous nuclear technologies
- Continued the development of the Defense Export License Tracking Analysis (DELTA) system, an automated system for case tracking and analyses for export licenses
- Provided analytical support in the preparation of the Conduct of the Persian Gulf War report submitted to the Congress in April 1992

Examples of program plans are:
- Factors Affecting and Affected by U.S. Defense Cooperation with the Countries of the Gulf
- Prospects for Korean Unification: Implications for U.S. Security Policy
- Continued Research on Future Directions for Cuba
- Concepts for Developing Cooperative Relationships with Russia and Ukraine for Conventional Force Planning
- Logistics Policy Issues Related to Conventional Forces in Europe--continuing effort
- Developing Missile and Nuclear Nonproliferation Provisions
- Military Impact of Proliferation Activities
- Nuclear Use Doctrines of Proliferating Countries and Perceptions of U.S. Nuclear Options
- Evaluating and Improving the Screening Procedures in Special Access Programs
- European Defense Integration, Role Specialization, and New Basing Modes for U.S. Air and Ground Forces
- Russia's Far East
- China's Future Strategic Direction
- Current Defense and Security Challenges Facing the U.S. in East Asia and the Pacific

P810 General Support for OSD Net Assessment:

Examples of accomplishments and plans are:
- Net assessments of the conventional, nuclear, and

Program Element: #0605104D
PE Title: Technical Studies, Support and Analysis

Budget Activity: 6
Date: April 1993

nonconventional land, air, and sea forces for the Mid East/SW Asia and East Asia/Pacific regions
- Analysis of the real rates of growth in post-Soviet republics' economies
- Emerging trends in development of post-Soviet military science and doctrine and their impact on assessing comparative regional force structures and strategies
- Analysis of impact of post-Soviet economic performance in terms of the conversion of military industrial production to the civilian sector; institutional and performance costs associated with an evolving army; and health and environmental factors influencing post-Soviet military performance
- Continuing research on the proliferation and diffusion of military technology/systems focused on the resultant impact on strategy and the doctrine of deterrence
- Continued comparative assessment of European military balance with respect to doctrine, capabilities, force modernization and effectiveness to include the impact of force reductions on regional issues
- Analysis of force structure & concepts of operations in Mid East Southwest Asia & East Asia/Pacific areas
- Implications of the diffusion of modern military equipment and technology from a defense policy planning perspective
- Dynamics associated with evolution to a more multipolar world in terms of future opportunities and risks in the military competition given defensive versus offensive doctrines
- Assess the role of economic factors in limiting the degree to which the armed forces of different nations undertake a military technical revolution (MTR) with the starting point being the hypothesis that revolutionary changes in military technology, operations, and organizations are likely to be feasible and advantageous over the next several decades. Assess the economic costs of making such revolutionary changes in a nations' policies on control or export of military and nonmilitary goods, whether costs will change over time, whether the costs will be prohibitive for some nations, etc. in order to illuminate the broader question of the likely rate and extent of the MTR.
- Assess the role of economics, organizational factors, political changes, historical influences, and technological changes in determining the potential for military cooperation, alliance, rivalry, or conflict among the major Asian nations during the next three decades.
- Continued development of a consistent and comprehensive competitive force modernization model to assess the ability of selected space systems to enhance the capabilities of terrestrial forces, and the impact on military force capabilities as well as on regional military balances.

P430 General Support to ASD(C3I): This program funds projects for Strategic Command, Control and Communications (C3); Theater and Tactical C3; Defense-wide C3; Information Systems (C3); Defense-wide Intelligence program efforts related to research, development and defense planning in support of the Assistant Secretary of Defense (ASD) Command, Control, Communications and Intelligence (C3I). The

defense planning in support of the Assistant Secretary of Defense (ASD) Command, Control, Communications and Intelligence (C3I). The ASD(C3I) technical program consists of projects directly supporting the development of Defense-wide C3I policy, evaluation of existing and planned command, control, communications, counterintelligence, security countermeasures, intelligence systems and technology, analysis of potential worldwide C3 issues, management technologies, and other areas affecting medium and long range planning.

Examples of accomplishments and plans are:

- Developed intelligence architecture studies to identify connectivity between US, NATO, and allied nations
- Supported multinational Battlefield Information Collection and Exploitation Systems (BICES) Project Team studies on connectivity and interoperability
- Analyzed and developed recommendations on major C3 issues to the NATO Communications and Information Systems Committee such as impact of the post cold war environment on NATO C3 plans and programs, affordability of the Tri-Major NATO Command and Control Plan and the development of a C3 Architecture and Master Plan
- As part of a multinational working group, drafted the Allied Command Europe Command and Control Information System (CCIS) Implementation Strategy for endorsement as NATO policy
- Redirected the NATO Battlefield Information Collection and Exploitation Systems pilot study to consider the rationalization of NATO-required compatibility with the US Limited Operational Capability Europe
- Analyzed Network Security issues and evaluation
- Evaluated Network security architectures
- Completed system research and planning of the network security architecture of operating DOD networks
- Developed the implementation plan for recommendations to the ASD(C3I) for policy and structure improvements resulting from analysis of Desert Shield/Storm lessons learned
- Reviewed current and future legislation and FCC proposals impacting C3I, and provided recommendations for DOD responses and proposals
- Conducted research on future military intelligence alliances to be considered by DOD with US and foreign intelligence and other government officials
- Development of the NATO-wide CCIS implementation strategy and plans
- NATO C3 planning and implementation in selected areas, including the C3 capability required for NATO crisis management, affordable security implementation, and development of NATO information system models and standards consistent with the US Corporate Information Management efforts
- Technical studies support for ASD(C3I)'s Intelligence Systems Council concerning interoperability issues
- Additional geographic areas of study for future military intelligence alliances
- In each case, the expected products require multiple years of research in order to fully satisfy the needs of the ASD (C3I)

Program Element: #0605104D
PE Title: Technical Studies, Support and Analysis

Budget Activity: 6
Date: April 1993

P910 General Support for ASD(FM&P): These funds are used to provide increased capability of DOD manpower in meeting force effectiveness, combat readiness, and sustainability goals. Specifically, they are used to: (1) explore new concepts to support effective training; (2) develop methods to improve the determination of the requirements for manpower; (3) improve the technological capability of personnel systems to acquire, distribute, train, and utilize qualified personnel; (4) develop analytical tools to quantify the relationship between civilian and military service-related factors and job performance; and (5) explore new methods for managing total force manpower.

Examples of program accomplishments are:
- Army support personnel structure during the drawdown
- Effects of Desert Storm mobilization on Reserve medical personnel
- Effectiveness of simulator versus optempo training

Examples of program plans are:
- Analysis of alternative structures of the DOD civilian work force and civilian personnel policy options
- Manpower planning in the drawdown, to include the effects of compensation and costs for alternative force manning levels
- Manpower requirements determination
- Manpower forecasting models

- Total force analysis, planning and costing (military and civilian)
- Training and training cost effectiveness
- Career development and retention issues
- Compensation and incentives policy analysis
- Mobilization planning/emergency planning and Reconstitution
- Force drawdown planning/separation incentives
- Family program evaluation and analysis
- Research on civil-military partnerships

P610 General Support for ASD(PA&E): This program provides support for studies and analysis for the Office of the Assistant Secretary of Defense (Program Analysis and Evaluation).

Examples of program accomplishments are:
- Completion of research on the costs to the Egyptian government of alternative defense forces
- Assessment of the feasibility and costs of extending the lifetime of Trident C-4 seabased ballistic missiles
- Cost analysis of focal plane arrays
- Assessment of the cost effectiveness of non-nuclear attack submarines
- Support for the Secretary's Total Force Policy study
- Assessment of the changes in force cost due to changes in the active/reserve force balance
- Analysis of the capability of US antisubmarine warfare forces

Ongoing activities and future plans include:
- Development of a system to perform cost analyses of force structure and infrastructure support systems

- Examination of force planning options for the next century
- Development of methods to assess military capabilities, regional force balances, and burdensharing/resource allocation in the post-Cold War era
- Examination of the sources of cost growth in the development and acquisition of weapon systems
- Evaluation of the adequacy of funding for infrastructure to support military forces
- Development of a system to assess the effectiveness of strategic defense forces
- Assessment of over-the-horizon warfighting capabilities
- Examination of future strategic force structures
- Assessment of the future role of attack submarines
- Development of techniques for modeling mobility and logistics
- Assessment of the Contractor Cost Data Reporting system
- Analysis of the costs and demands on the military medical care system
- Independent analysis of the cost and operational effectiveness of planned weapon systems

P719 General Support to P&L:

Examples of accomplishments and plans are:

- Exploiting Critical Technologies
- Rapid Prototyping of Corporate Information Management
- Explosives Accident Database
- Environmental Budgeting, Compliance and Support
- Evaluation of Contracting Out Fire Protection on Installations
- Toxic Release Inventory
- Total Asset Visibility
- Depot Maintenance Consolidation
- Inventory Reduction
- Implement Defense Business Operations Fund (DBOF) Unit Cost

P410 RAND (NDRI) Research Center:

This program provides research support and policy analysis for the Office of the Secretary of Defense, the Joint Staff, and the Defense Advanced Research Projects Agency. The work is performed by the National Defense Research Institute (NDRI) which is a Federally Funded Research and Development Center (FFRDC) within the RAND Corporation. The broad objectives of the program are to: (1) ensure access by all OSD components to independent interdisciplinary expert research capabilities covering a broad range of relevant specialties; (2) institutionalize capabilities for analysis of major research objectives that cut across the responsibilities of individual OSD components; and (3) ensure that sponsors will continue to have available the benefit of these long-term programs and capabilities in the most productive and useful way. The program is approved and reviewed annually by the Defense Advisory Group which is made up of the principals of the ten sponsoring offices. This program will provide continuing and newly defined research and analytical support in the following areas:

- Ongoing assessments for USD(P) focused on the dynamic changes ongoing within the former Soviet Union and East Europe and the implications for DOD policymakers

Program Element # 0605104D
PE Title: Technical Studies, Support and Analysis

Budget Activity 6
Date: April 1993

- Studies for ASD(C3I) on electromagnetic spectrum management/compatibility and capability and U.S. military intelligence alliances in the post-Cold War world
- Continuation of the analyses for the Joint Staff on joint strategic command and control, combined logistics, and battle management
- Continued development of the RAND Strategy Assessment System under the sponsorship of the Director, Net Assessment
- Economic and costing research for the ASD(PA&E)
- Studies to improve and streamline the acquisition process for ASD(P&L)
- Completed research for ASD(FM&P) and Reserve Affairs includes:
- Retrospective assessment of the Defense Officer Personnel Management Act of 1980
- Development of a new civilian wage index for Defense manpower
- Assessing the structure and mix of future active and Reserve forces
- 7th QRMC issues
- Strategies for force management during the drawdown
- Reserve recruiting supply
- Planned analyses on military personnel recruiting, retention, force structure, training, education, compensation, attrition and family and child care issues for the ASD(FM&P) and Reserve Affairs
- Applied Science and Technology
- Defense Manpower Research
- Information Processing System
- International Economic Policy
- Strategy Planning and Assessment
- Military Forces Employment
- International Security and Defense Policy
- Acquisition and Support Policy
- Specific Future Studies can be Event-Driven

D. (U) WORK PERFORMED BY:

Institute for Defense Analyses, Alexandria, VA
RAND National Defense Research Institute, Santa Monica, CA
Logistics Management Institute, Bethesda, MD
MITRE Corporation, Hanscom AFB, MA and McLean, VA
General Research Corporation, McLean, VA
American Institute for Research, Washington, DC
Army Research Institute, Alexandria, VA
Booz-Allen & Hamilton
Analytical Services, Inc.
BDM Corporation
Science Applications, Inc.
Strategic Analysis, Inc., Arlington, VA
Decision Systems Technologies Inc., Greenbelt, MD
ORKAND Corporation, Washington, DC
Larkin Corporation, McLean, VA
National Academy of Sciences, Washington, DC

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GTE Inc, Chantilly, VA
Cost Management Systems, Vienna, VA
Defense Technical Information Center, Alexandria, VA
DARPA, Arlington, VA
DOE, Albuquerque, NM
Other organizations including academic study centers, commercial analytical organizations, not-for-profit organizations.

E. (U) COMPARISON WITH PREVIOUS DESCRIPTIVE SUMMARY: Projects funded out of this program element are mostly determined by world events. Projects have changed due to the daily changing world situation.

F. (U) PROGRAM DOCUMENTATION: Numerous.

G. (U) RELATED ACTIVITIES: Other programs contributing to the efforts are studies, tasks and evaluations, policy and resource plans, and assessments performed by the military services, Defense Agencies, other segments of OSD and DOD, the intelligence community, Department of State, and Department of Energy.

H. (U) OTHER APPROPRIATION FUNDS: None.

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: The Key Technologies function supports the preparation of cooperative opportunities.

FY 1994 BUDGET ESTIMATES

Program Element: 0605117D
PE Title: Foreign Materiel Acquisition & Exploitation

Project Number: P 411
Budget Activity: 6
Date: April 1993

A. (U) RESOURCES ($ in Thousands)

Project Title	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	To Complete	Total Program
Foreign Materiel Acquisition and Exploitation					
	9,800	9,498	336,176	ongoing	ongoing

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program is involved in the acquisition and exploitation of foreign military equipment and military technology.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS: The FY 1994 and outyear programs include special classified programs for which information will be provided only on a "need-to-know" basis to authorized personnel. Funds have been and will be used to acquire high-priority foreign materiel as it becomes available.

D. (U) WORK PERFORMED BY: Work on this program will be performed by various elements of the U.S. Government.

E. (U) COMPARISON WITH PREVIOUS DESCRIPTIVE SUMMARY: Detailed information is classified and will be provided on a "need to know" basis to authorized personnel.

F. (U) PROGRAM DOCUMENTATION: DoD Directive S-3325.1 (Foreign Materiel Program)

G. (U) RELATED ACTIVITIES: None

H. (U) OTHER APPROPRIATION FUNDS: None

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable

J. (U) MILESTONE SCHEDULE: Although specific dates cannot be precisely established, the Foreign Materiel Program Review Board (FMPRB) has approved a Foreign Materiel Acquisition (FMA) list that targets high-priority foreign military materiel that is attainable and potentially acquirable. As targets of opportunity become available, materiel acquisition actions will be handled with real-time responsiveness and obligation of funds.

FY 1994 BUDGET ESTIMATES

Program Element: 0901600D
PE Title: Contract Administration/Audit

Project Number: P775
Budget Activity: 6
Date: April 1993

A. (U) RESOURCES: ($ in thousands)

Project Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Prog.
Contract Administration/Audit	0	0	18,625	Cont.	Cont.

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: The FY1994 budget reflects the portion of the Department's estimate as a result of contract awards made in this appropriation. This represents a change from the way the budget was presented last year and reflects a Congressional and Departmental initiative to move toward mission budgeting which calls for an improved method of budgeting and justifying resources. The visibility of total costs related to contract awards and administrative requirements is improved in this presentation because support service funding for related contracts is included in this appropriation.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS: These funds will be used to finance contract services that are performed in support of programs budgeted in this appropriation.

D. (U) WORK PERFORMED BY: Defense Contract Audit Agency, Defense Contract Management Command.

E. (U) COMPARISON WITH PREVIOUS DESCRIPTIVE SUMMARY: N/A.

F. (U) PROGRAM DOCUMENTATION: N/A.

G. (U) RELATED ACTIVITIES: N/A.

H. (U) OTHER APPROPRIATION FUNDS: None.

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: N/A.

J. (U) MILESTONE SCHEDULE: N/A.

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FY 1994 Congressional Submission RDT&E Descriptive Summaries

April 1993

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ADVANCED RESEARCH PROJECTS AGENCY
RESEARCH, DEVELOPMENT, TEST AND EVALUATION, DEFENSEWIDE
SUMMARY BY BUDGET ACTIVITY
($ in Thousands)

		FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
1	Technology Base	861,512	980,585	847,853
2	Advanced Technology Development	667,571	1,242,947	1,277,558
6	Defensewide Mission Support	68,209	26,920	56,753
	TOTAL RDT&E - DIRECT	1,597,292	2,250,452	2,182,164
	Reimbursements	9,000	15,000	10,000
	TOTAL PROGRAM	1,606,292	2,265,452	2,192,164

Apr-93

ADVANCED RESEARCH PROJECTS AGENCY
RESEARCH, DEVELOPMENT, TEST AND EVALUATION, DEFENSEWIDE
SUMMARY BY PROGRAM CATEGORY
($ in Thousands)

		FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
6.1	Research	115,790	109,629	79,657
6.2	Exploratory Development	745,722	870,956	768,196
6.3	Advanced Development	667,571	1,242,947	1,277,558
6.5	Management and Support	68,209	26,920	56,753
	Total Research and Development (Program 6)	1,597,292	2,250,452	2,182,164
	Reimbursements	9,000	15,000	10,000
	TOTAL PROGRAM	1,606,292	2,265,452	2,192,164

Apr-93

DEPARTMENT OF DEFENSE - MILITARY
ADVANCED RESEARCH PROJECTS AGENCY
RESEARCH, DEVELOPMENT, TEST AND EVALUATION, DEFENSEWIDE
DETAIL BY BUDGET ACTIVITY
($ In Thousands)

Element Code	Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
1	Technology Base			
6.1	Research	115,790	109,629	79,657
0601101E	Defense Research Sciences	115,790	109,629	79,657
6.2	Exploratory Development	745,722	870,956	768,196
0602301E	Computing Systems & Communications Tech	288,292	349,463	368,589
0602702E	Tactical Technology	128,052	98,019	143,891
0602707E	Particle Beam Technology	2,495	0	0
0602708E	Int Command & Control Technology	109,008	152,180	57,214
0602712E	Materials & Electronics Technology	198,409	255,112	198,502
0602714E	Treaty Verification	19,466	0	0
0602790E	Small Business Innovation Research	0	16,182	0
2	Advanced Technology Development			
6.3	Advanced Development	667,571	1,242,947	1,277,558
0603226E	EEMIT	249,495	286,568	512,198
0603227E	Relocatable Targets	28,240	0	0
0603569E	Advanced Submarine Technology	71,458	52,049	32,556
0603570E	Defense Reinvestment	60,000	561,633	324,000
0603739E	Electronics Manufacturing Technology	206,061	219,330	299,597
0603744E	Advanced Simulation	0	28,522	9,207
0603745E	Microelectronics Manufacturing	0	94,845	100,000
0603756E	Consolidated DoD Software Initiative	52,317	0	0
6	Defensewide Mission Support			
6.5	Management and Support	68,209	26,920	56,753
0305889E	DoD Intl Spt/Counter Narcotics	32,450	0	0
0605114E	Blacklite	4,000	4,770	4,875
0605502E	Small Business Innovation Research	12,115	0	0
0605898E	Management Headquarters	19,644	22,150	24,005
0901600E	Contract Administration/Audit	0	0	27,873
	Total ARPA	1,597,292	2,250,452	2,182,164

FY 1994 BUDGET ESTIMATES RDT&E DESCRIPTIVE SUMMARY

Program Element: #0601101E
PE Title: Defense Research Sciences
Budget Activity: 1. Technology Base
Date: April 1993

A. (U) RESOURCES: ($ in Thousands)

Project Number & Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
CCS-02	Information Sciences				
	44,816	49,175	33,677	Continuing	Continuing
ES-01	Electronic Sciences				
	26,568	34,791	31,853	Continuing	Continuing
MS-01	Materials Sciences				
	44,406	25,663	14,127	Continuing	Continuing
TOTAL	115,790	109,629	79,657	Continuing	Continuing

B. (U) BRIEF DESCRIPTION OF ELEMENT: The Defense Research Sciences program element provides the technical foundation for long-term improvements through the discovery of new phenomena and the exploration of the potential of such phenomena for military and commercial applications. It supports the scientific study and experimentation that is the base for more advanced knowledge and understanding in information, electronic and materials sciences. The programs contained in this Program Element reflect the Department's initiative to support dual-use technologies.

(U) The Information Sciences project focuses on advanced concepts in software technology, artificial intelligence, integration of intelligence technologies with manipulative systems in robotics, reliability and performance in microelectronic sciences, and varied aspects of High Performance Computing.

(U) The Electronic Sciences project explores and demonstrates electronic and optoelectronic device, circuit, and processing concepts to transmit, gather and process information at substantial increases in performance while realizing a considerable cost reduction.

(U) The Materials Sciences project concentrates on development of new materials for advanced composite structures, synthesis of efficient/heat resistant polymers, development of high power/energy density electrochemical power sources, disposal of toxic waste, and algorithms in Automatic Target Recognition to detect and identify targets hidden in foliage.

FY 1994 BUDGET ESTIMATES RDT&E DESCRIPTIVE SUMMARY

Program Element: #0601101E
PE Title: Defense Research Sciences

Project Number: CCS-02
Budget Activity: 1. Technology Base
Date: April 1993

A. (U) RESOURCES: ($ in Thousands)

Project Number & Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
CCS-02 Information Sciences	44,816	49,175	33,677	Continuing	Continuing

B. (U) BRIEF DESCRIPTION OF PROJECT: This project supports the scientific study and experimentation that is the basis for more advanced knowledge and understanding in Information Sciences related to long-term national security and commercial needs. Software technology, develops advanced concepts for methods and tools to produce high assurance software, language concepts that facilitate the rapid specification and evolution of systems, and techniques to manage shared complex structured data objects in design support systems. Intelligent systems technology focuses on advanced techniques for understanding spoken language, written text, and visual images. Robotics technology, produces advanced control systems, including the integration of visual recognition with manipulator systems. Microelectronic science calibrates fundamental concepts to produce reliable, testable, and high performance design. High Performance Computing (HPC) science generates concepts and methods for validating and verifying design components, and unique approaches to rapidly develop high performance libraries across multiple HPC architectures. This effort supports the Director of Defense Research and Engineering (DDR&E) thrust area, Technology for Affordability.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1992 Accomplishments:

- (U) Determined effectiveness of auditory models for robust speech recognition in noise.
- (U) Demonstrated advanced programming language concepts for specifying aspects of software requirements and for rapid prototyping of complex software.
- (U) Demonstrated concept for developing highly assured software involving separate multiple system layers.
- (U) Demonstrated open architecture framework for integrating advanced software tools.
- (U) Developed highly efficient parallel algorithms for multiple generic computational tasks.
- (U) Completed development of "ControlShell" - a software system for dynamic robotic control.
- (U) Completed development of a common infrastructure for data storage, update and retrieval.

FY 1994 BUDGET ESTIMATES RDT&E DESCRIPTIVE SUMMARY

Program Element: #0601101E
PE Title: Defense Research Sciences
Project Number: CCS-02
Budget Activity: 1. Technology Base
Date: April 1993

- (U) Demonstrated prototype language and runtime environment which operates on a conventional serial machine as well as a scalable parallel machine.
- (U) Demonstrated new algorithms using binary decision diagrams - the basis of logic synthesis systems.
- (U) Developed early theory of reliable networks that use the same area while providing significantly enhanced reliability.

(U) FY 1993 Planned Program:

- (U) Develop concept for language to specify software architecture and interconnection amongst modules in software systems.
- (U) Develop concepts for component-oriented approaches to large scale software systems.
- (U) Develop concepts to support reuse of aspects of systems architecture and design.
- (U) Develop a laboratory research environment for active vision and vision-guided navigation.
- (U) Conduct assessment of distributed object management technology in design applications.
- (U) Demonstrate close integration of object-oriented database and programming language technologies.
- (U) Collect corpora of annotated speech, and associated translations, to facilitate multilingual research.
- (U) Develop text translation database as test data for evaluation of document understanding systems.
- (U) Develop approaches combining model-based vision and neural networks.
- (U) Develop and disseminate a prototype of a persistent object base.
- (U) Develop tools that can verify adherence to formalized interface specifications, demonstrating them on standard protocols.
- (U) Demonstrate new fault tolerant interconnection techniques which can be implemented on scalable parallel systems.
- (U) Develop fundamental approaches to construct high performance libraries which allow execution across multiple applications.

(U) FY 1994 Planned Program:

- (U) Develop process model approaches for prototyping large scale software systems.
- (U) Develop means to specify functional aspects of individual reusable components.

FY 1994 BUDGET ESTIMATES RDT&E DESCRIPTIVE SUMMARY

Program Element: #0601101E
PE Title: Defense Research Sciences

Project Number: CCS-02
Budget Activity: 1. Technology Base
Date: April 1993

- (U) Demonstrate active vision assisted manipulator task execution from mobile platform.
- (U) Establish evaluation metrics for multilingual speech systems.
- (U) Demonstrate rudimentary spoken language translation systems and document understanding systems.
- (U) Develop evaluation metrics for preliminary hybrid vision systems.
- (U) Validate the persistent object base to support rapid development of autonomous multilingual software capable of sharing information.
- (U) Develop fundamental design concepts and approaches needed to incorporate gigahertz technologies into computing architectures.
- (U) Demonstrate high performance libraries that can be constructed and executed on multiple scalable architectures.
- (U) Demonstrate fault tolerant and reliable network communication concepts in distributed systems.

D. (U) WORK PERFORMED BY: University of Southern California/ Information Sciences Institute, Marina del Rey, CA; Stanford University, Palo Alto, CA; Massachusetts Institute of Technology, Cambridge, MA; University of California at Berkeley, CA; and Carnegie Mellon University, Pittsburgh, PA.

E. (U) RELATED ACTIVITIES: The technologies developed in this Project provide the foundation for further developments in 0602301E, Computing Systems and Communications Technology.

F. (U) OTHER APPROPRIATION FUNDS: None.

G. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable.

FY 1994 BUDGET ESTIMATES RDT&E DESCRIPTIVE SUMMARY

Program Element: #0601101E
PE Title: Defense Research Sciences
Project Number: ES-01
Budget Activity: 1. Technology Base
Date: April 1993

A. (U) RESOURCES: ($ in Thousands)

Project Number & Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
ES-01	Electronic Sciences				
	26,568	34,791	31,853	Continuing	Continuing

B. (U) BRIEF DESCRIPTION OF PROJECT: This project explores and demonstrates electronic and optoelectronic device, circuit, and processing concepts that will provide: (1) new technical options for future electronic and optical systems used in information transmission, gathering and processing; and (2) a substantial increase in performance and cost reduction per function. Research areas include new electronic device and circuit concepts, innovative optical materials and devices, artificial neural network (ANN) research, fundamentally new semiconductor processing, and microelectromechanical systems (MEMS) technology. This basic research project creates the vital new concepts for advanced electronic, optoelectronic, and MEMS components to meet future Department of Defense (DoD) needs involving all the DDR&E thrust areas.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1992 Accomplishments:

- (U) Fabricated integrated optical processing modules of photorefractive elements and electronic devices.
- (U) Formulated stable organic electro-optical polymers.
- (U) Integrated polymer waveguide devices with silicon very large scale integrated (VLSI) circuits.
- (U) Demonstrated long-wavelength infrared detector arrays with improved uniformity using low cost GaAs substrates at 60°K.
- (U) Investigated nearest neighbor interaction cellular automata architectures, using quantum devices.
- (U) Demonstrated logic elements using quantum devices.
- (U) Fabricated and demonstrated high-speed (> 1 billion operations/sec) neural net microchips.
- (U) Demonstrated neural network speech recognition and word spotting techniques.
- (U) Demonstrated nanoscale electrical probe.
- (U) Demonstrated artificial retina using nanoelectronics.

FY 1994 BUDGET ESTIMATES RDT&E DESCRIPTIVE SUMMARY

Program Element: #0601101E
PE Title: Defense Research Sciences
Project Number: ES-01
Budget Activity: 1. Technology Base
Date: April 1993

(U) FY 1993 Planned Program:

- (U) Develop diode laser amplifier arrays.
- (U) Develop coupled, quantum-well optical switches.
- (U) Demonstrate blue-green diode laser.
- (U) Fabricate nonlinear polymer device structures with molecular beam epitaxy (MBE).
- (U) Develop neural network techniques for temporal processing, nonlinear adaptive filters, and synthesis of 3-D images from 2-D views.
- (U) Demonstrate low cost, long-wavelength infrared focal plane arrays operating at 77°K using low cost GaAs substrates.
- (U) Demonstrate feasibility of free-space optical interconnect.
- (U) Develop conformal printing, 3-dimensional machine technologies, and shared multi-project fabrication runs for the manufacturing of microelectro-mechanical systems (MEMS).
- (U) Determine the utility of indium phosphide (InP) heterojunction bipolar transistor (HBT) technology for very wide bandwidth analog-to-digital (A/D) converter applications.
- (U) Demonstrate quantum dots grown in nanochannel glasses.
- (U) Measure optical constants of III-V materials (GaAs, InP, and their alloys) as a function of temperature and strain.
- (U) Demonstrate nanoelectronic shift register.
- (U) Fabricate lateral resonant-tunneling device.

(U) FY 1994 Planned Program:

- (U) Explore multi-valued logic architectures for nanoelectronics.
- (U) Demonstrate self-assembled organic polymer-based 10-nanometer-long wires.
- (U) Demonstrate 10X reduction in ultra-low-power laser size.
- (U) Demonstrate optical interconnects for chip-to-chip and on-chip.
- (U) Demonstrate scanning tunneling microscope patterning on the nanoscale.
- (U) Develop semiconductor laser diodes with minimum relative intensity noise (RIN) for analog modulation.
- (U) Investigate charge transport across quantum well interface for high speed operation.
- (U) Investigate crystalline and quantum well nonlinear polymer devices.

FY 1994 BUDGET ESTIMATES RDT&E DESCRIPTIVE SUMMARY

Program Element: #0601101E
PE Title: Defense Research Sciences
Project Number: ES-01
Budget Activity: 1. Technology Base
Date: April 1993

- (U) Initiate development of hybrid architectures, composed of neural net and conventional techniques, for application to image and speech recognition.
- (U) Demonstrate increased functional density using hybrid resonant tunnel diode and heterojunction bipolar transistor (HBT) circuits.
- (U) Initiate effort to explore abstraction concepts for the synthesis of semiconductor processes.
- (U) Develop formalism for describing unit processes and integrating process flows.
- (U) Develop microsensor CAD/CAM and process simulation tools and initiate multi-project, common fabrication infrastructure.
- (U) Begin development of massively parallel high-density read/write positioning microactuators for ultra-high density data storage.

D. (U) WORK PERFORMED BY: Stanford University, Palo Alto, CA; California Institute of Technology, Pasadena, CA; Texas Instruments, Dallas, TX; Martin-Marietta Labs, Baltimore, MD; Hughes Research Laboratory, Malibu, CA; Yale University, New Haven, CT; Lincoln Laboratory, Lexington, MA; Mayo Foundation, Rochester, MN; Massachusetts Institute of Technology, Cambridge, MA; Optivision, Palo Alto, CA; Rockwell International Science Center, Thousand Oaks, CA; and AT&T Bell Labs, Holmdel, NJ.

E. (U) RELATED ACTIVITIES: Efforts in this project are coupled to the Services' program through use of Service agents, annual DoD-wide program reviews, and review by the Advisory Group on Electron Devices (AGED). These activities assure that no unnecessary duplication of effort occurs. This project provides a research base for 62712E, MPT-02, Electronics Processing Technology.

F. (U) OTHER APPROPRIATION FUNDS: None.

G. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable.

FY 1994 BUDGET ESTIMATES RDT&E DESCRIPTIVE SUMMARY

Program Element: #0601101E
PE Title: Defense Research Sciences

Project Number: MS-01
Budget Activity: 1. Technology Base
Date: April 1993

A. (U) RESOURCES: ($ in Thousands)

Project Number & Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
MS-01	Materials Sciences 44,406	25,663	14,127	Continuing	Continuing

B. (U) BRIEF DESCRIPTION OF PROJECT: This project is concerned with the development of new materials and concepts for advanced composite structures; synthesis of stronger and more heat resistant polymers; exploitation of biologically-derived materials such as electron source structures, magnetic composite materials and advanced spatial light modulators; development of high power/energy density electrochemical power sources. Other areas of focus are research into the disposal of toxic chemical wastes and waste source reduction for DoD relevant manufacturing processes; development of advanced algorithms and associated technologies for detecting and identifying targets hidden in foliage; and advanced signal processing algorithms to improve unattended ground sensor (UGS) performance.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1992 Accomplishments:

- (U) Demonstrated rapid process for manufacture of small diameter boron nitride fibers.
- (U) Produced and delivered 25 solid state batteries for performance testing.
- (U) Determined the electrostrictive properties of polyurethane films and demonstrated the possibility of developing an advanced sonar.
- (U) Initiated work on supercritical water oxidation for the safe destruction of toxic military wastes.
- (U) Assembled and tested a platinum/ruthenium alloy catalyst direct methanol fuel cell producing the highest direct methanol cell data reported to date.
- (U) Initiated a program for the avoidance/elimination of toxic waste production as by-products of DoD-related manufacturing processes.
- (U) Demonstrated for the first time the fabrication of continuous fiber ceramic matrix composites with fiber coatings that successfully improve high temperature toughness.
- (U) Initiated team effort to develop manufacturable processes for high temperature superconducting

interconnects in multi-chip modules, to be applied to electronic-warfare systems in military avionics.

(U) FY 1993 Planned Program:

- (U) Optimize processing of boron nitride fiber for composite material reinforcement.
- (U) Complete performance testing of solid state batteries previously delivered in FY 1992.
- (U) Initiate contracts for toxic waste source reduction for DoD relevant manufacturing processes.
- (U) Complete thermo mechanical testing of high temperature polymer composite coupons.
- (U) Produce prototype primary solid state battery.
- (U) Initiate construction of pilot plant for safe destruction of toxic military chemical wastes.
- (U) Develop novel methods for automatic target recognition and classification using wavelets, a new signal representation method, and other advanced mathematical techniques.
- (U) Develop procedures for optimization of complementary metal oxide semiconductor (CMOS) chips for operation at 80°K, without substantially changing fabrication procedures (i.e., variations in implant density and depth).
- (U) Initiate a program to develop elevated temperature operation of laser diodes to pump solid state lasers and two micron laser sources for infrared countermeasures.
- (U) Investigate signal clutter adaptive detection algorithms for locating targets in deep-hide.

(U) FY 1994 Planned Program:

- (U) Demonstrate high efficiency direct oxidation fuel cell power module.
- (U) Demonstrate prototype rechargeable solid state military battery.
- (U) Construct supercritical water oxidation processor for destruction of toxic wastes.
- (U) Demonstrate benefits of damage tolerant monolithic structural ceramics with fiber composite laminate surface layers.
- (U) Initiate a program to develop a logistic fuel cell for mobile electric power.
- (U) Initiate program in medical technology concerned with developing medical sensors and the use of advanced information technologies to enhance battlefield trauma care.

FY 1994 BUDGET ESTIMATES RDT&E DESCRIPTIVE SUMMARY

Program Element: #0601101E
PE Title: Defense Research Sciences

Project Number: MS-01
Budget Activity: 1. Technology Base
Date: April 1993

D. (U) WORK PERFORMED BY: University of Pennsylvania, Philadelphia, PA; Massachusetts Institute of Technology, Cambridge, MA; California Institute of Technology, Pasadena, CA; Lanxide Corporation, Newark, DE; GA Technologies, La Jolla, CA; University of California, Santa Barbara, CA; International Fuel Cells, South Windsor, CT; Owens Corning Fiberglass, Granville, OH; University of Illinois, Urbana, IL; E-Systems, Greenville, TX; nChip, Sunnyvale, CA; Cornell University, Ithaca, NY; E-Systems, Falls Church, VA; University of Arkansas, Fayetteville, AK; Texas Instruments, Dallas, TX; Northwestern University, Evanston, IL; and Georgia Institute of Technology, Atlanta, GA.

E. (U) RELATED ACTIVITIES: ARPA's research in Materials Sciences is coordinated within the DoD and with other federal agencies via the National Science Foundation-hosted Interagency Materials Group, Office of Science and Technology Policy (OSTP) Committee on Materials (COMAT), and various Director Defense Research and Engineering (DDR&E) sponsored topical workshops on advanced materials. These activities assure that no unnecessary duplication of effort occurs.

F. (U) OTHER APPROPRIATION FUNDS: None.

G. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable.

FY 1994 BUDGET ESTIMATES RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602301E
PE Title: Computing Systems and Communications Technology
Budget Activity: 1. Technology Base
Date: April 1993

A. (U) RESOURCES: ($ in Thousands)

Project Number & Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
ST-01	JASON				
	1,300	1,240	1,240	Continuing	Continuing
ST-10	Strategic Computing				
	79,106	68,234	0	0	Transferred to ST-11 and ST-19
ST-11*	Intelligent Systems and Software				
	31,689	38,831	68,841	Continuing	Continuing
ST-12*	Advanced Quantum Electro-Optics and Electronic Warfare				
	11,768	8,618	0	0	Transferred to TT-06
ST-15	Gallium Arsenide				
	7,154	0	0	0	136,970
ST-16*	High Temperature Superconductivity/Ceramics				
	26,446	0	0	0	Transferred to MPT-06
ST-18	DARPA Initiative in Concurrent Engineering (DICE)				
	20,000	0	0	0	47,135
ST-19	High Performance Computing (HPC)				
	110,829	134,388	237,926	Continuing	Continuing
ST-20*	Distributed Information Systems/C^3				
	(33,993)	34,352	0	0	Transferred to ST-11
ST-21*	Software Engineering Institute (SEI)				
	(27,100)	15,635	0	0	Transferred to ST-22
ST-22*	Software Engineering Technology				
	(25,217)	21,814	39,096	Continuing	Continuing
ST-23*	Surveillance Research				
	(19,466)	26,351	21,486	Continuing	Continuing
TOTAL	288,292	349,463	368,589		

FY 1994 BUDGET ESTIMATES RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602301E
PE Title: Computing Systems and Communications Technology

Budget Activity: 1. Technology Base
Date: April 1993

*These projects reflect the Program Element/Project consolidation and realignment within ARPA. FY 1992 funding in parentheses is shown for continuity purposes and does not add to total.

B. (U) BRIEF DESCRIPTION OF ELEMENT/PROJECT: This program element funds projects directed toward the application of advanced, innovative computing systems and communications technologies. These programs include:

(U) ARPA leadership of the Federal High Performance Computing and Communications Initiative to develop technologies to allow computer systems to function at a trillion operations per second.

(U) Software engineering to provide fundamentally new software capabilities and expand the application of artificial intelligence.

(U) Software Engineering Institute (SEI) and Software Technology for Adaptable, Reliable Systems (STARS). SEI works to transition, introduce and promulgate modern software in the defense industry. STARS works to develop large-scale software products that have commercial as well as military capabilities.

(U) The surveillance research and anti-nuclear proliferation project enhances U.S. capabilities to globally monitor nuclear explosions, and to detect production, testing, and storage of nuclear material and weapons.

(U) The JASON studies effort to support the National Security Community.

(U) The programs contained in Projects ST-11, ST-19 and ST-22 reflect the Department's initiative to support dual-use technologies.

ADVANCED RESEARCH PROJECTS AGENCY
RESEARCH, DEVELOPMENT, TEST AND EVALUATION, DEFENSEWIDE
SUMMARY BY BUDGET ACTIVITY
($ in Thousands)

		FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
1	Technology Base	861,512	980,585	847,853
2	Advanced Technology Development	667,571	1,242,947	1,277,558
6	Defensewide Mission Support	68,209	26,920	56,753
	TOTAL RDT&E - DIRECT	1,597,292	2,250,452	2,182,164
	Reimbursements	9,000	15,000	10,000
	TOTAL PROGRAM	1,606,292	2,265,452	2,192,164

Apr-93

FY 1994 BUDGET ESTIMATES RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602301E
PE Title: Computing Systems and Communication Technology
Project Number: ST-01
Budget Activity: 1. Technology Base
Date: April 1993

A. (U) RESOURCES: ($ in Thousands)

Project Number & Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
ST-01	JASON				
	1,300	1,240	1,240	Continuing	Continuing

B. (U) BRIEF DESCRIPTION OF PROJECT: This project supports the JASONs, an independent group of distinguished individuals dedicated to sophisticated scientific and technical research and analysis in support of the National Security Community. JASON membership is carefully balanced to provide a wide spectrum of scientific expertise and technical analysis in theoretical and experimental physics, materials, information sciences, and other allied disciplines.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1992 Accomplishments:
- (U) Conducted investigations involving: structural acoustics; advanced land combat vehicles; precision strike; ASW; nuclear weapon proliferation; and global surveillance and communications.

(U) FY 1993 Planned Program:
- (U) Conduct extensive technical investigations in areas such as: advanced sensors for surveillance and strike; shallow water acoustic ASW; advanced concepts for lightweight survivable combat vehicles; advanced materials; and signal processing.

(U) FY 1994 Planned Program:
- (U) Continue investigations in technical problems related to the ARPA mission of supporting the Services with the development of advanced technologies, including new approaches to stealth, surveillance, communications and signal processing.

D. (U) WORK PERFORMED BY: MITRE Corporation, McLean, VA supports the JASON group.

FY 1994 BUDGET ESTIMATES RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602301E
PE Title: Computing Systems and Communication Technology
Project Number: ST-01
Budget Activity: 1. Technology Base
Date: April 1993

E. (U) RELATED ACTIVITIES: Not applicable.

F. (U) OTHER APPROPRIATION FUNDS: None.

G. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable.

FY 1994 BUDGET ESTIMATES RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602301E
PE Title: Computing Systems and Communications Technology
Project Number: ST-11
Budget Activity: 1. Technology Base
Date: April 1993

A. (U) RESOURCES: ($ in Thousands)

Project Number & Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
ST-11	Intelligent Systems and Software				
	31,689	38,831	68,841	Continuing	Continuing

As part of the consolidation and realignment of program elements and projects within ARPA, a portion of the Strategic Computing (Project ST-10) funding was transferred to ST-11 in FY 1994 and outyears. In FY 1994, $34,939K was transferred.

B. (U) BRIEF DESCRIPTION OF PROJECT: This project develops new science and technology concepts that lead to fundamentally new software capabilities and intelligent information processing approaches. This will enable computers to augment military personnel performing tactical decision-making tasks in stressful, time sensitive situations; create efficient software systems supporting computer and software intensive defense systems; and develop advanced software technology.

(U) Major areas of technical emphasis are in (a) software development technology including languages, algorithms, data and object bases, domain specific software architectures, software prototyping technology, software design tools, software reuse, and advanced software engineering environments; (b) intelligent systems (artificial intelligence) including autonomous systems, interactive problem solving; and intelligent integration of information from heterogeneous sources; and (c) manufacturing automation and design engineering include the development of advanced software systems which support sharing of engineering knowledge, advanced product and process design representations, integrated product and process design, software tools for design process management, manufacturing process planning, manufacturing process control, and demonstrations.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1992 Accomplishments:
- (U) Developed standards to facilitate reuse of AI methods and knowledge bases.
- (U) Develop common image understanding.
- (U) Developed consensus derived software architectures.

FY 1994 BUDGET ESTIMATES RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602301E
PE Title: Computing Systems and Communications Technology
Project Number: ST-11
Budget Activity: 1. Technology Base
Date: April 1993

- (U) Demonstrated new AI tools in very large scale distributed experiments.
- (U) Demonstrated a large-scale interactive knowledge-based transportation planning aid.
- (U) Developed a robust road-sign recognition and planning system.
- (U) Completed fielding of 50 Dynamic Analysis and Replanning Tool (DART) planning systems to 14 military commands.
- (U) Developed prototype implementation of high-level language to support rapid software prototyping.
- (U) Demonstrated capabilities of simulated and virtual factory for semiconductor process design.
- (U) Developed autonomous navigation capabilities on surrogate semi-autonomous vehicles.
- (U) Demonstrated, in laboratory setting, a software architecture supporting multi-disciplinary design, analysis, manufacturing and engineering.
- (U) Evaluated performance of prototyping languages.
- (U) Established baseline definition, and demonstrated, in a laboratory setting, construction of software systems from components generated by heterogeneous languages.
- (U) Demonstrated interoperability of Ada, C, C++, and CLOS.
- (U) Developed semi-automated and automated methods for constructing document retrieval systems.
- (U) Demonstrated improved techniques for gisting, topic spotting and speakers spotting of speech.

(U) FY 1993 Planned Program:

- (U) Develop robust capability for automatic scene segmentation.
- (U) Release beta version compiler for the image understanding architecture, scalable parallel computer optimized for machine vision applications.
- (U) Incorporate stereo vision into complete working autonomous systems.
- (U) Develop software architectural framework for wide-area object sharing among electrical, mechanical and software design tools.
- (U) Demonstrate human-aided machine text translation.
- (U) Develop formal software architecture representation languages. Represent software architectures from key DoD domains using architecture representation languages, and a common visual model.

FY 1994 BUDGET ESTIMATES RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602301E
PE Title: Computing Systems and Communications Technology
Project Number: ST-11
Budget Activity: 1. Technology Base
Date: April 1993

- (U) Deploy configured data sets to R&D community to support research on image understanding, stereo vision, planning, hybrid control, and machine learning.
- (U) Develop robust systems to aid real-time planning of autonomous systems.
- (U) Develop and demonstrate agent-based architectures for sharing design knowledge, manufacturing process planning, and manufacturing control.
- (U) Develop architecture for a heterogeneous database system which integrates, interfaces, creates and maintains a single database from multiple non-interoperable intelligence community databases.
- (U) Develop a corresponding machine learning strategy to enable computers to learn specific user interaction characteristics.
- (U) Develop knowledge-based decision aids to support the rapid construction of multiple battle plans.
- (U) Develop improved message-handling algorithms.
- (U) Develop databases, evaluation techniques and advanced algorithms for document-image processing.
- (U) Develop and install text data extraction system for DEA investigative reports.

(U) FY 1994 Planned Program:

- (U) Develop domain-specific software architecture reuse mechanisms, including attachment of components from reuse libraries and automatic code generators.
- (U) Develop executable software prototypes utilizing prototyping and specification languages.
- (U) Develop robust capability for acquiring cartographic models from aerial imagery.
- (U) Develop integrated learning strategies for autonomous systems.
- (U) Develop recognition and identification algorithms for identifying targets from a moving vehicle.
- (U) Achieve robust speech recognition performance under adverse acoustic conditions.
- (U) Demonstrate preliminary automatic machine translation of text.
- (U) Develop human computer interaction systems capable of acquiring task specific models of user interaction.
- (U) Develop and demonstrate information fusion and aggregation services to facilitate interoperability of heterogeneous databases.

FY 1994 BUDGET ESTIMATES RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602301E
PE Title: Computing Systems and Communications Technology
Project Number: ST-11
Budget Activity: 1. Technology Base
Date: April 1993

- (U) Develop computer aided design tools which include constraint propagation, tolerance management, and simulation of assembly processes for electro-mechanical systems.
- (U) Demonstrate command and control functionality using high performance computing technology.
- (U) Develop enhanced knowledge-based decision support tools that integrate historical "lessons learned" information which is acquired and indexed from previously developed and executed plans.
- (U) Demonstrate qualitative improvements for the training and aiding of human planners and analysts through the use of enhanced decision support tools in a realistic crisis scenario.
- (U) Develop unified retrieval extraction system for intelligence analysis of text.

D. (U) WORK PERFORMED BY: Stanford University, Palo Alto, CA; University of Southern California, Information Sciences Institute, Marina del Ray, CA; Carnegie Mellon University, Pittsburgh, PA; Harvard University, Cambridge, MA; University of Massachusetts, Amherst, MA; Computational Logic, Inc., Austin, TX; University of California at Berkeley, CA; Teleos Corporation, Palo Alto, CA; ISX Corporation, Woodland Hills, CA; General Electric, Schenectady, NY; Martin Marietta, Denver, CO; IBM, Oswego, NY; GTE, Chantilly, VA; Honeywell, Minneapolis, MN; and Rice University, Houston, TX.

E. (U) RELATED ACTIVITIES: Builds upon the new high performance computing technologies being produced under project ST-19 in this program element.

F. (U) OTHER APPROPRIATIONS FUNDS: None.

G. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable.

FY 1994 BUDGET ESTIMATES RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602301E
PE Title: Computing Systems and Communications Technology
Project Number: ST-19
Budget Activity: 1. Technology Base
Date: April 1993

A. (U) RESOURCES: ($ in Thousands)

Project Number & Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
ST-19	High Performance Computing				
	110,829	134,388	237,926	Continuing	Continuing
ST-10	(20,499)	(22,078)			

As part of the consolidation and realignment of program elements and projects within ARPA, a portion of the Strategic Computing Project (ST-10) funding was transferred to ST-19 in FY 1994 and outyears. In FY 1994 $66,029 was transferred.

B. (U) BRIEF DESCRIPTION OF PROJECT: This project develops High Performance Computing and Communications (HPCC) technologies leading to trillion operations per second (teraops) computing systems and billion bits per second (gigabits) networking with associated software technologies by the mid-1990's, and ensures this accelerated rate of advance for future defense needs. These results will be used in other ARPA and Defense programs for experimental application to critical defense problems, including embedded high performance systems for distributed C3 systems.

(U) The HPCC program includes microsystems component technology and advanced packaging, systems software technology, algorithms and programming tools for scalable parallel distributed heterogeneous systems, switches and protocols for gigabits capacity networks, and early use of experimental systems. The scalable computing and networking technologies will also enable the development of a national information infrastructure. This project produces the key high performance computing technologies that are the foundation for all of the new Defense science and technology thrust areas and the Presidential Initiatives in High Performance Computing and Communications including an infrastructure to enable accelerated technology transition.

FY 1994 BUDGET ESTIMATES RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602301E
PE Title: Computing Systems and Communications Technology
Project Number: ST-19
Budget Activity: 1. Technology Base
Date: April 1993

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1992 Accomplishments:

- (U) Developed scalable parallel high performance systems of the 100 gigaops class (Thinking Machines CM-5 and the Intel Paragon).
- (U) Developed prototype software libraries and compilers for scalable parallel computing systems.
- (U) Deployed a wide area file system to over 130 groups to support transparent access of data and files across the Internet while providing the kinds of security and integrity commonly associated with private data.
- (U) Demonstrated the Mach operating system in a heterogeneous system of high performance workstations and parallel computing systems. Extended Mach to include support of multicomputers of 1000 nodes, new operating system services, and demonstrations of initial trusted versions.
- (U) Demonstrated scalable mass storage systems using redundant arrays of inexpensive disks which provide the basis for new commercial products.
- (U) Established five testbeds for gigabit/second network research which include over 20 sites using several different switching technologies. The testbeds are operating in the 100 megabit performance range with some early gigabit per second networks.
- (U) Demonstrated a prototype semiconductor manufacturing capability using computational prototyping, and developed designs for embeddable high density computing modules using scalable components.

(U) FY 1993 Planned Program:

- (U) Distribute prototype high performance computing (HPC) software library for experimental use in a wide area file system.
- (U) Define architecture for nationwide gigabit network including integrated ground based and space based communication channels.
- (U) Demonstrate major modules for teraops high performance computing systems and a scalable operating system suitable for heterogeneous and distributed teraops computing. Demonstrations will

include the associated development environments and trusted operating system capabilities.

- (U) Demonstrate first embeddable version of HPC technologies using multichip modules.
- (U) Develop ground stations for gigabit geosynchronous satellites with NASA.

(U) FY 1994 Planned Program:

- (U) Integrate real-time functionality into portable operating system technology.
- (U) Demonstrate C3 systems technology with scalable high performance network technology enabling full multimedia real-time information exchange using early gigabit networks.
- (U) Develop initial prototype of C3 and weapons systems using embeddable high performance computing (HPC) technologies. Demonstrations will have 10 billion operations per second per cubic foot based on 100 billion operation per second systems technology.
- (U) Demonstrate software and hardware compatibility between scalable commercial HPC system and embeddable versions.
- (U) Demonstrate scalable libraries for high performance computers of fundamental algorithms to enable rapid development of application software and algorithms for efficient implementations applied to critical DoD problems such as critical fluid dynamics and image processing.
- (U) Develop and distribute HPC software, documentation, performance measurements, and prototype applications using a wide area file system.
- (U) Demonstrate small scale gigabits network among the gigabit testbeds using both land and space based communications channels.
- (U) Demonstrate prototype on prototype small scale teraops systems with scalable mass storage and gigabit network interfaces.
- (U) Develop trusted user services for scalable operating systems.
- (U) Develop foundations for peta operations per second and terabits systems.

FY 1994 BUDGET ESTIMATES RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602301E
PE Title: Computing Systems and Communications Technology
Project Number: ST-19
Budget Activity: 1. Technology Base
Date: April 1993

- (U) Demonstrate methods for automatically generating optimally efficient parallel algorithms for important classes of signal processing applications.
- (U) Develop software tools for design of wavelet-based signal processors for communications and automatic target recognition applications.

D. (U) WORK PERFORMED BY: Massachusetts Institute of Technology, Cambridge, MA; Intel Corporation, Hillsboro, OR; Carnegie Mellon University, Pittsburgh, PA; Thinking Machines, Cambridge, MA; Maden Tech, Arlington, VA; University of California/Berkeley, Berkeley, CA; Cray Research, Chippewa Falls, WI; and University of Southern California/Information Sciences Institute, Los Angeles, CA.

E. (U) RELATED ACTIVITIES: Program Element (PE) #0603739E, Project MT-04, Electronic Module Technology.

F. (U) OTHER APPROPRIATION FUNDS: None.

G. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable.

FY 1994 BUDGET ESTIMATES RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602301E
PE Title: Computing Systems and Communications Technology
Project Number: ST-22
Budget Activity: 1. Technology Base
Date: April 1993

A. (U) RESOURCES: ($ in Thousands)

Project Number & Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
ST-22	Software Engineering Technology				
	(52,317*)	(37,449*)	39,096	Continuing	Continuing

*As part of a consolidation and realignment of Program Elements and Projects, Project ST-21 (SEI) was transferred to this project. Prior year funds are shown for continuity purposes.

B. (U) BRIEF DESCRIPTION OF PROJECT: Software technology is a top item on the DoD Key Technologies list because of continually increasing demands for quality software in DoD software-intensive systems, and the need for an advanced state of software engineering practice in their production. This project funds the Software Engineering Institute (SEI) and Software Technology for Adaptable, Reliable Systems (STARS) program.

(U) The SEI is a Federally Funded Research and Development Center (FFRDC) established in 1984 to conduct programs in software engineering. The SEI is composed of world class software engineers whose efforts are directed at transitioning technology and the acceptance of modern software engineering techniques and methods, promulgating their use throughout the defense industry, and establishing standards of excellence for the software engineering profession.

(U) The STARS program is developing a family of large-scale "software factory" products through large aerospace companies that have strong technology transition paths to their commercial counterparts. STARS will demonstrate a process-driven, domain-specific, reuse-based approach to software engineering. STARS is generating three key integrating elements: a set of Software Engineering Environments (SEEs); a set of modern tailorable software life-cycle process building blocks; and a software asset library capability to facilitate software productivity. The SEEs will be composed of commercially-supported products with open interfaces to stimulate the Computer Aided Software Engineering (CASE) tools marketplace. The SEEs will reinforce use of modern process models, have seamless interfaces to asset libraries, and will be evaluated on current DoD programs. SEI and STARS efforts are aimed at enabling future DoD software

intensive weapon systems to meet mission requirements quickly and affordably.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1992 Accomplishments:

- (U) Prepared initial version of Software Capability Evaluation (SCE) handbook.
- (U) Initiated the identification of a core set of software engineering measures.
- (U) Refined the Capability Maturity Model.
- (U) Prepared and tested alpha version of a Real Time Simulation handbook.
- (U) Developed initial state of the practice report on risk management.
- (U) Initiated STARS process asset library.
- (U) Selected STARS Software Engineering Environments (SEE) demonstration projects.
- (U) Began integration of process mechanisms and reuse asset library mechanisms into the three STARS SEEs.
- (U) Evaluated and extended STARS software asset library capabilities.

(U) FY 1993 Planned Program:

- (U) Develop risk management mechanisms and courses.
- (U) Provide a revised questionnaire for the Capability Maturity Model.
- (U) Initiate research and education on secure systems engineering.
- (U) Develop engineering analysis techniques for software architectural design decisions and conduct case studies.
- (U) Prepare a rate monotonic analysis handbook with examples of common real-time system patterns.
- (U) Complete STARS SEE initial operational capability.
- (U) Continue development of STARS process asset library.
- (U) Tailor STARS SEEs, asset libraries, and process building blocks for use on Service demonstrations.
- (U) Evaluate and extend STARS software asset library capabilities and plan for its transition to become self-supporting.
- (U) Develop prototype STARS software development plan 2000.

FY 1994 BUDGET ESTIMATES RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602301E
PE Title: Computing Systems and Communications Technology
Project Number: ST-22
Budget Activity: 1. Technology Base
Date: April 1993

(U) FY 1994 Planned Program:

- (U) Prototype an integrated process improvement framework.
- (U) Develop unified, adaptable models for re-engineering and reuse.
- (U) Initiate engineering techniques maturity model and practices.
- (U) Develop and prototype risk management processes.
- (U) Develop and prototype structural models for dependable distributed systems.

D. (U) WORK PERFORMED BY: The SEI is a Federally Funded Research and Development Center. The contractor is Carnegie Mellon University, Pittsburgh, PA. The STARS prime contractors are Boeing Aerospace Corporation, Kent, WA; IBM Federal Systems Company, Gaithersburg, MD; and Paramax, McLean, VA.

E. (U) RELATED ACTIVITIES:

- (U) 0602301E, Intelligent Systems and Software (ST-11)
- (U) 0601101E, Information Sciences (CCS-02)
- (U) 0603756D, Consolidated DoD Software Initiative (Ada Program)
- (U) 0604740F, Computer Resource Management Technology.

(U) The ARPA PE activities above are managed to ensure that there is no duplication of effort among programs. ARPA ensures that SEI and STARS commonalities are synergetic by supporting a joint STARS/SEI team to work on process element definitions.

F. (U) OTHER APPROPRIATION FUNDS: None.

G. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable.

FY 1994 BUDGET ESTIMATES RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602301E
PE Title: Computing Systems and Communications Technology
Project Number: ST-23
Budget Activity: 1. Technology Base
Date: April 1993

A. (U) RESOURCES: ($ in Thousands)

Project Number & Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
ST-23 Surveillance Research	(19,466*)	26,351	21,486	Continuing	Continuing

*This project was funded under program element #0602714E, project NM-01 in FY 1992 and prior.

B. (U) BRIEF DESCRIPTION OF PROJECT: This multifaceted research program is conducted to enhance U.S. surveillance capabilities for monitoring worldwide nuclear explosions and to develop methods for detecting the production, testing and storage of nuclear materials and weapons. Additionally, this program provides the required technical support for U.S. participation in the Conference on Disarmament for the development and testing of an International Monitoring System, and for nuclear test treaty negotiations. The advanced surveillance technologies developed in this program are adapted into existing operational nuclear monitoring systems. This program also addresses methods for demonstrating technologies to enhance the monitoring of the Nuclear Non-Proliferation Treaty and its renewal. This research supports the Global Surveillance and Communications (GSC) DDR&E thrust area.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1992 Accomplishments:
- (U) Demonstrated prototype Intelligent Monitoring System incorporating data from a network of high frequency arrays and high performance stations.
- (U) Completed and transferred technologies to utilize data collected during on-site inspections.
- (U) Provided technical support to nuclear testing negotiations, including the Conference on Disarmament.

(U) FY 1993 Planned Program:
- (U) Begin transfer of the technology of advanced seismic arrays and Intelligent Monitoring System components to the U.S. Atomic Energy Detection System.
- (U) Complete transfer of technology from the advanced yield estimation program into operational monitoring system.
- (U) Begin planning for demonstration of a Comprehensive Test Ban Treaty (CTBT) monitoring system.

FY 1994 BUDGET ESTIMATES RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602301E
PE Title: Computing Systems and Communications Technology
Project Number: ST-23
Budget Activity: 1. Technology Base
Date: April 1993

- (U) Provide technical support to international negotiations on nuclear testing including technical support to the Conference on Disarmament.
- (U) Prototype smart surveillance systems for collection of monitoring data on a global scale.
- (U) Begin program to develop high resolution, room temperature radiation sensors for monitoring and inspection purposes.
- (U) Begin development of laboratory nanoscale particle assay techniques.
- (U) Begin development of components of a global nuclear proliferation monitoring system.

(U) FY 1994 Planned Program:

- (U) Develop and test advanced technologies for automatic sampling and analysis of nuclear materials for global nuclear proliferation monitoring.
- (U) Develop technologies for nuclear threshold monitoring on a global basis.
- (U) Begin program in machine learning and neural net decision-making for improved seismic data analysis and event identification.
- (U) Provide technical support to international negotiations on nuclear testing including technical support to the Conference on Disarmament. Conduct large-scale preliminary tests to demonstrate the capabilities of the international monitoring system.
- (U) Complete technologies for automated signal analyses and transfer to operational systems.
- (U) Prototype high-resolution room temperature radiation sensors into lightweight systems for proliferation monitoring.
- (U) Develop laboratory nanoscale particle analysis techniques for improved interpretation of nuclear samples.
- (U) Demonstrate components for a global nuclear non-proliferation monitoring system and install prototypes in key locations in the Mid-east and Asia near areas of nuclear concern.

D. (U) WORK PERFORMED BY: Major performers include: Teledyne Geotech, Garland, TX; Science Applications International Corporation, San Diego, CA; University of Florida, Gainesville, FL; Southern Methodist University, Dallas, TX; California Institute of Technology, Pasadena, CA; Columbia University, New York, NY; Constellation Technologies, Inc., Gainesville, FL; Hughes Santa Barbara Research Center, Santa Barbara,

FY 1994 BUDGET ESTIMATES RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602301E
PE Title: Computing Systems and Communications Technology
Project Number: ST-23
Budget Activity: 1. Technology Base
Date: April 1993

CA; Grumman Aerospace Corp., Bethpage, NY; and Mission Support Inc., Salt Lake City, UT.

E. (U) RELATED ACTIVITIES: Complementary research is conducted by the National Labs of the Department of Energy and by the Air Force Technical Applications Center for operational applications. Close coordination of the program is carried out with the CIA Nuclear Non-proliferation Center.

F. (U) OTHER APPROPRIATION FUNDS: None.

G. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Agreements with Norway, the Federal Republic of Germany and China call for joint activities in seismic facilities in those countries. The United Nations' Conference on Disarmament, with U.S. concurrence, has formally agreed on the development of the international monitoring system and large scale tests of this system, and agreements have been made with a large number of countries, including Russia, China, Egypt, and Pakistan to support this effort.

FY 1994 BUDGET ESTIMATES RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602702E
PE Title: Tactical Technology
Budget Activity: 1. Technology Base
Date: April 1993

A. (U) RESOURCES: ($ in Thousands)

Project Number & Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
TT-03	Naval Warfare Technology				
	58,091	33,154	33,828	Continuing	Continuing
TT-04	Close Combat Technology				
	25,309	4,285	28,300	Continuing	Continuing
TT-05	Advanced Targeting Technology				
	19,733	15,963	48,098	Continuing	Continuing
TT-06	Advanced Tactical Technology				
	15,859	19,367	26,285	Continuing	Continuing
TT-07	Aeronautics Technology				
	9,060	25,250	7,380	Continuing	Continuing
TOTAL	128,052	98,019	143,891		

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program element is dedicated to the advancement of concepts and technologies directed toward next generation tactical systems. Major objectives are: (1) enabling technologies for Command, Control and Intelligence for littoral warfare, automating an integrated ship design process and automating platform systems; (2) lighter, more deployable forces in close combat technology and increase efforts for ground combat; (3) tactical weapons sensors and processors with emphasis on direct connectivity between sensors and weapon delivery systems; (4) lasers and microwaves to improve the performance of critical electronic warfare, radars, electronic displays, sensors, and communications systems; and (5) produce effective and affordable conventional aerospace technology systems with significantly enhanced capabilities.

FY 1994 BUDGET ESTIMATES RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602702E
PE Title: Tactical Technology

Project Number: TT-03
Budget Activity: 1. Technology Base
Date: April 1993

A. (U) RESOURCES: ($ in Thousands)

Project Number & Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
TT-03	Naval Warfare Technology				
	58,091	33,154	33,828	Continuing	Continuing

B. (U) BRIEF DESCRIPTION OF PROJECT: The Naval Warfare Technology project is developing new technologies for application to a broad range of naval requirements. The project is developing enabling technologies for Command, Control, Communications, and Intelligence (C3I) for Littoral Warfare, automating an integrated ship design process and automating weapon and platform systems employed in littoral warfare. The products will help decision makers better employ the resources under their control and enhance the affordability of future ship systems through automation and more effective ship design processes.

(U) The C3I/Synthetic Environments effort will develop integrated employment and execution aids for demonstration in the Commander in Chief (CINC) Command Complex to assist in carrying out strike, mine warfare, amphibious assault, and other near-land warfare missions. Advanced simulation technologies are being developed to support training, operations, and systems acquisition.

(U) The Ship Systems Automation (SSA) effort will demonstrate advanced, highly automated combat and platform systems for submarine and surface ship applications. Technology developments include intelligent command-level decision support components; automated sensor systems that fuse multi-source data and dynamically reconfigure based on the current tactical situation; and automated fire control systems that intelligently determine optimal attack and defense solutions. These will be capable of adapting to modified tactics and countermeasures, as well as intelligent signature, damage, maneuvering, and machinery/equipment controls.

(U) Simulation Based Design (SBD) is developing integrated automated tools to enable fundamental changes in the process for ship design to facilitate combining affordablity with requisite performance characteristics in future naval and commercial vessels. Virtual prototyping will provide simulations for concurrent assessments of design performance, producibility, quality, and cost. This process will systematically and comprehensively assess the impact of technology

insertion on ship mission performance and overall life cycle affordability from early in the design cycle.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1992 Accomplishments:

- (U) Demonstrated advanced bi-static processing technology at sea.
- (U) Demonstrated passive-acoustic sonar scene description system at sea.
- (U) Demonstrated full-beam automated processing at a U.S. Navy ocean surveillance facility.
- (U) Demonstrated an Acoustic Warfare Battle Management Decision Support System for Fleet Commander.

(U) FY 1993 Planned Program:

- (U) Demonstrate optimization of resource allocation with the Acoustic Warfare Battle Management Decision Support System for Fleet Commander.
- (U) Demonstrate Anti-Submarine Warfare (ASW) passive acoustic multi-sensor fusion using real-time data.
- (U) Prepare concept design for Ship Systems Automation (SSA) program.
- (U) Design Simulation-Based Design (SBD) system architectures and operating system modules.

(U) FY 1994 Planned Program:

- (U) Demonstrate full fidelity acoustic synthetic ocean environment simulation capability.
- (U) Initiate development of employment, deployment and execution aids for Commander in Chief (CINC) Command Complex.
- (U) Develop system architecture and initiate detailed design for SSA.
- (U) Conduct laboratory demonstration of SSA concept.
- (U) Demonstrate initial SBD virtual prototyping using three-dimensional ship design database.

D. (U) WORK PERFORMED BY: AT&T Bell Laboratories, Whippany, NJ; Orincon Corporation, San Diego, CA; Science Applications International Corporation, McLean, VA; Johns Hopkins University, Laurel, MD; Naval Command and Control and Oceans Systems Center, San Diego, CA; Naval Undersea Warfare Center, Newport, RI; Alliant TechSystems, Arlington, VA; Lockheed Missiles & Space, Palo Alto, CA; and General Dynamics, Electric Boat Division, Groton, CT.

FY 1994 BUDGET ESTIMATES RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602702E
PE Title: Tactical Technology

Project Number: TT-03
Budget Activity: 1. Technology Base
Date: April 1993

E. (U) RELATED ACTIVITIES: To ensure there is no duplication of effort, this program is coordinated with the Office of Naval Research, Space and Naval Warfare Systems Command, and Naval Sea Systems Command. Related efforts are as follows:

- (U) PE 0602314N Undersea Surveillance & Weapons Technology
- (U) PE 0602232N Command, Control, Communications, and Intelligence (C3I) Technology
- (U) PE 0603555N Enhanced Advanced Technology Demonstration (ATD) (shallow water technology)
- (U) PE 0603747N Advanced Anti-Submarine Warfare (ASW) Technology.

F. (U) OTHER APPROPRIATION FUNDS: None.

G. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable.

FY 1994 BUDGET ESTIMATES RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602702E
PE Title: Tactical Technology
Project Number: TT-04
Budget Activity: 1. Technology Base
Date: April 1993

A. (U) RESOURCES: ($ in Thousands)

Project Number & Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
TT-04	Close Combat Technology				
	25,309	4,285	28,300*	Continuing	Continuing

*Includes efforts initiated in prior years in PE 0603737D, Balanced Technology Initiative.

B. (U) BRIEF DESCRIPTION OF PROJECT: This project supports four main efforts: the light contingency vehicle; integrated survivability; technologies for contingency operations with initial focus on the dismounted soldier; and thermophotovoltaic electric generation for underwater and cogeneration applications.

(U) The Light Contingency Vehicle (LCV) program is developing concepts and technologies to improve the deployability and capability of light forces. Rapid response missions require air liftable and, in some cases, air droppable vehicles capable of facing heavy armored forces. Current vehicles used for this purpose, such as the HMMWV, have limited rates of fire and almost no protection. The LCV vehicle will be a small, lightweight (under 12 tons), highly mobile armored vehicle with a variety of applications. Survivability will be achieved through a flexible combination of advanced attachable armor and unconventional survivability techniques. Firepower will be achieved principally through a communications link to a separate firing platform such as the non line-of-sight (NLOS) missile. Modern battle management techniques will also be integrated including land navigation, position display on electronic maps, and automated identification of friend or foe (IFF).

(U) The Integrated Survivability program is developing technologies to address various aspects of survivability, including kill avoidance (with advanced armors), hit avoidance (with countermeasures and active defense), and detection avoidance. These technologies will be developed and tested separately, then integrated onto a testbed such as the LCV.

(U) The Contingency Technologies program is focusing on improving the lethality, survivability, and situation awareness of the dismounted soldier. The initial effort is to apply developing commercial personal communications technologies to the command/control and situation awareness of the dismounted soldier. Two-way voice/data communications will be provided to each soldier in a squad, and their position will be displayed to the squad leader, who will also receive this information

from adjacent squads. This will serve as a testbed system for the Army to determine the utility and requirements of the system.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1992 Accomplishments:

- (U) Tested five major near-term combat Identification Friend and Foe technologies.
- (U) Completed Optical Access combustion chamber for Turbo-Roto-Compound (TRC) engine.
- (U) Completed field tests of brassboard vehicle-mounted and hand-held mine detection systems; continued development of airborne mine detection technology and anti-helicopter mine.

(U) FY 1993 Planned Program:

- (U) TRC engine: begin three-cylinder technology demonstration.
- (U) Test anti-helicopter mine form/fit systems.
- (U) Perform concept refinement for Land Warrior use of commercial communication devices.
- (U) Initiate studies and technologies for contingency vehicle Battlefield Management systems.
- (U) Develop and demonstrate efficient thermophotovoltaic electric generation for underwater and cogeneration applications.

(U) FY 1994 Planned Program:

- (U) Finalize concept definition of light contingency vehicle (LCV) and begin design.
- (U) Complete initial design of TRC 3 cylinder engine and begin fabrication of engine and air handling systems.
- (U) Begin development of technologies for contingency operations with initial focus on the application of commercial communications systems to support the dismounted soldier.
- (U) Continue exploratory studies, simulations for contingency vehicle battlefield management systems.
- (U) Develop and demonstrate technology for the Small, Low Cost Intercept Device (SLID) program and integration of armor to protect high value assets at standoff.
- (U) Begin demonstration of netted, controllable and helicopter minefields.
- (U) Develop and demonstrate the simulation-based design workstations required to simultaneously address performance and producibility of new weapons concepts.

FY 1994 BUDGET ESTIMATES RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602702E
PE Title: Tactical Technology

Project Number: TT-04
Budget Activity: 1. Technology Base
Date: April 1993

D. (U) WORK PERFORMED BY: The major performers include Hughes Aircraft, El Segundo, CA; Raytheon, Lexington, MA; Detroit Diesel Corporation, Detroit, MI; Textron Defense, Wilmington, MA; Lawrence Livermore Laboratories, Livermore, CA; University of Iowa, Iowa City, IA; Texas Instruments, Dallas, TX; TRW, Redondo Beach, CA; Allied Signal, Towson, MD; and Rockwell International, Duluth, GA.

E. (U) RELATED ACTIVITIES: LCV development is being supported by the Army in PE 0603005A, Combat Vehicle and Automotive Advanced Technology, and by the USMC in PE 0602131M, Marine Corps Landing Force Technology, as part of a coordinated joint effort.

F. (U) OTHER APPROPRIATION FUNDS: None.

G. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable.

FY 1994 BUDGET ESTIMATES RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602702E
PE Title: Tactical Technology
Project Number: TT-05
Budget Activity: 1. Technology Base
Date: April 1993

A. (U) RESOURCES: ($ in Thousands)

Project Number & Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
TT-05	Advanced Targeting Technology (WAR BREAKER)				
	19,733	15,963	48,098*	Continuing	Continuing
BTI	(12,000)	(36,500)			

*Includes $23 million for effort initiated in prior years in PE0603737D, Balanced Technology Initiative.

B. (U) BRIEF DESCRIPTION OF PROJECT: Recent experience in Desert Storm has dramatically demonstrated our current inability to prosecute tactical ballistic missile (TBM) launchers. The WAR BREAKER program will develop and demonstrate advanced technology and systems to enable the detection, identification and prosecution of a wide range of high value, time critical fixed and mobile targets including TBM launchers, mobile command posts, tanks and artillery. This project develops advanced sensor and processing technologies including advanced automatic target recognition, sensor fusion, stochastic target detection strategies data fusion, image understanding, text understanding and sensor technologies. Emphasis is on enabling technologies that support effective search and strike against existing and future targets, in deep hide and/or employing advanced deception/concealment techniques. Included in the enabling technology is the Damocles Autonomous Submunition, an effort that was transitioned from the Balanced Technology Initiative (BTI) to ARPA.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1992 Accomplishments:

- (U) Demonstrated infrared microdetector with linear array.
- (U) Completed Acoustic Charge Transport (ACT) development.
- (U) Evaluated advanced signal processing concepts for radar and electro-optical/infrared electro-optic infrared (EO/IR) sensors focusing on improvements to wide area coverage, deep hide target detection and automatic target recognition.

FY 1994 BUDGET ESTIMATES RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602702E
PE Title: Tactical Technology
Project Number: TT-05
Budget Activity: 1. Technology Base
Date: April 1993

- (U) Expanded tactical ballistic missile target tracking capability to include time critical target and geographic regions.
- (U) Evaluated Intelligence Correlation and Planning monitoring system and developed preliminary designs for advanced automated operational planning.
- (U) Initiated evaluation of sophisticated unattended ground sensors; developed requirements for intelligent algorithms and communications for internetted sensors.
- (U) Developed command/control concept to support rapid sensor-to-shooter target insertion.

(U) FY 1993 Planned Program:

- (U) Demonstrate feasibility of command/control connectivity to support rapid sensor to shooter target data flow.
- (U) Evaluate advanced radar and EO/IR system concepts for focused surveillance applications.
- (U) Acquire test data to assess target detectability in foliage using an ultra wideband High Frequency (HF)/Ultra High Frequency (UHF) synthetic aperture radar (SAR) system.
- (U) Continue unattended ground sensor algorithm communications development.

(U) FY 1994 Planned Program:

- (U) Continue Damocles proof of principle technology development and begin experiment.
- (U) Analyze and assess the performance of algorithms in detecting man-made targets in foliage from imaging radar and ultra-wideband (UWB) SAR data.
- (U) Acquire and analyze data to assess potential discriminants for detecting and identifying targets in deep clutter based on active laser phenomenology.
- (U) Initiate Unattended Ground Sensor (UGS) brass board development.
- (U) Commence Imagery Exploitation System (IES) Cycle 3 development to incorporate a new imagery sensor type, reduce processing speed and focus on specific theaters.
- (U) Conduct exclusive field evaluation of CAPABAS and the SRI Ultra Wide-Band Synthetic Aperature Radar.

FY 1994 BUDGET ESTIMATES RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602702E
PE Title: Tactical Technology

Project Number: TT-05
Budget Activity: 1. Technology Base
Date: April 1993

- (U) Continue automatic target detection/recognition (ATD/R) technology development supporting prosecution of deep hide targets.

D. (U) WORK PERFORMED BY: General Dynamics/Convair Division, San Diego, CA; Martin-Marietta, Orlando, FL; ERIM, Ann Arbor, MI; Lincoln Laboratory, Lexington, MA; Texas Instruments, Dallas, TX; BDM International, McLean, VA; SAIC International, Arlington, VA; Boeing Corporation, Seattle, WA; and others to be determined.

E. (U) RELATED ACTIVITIES:

- (U) PE #0603226E, Project EE-40, Critical Mobile Targets, is directly dependent on technologies developed in this project.
- (U) This project is a part of the ARPA contribution to the Joint DoD Advanced Technology Demonstration for Global Surveillance and Communication and Precision Strike thrust areas. The specific projects have been coordinated with Army, Navy, and Air Force.

F. (U) OTHER APPROPRIATION FUNDS: None.

G. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable.

FY 1994 BUDGET ESTIMATES RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602702E
PE Title: Tactical Technology
Project Number: TT-06
Budget Activity: 1. Technology Base
Date: April 1993

A. (U) RESOURCES: ($ in Thousands)

Project Number & Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
TT-06	Advanced Tactical Technology				
	15,859	19,367	26,285	Continuing	Continuing

*Increase in FY 1994 due to merger of ST-12 into TT-06.

B. (U) BRIEF DESCRIPTION OF PROJECT: This project is focused on the technology and applications of lasers, microwave generators and mathematical algorithms for signal processing to improve the performance of critical electronic warfare, radars, electronic displays, sensors and communications systems. Five broad technology areas are being investigated: (a) compact, efficient, frequency-agile, diode-pumped, solid-state lasers for laser radars and sensors; (b) narrowband and wideband microwave source development for radars and decoys; (c) vacuum micro-electronics for smaller and better microwave tubes; (d) novel signal processing methods for radar data processing and target recognition; and (e) fast computational methods for electro-magnetic scattering and acoustic propagation in turbulent flows.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1992 Accomplishments:

- (U) Demonstrated laboratory breadboard operation of continuous wave diode-pumped solid state laser operating at two microns with 15 watt output power.
- (U) Initiated a program to develop linear and two-dimensional arrays of microlasers for laser radars.
- (U) Completed 94 gigahertz (GHz) power amplifier gun design.
- (U) Demonstrated uniform current emission and long-life operation of microcathode.
- (U) Completed coherent integration of time-array signal processor for impulse radar.
- (U) Completed cooperative Angle Jamming study and simulation against monopulse radars.
- (U) Completed simulations of on-board, off-board electronic countermeasure technique against monopulse missile seekers.

FY 1994 BUDGET ESTIMATES RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602702E
PE Title: Tactical Technology
Project Number: TT-06
Budget Activity: 1. Technology Base
Date: April 1993

- (U) Completed simulation study on the utility of laser countermeasures and sensor protection concepts in air defense scenarios.

(U) FY 1993 Planned Program:

- (U) Demonstrate field transportable brassboard/lasers operating at high average power in the visible and mid-infrared spectral regions.
- (U) Initiate a program for adaptive pointing and tracking of targets for countermeasures applications.
- (U) Demonstrate high power operation of 94 gigahertz GHz amplifier.
- (U) Demonstrate microcathode operation at 1 GHz modulation and 5 ampere per square centimeter emission.
- (U) Design and fabricate on-board, off-board electronic countermeasure signal processor and generator.
- (U) Begin design of an electronic system to demonstrate cooperative angle jamming technique.
- (U) Begin design of a 2 Watt, 44 GHz quasi optical millimeter wave power amplifier.

(U) FY 1994 Planned Program:

- (U) Design, fabricate, assemble and field test an ultra-wide-band radar prototype.
- (U) Initiate a holographic data storage program to achieve one billion bit per second data transfer rate and a storage capacity of 100 billion bits.
- (U) Design and fabricate electronic system to demonstrate cooperative angle jamming technique.
- (U) Demonstrate 10 GHz operation of microcathode to miniaturize microwave power tubes.
- (U) Design and fabricate 44 GHz and 94 GHz, high power, high efficiency amplifiers.
- (U) Demonstrate kilowatt average power lasers for laser radar applications.
- (U) Develop designs and critical technology components for a 30 watt average power tunable, mid infrared laser for countermeasures and laser radar applications.
- (U) Develop wavelet-based design tools for rapid design of novel digital signal processing algorithms and hardware for communication and target recognition.

FY 1994 BUDGET ESTIMATES RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602702E
PE Title: Tactical Technology

Project Number: TT-06
Budget Activity: 1. Technology Base
Date: April 1993

- (U) Transition wavelet methods, developed for detection of transient signals in sonar systems, to development of multisensor fusion systems.
- (U) Fabricate and test a 2 Watt, 44 GHz quasi optical millimeter wave power amplifier.
- (U) Demonstrate new computational procedures for signal processing in airborne platforms; enables communications with low cost antenna arrays for application to low probability of intercept communications and frequency reuse for military communications.
- (U) Develop a new class of procedures for simplifying output of expensive simulations and experiments for design, optimization, and control.

D. (U) WORK PERFORMED BY: Major performers include: Hughes Aircraft Company, El Segundo, CA; Science Research Laboratory, Somerville, MA; TRW, Redondo Beach, CA; Lockheed/Sanders, Nashua, NH; Varian Associates, Palo Alto, CA; Honeywell, Bloomington, MN; and Northrop Corporation, Hawthorn, CA.

E. (U) RELATED ACTIVITIES: All programs are coordinated with Services' R&D programs to promote technology transfer and avoid duplication of effort.

F. (U) OTHER APPROPRIATION FUNDS: None.

G. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Advanced Research Projects Agency (ARPA) is also an active participant in the US-UK Information Exchange Program on laser technology and effects.

FY 1994 BUDGET ESTIMATES RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602702E
PE Title: Tactical Technology
Project Number: TT-07
Budget Activity: 1. Technology Base
Date: April 1993

A. (U) RESOURCES: ($ in Thousands)

Project Number & Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
TT-07	Aeronautics Technology				
	9,060	25,250	7,380*	Continuing	Continuing
BTI	(7,300)	(9,500)			

*Includes $4.6 million for a program previously funded in PE 0603737D, Balanced Technology Initiative.

B. (U) BRIEF DESCRIPTION OF PROJECT: As the Department of Defense (DoD) attention focuses on enhancing conventional defenses, the requirement to produce effective, survivable and affordable weapon systems becomes increasingly more important. The timely development of cost-effective enabling technologies for aircraft and missiles is the objective of the Aeronautics Technology Project. Three focused efforts are planned in FY 1994. The micro-balloon radar absorbing material (RAM) effort is examining the application of hollow ceramic spheres for lightweight RAM. A second effort is investigating advanced infrared treatment concepts. The third effort is focused on improved communications (Speakeasy). Its' objective is to develop an affordable, multimode radio. The results of this project will be disseminated to DoD systems programs to enable future development of affordable, conventional weapon systems that will greatly enhance our ability to perform both 'battle management' and 'battle execution' functions. This effort is part of the Air Superiority and Defense DDR&E thrust area. In FY 1993 this project includes the congressionally directed DP-2 Vectored Thrust Technology Demonstration program.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1992 Accomplishments:
- (U) Completed designs for miniature turbine engine.
- (U) Completed fuel cell study for advanced Aircraft.
- (U) Completed F-15 Test of mid-wave Infrared (MWIR) coating.
- (U) Initiated study of advanced materials for low cost expendable engines.

(U) FY 1993 Planned Program:
- (U) Assemble, bench check and performance test miniature turbine engines.

FY 1994 BUDGET ESTIMATES RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602702E
PE Title: Tactical Technology
Project Number: TT-07
Budget Activity: 1. Technology Base
Date: April 1993

- (U) Continue investigation of advanced treatment concepts for IR suppression.
- (U) Study post launch destruct mechanisms.
- (U) Investigate applications of Advanced Landing Systems (ALS) technology.

(U) FY 1994 Planned Program:

- (U) Investigate IR treatments compatible with radar and visual signature materials.
- (U) Investigate advanced low cost expendable engine application.
- (U) Initiate Phase II of Speakeasy development.

D. (U) WORK PERFORMED BY: Institute for Defense Analyses, Alexandria, VA; Sundstrand Power Systems, San Diego, CA; Lockheed, Burbank, CA; General Dynamics, Fort Worth, TX; Spectro Dynamic Systems, Hickory, NC; Hazeltine Corporation, Greenlawn, NY; TRW, San Diego, CA; Naval Air Warfare Center, Warminster, PA; NASA, Ames Research Center, Sunnyvale, CA; Naval Research Laboratory, Washington, DC; and Rome Laboratory, Griffiss AFB, NY.

E. (U) RELATED ACTIVITIES: In FY 1995, Speakeasy will transition to Air Force (PE #0603789F) and Army (PE #0602782A).

F. (U) OTHER APPROPRIATION FUNDS: None.

G. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable.

FY 1994 BUDGET ESTIMATES RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602708E
PE Title: Integrated Command and Control Technology
Budget Activity: 1. Technology Base
Date: April 1993

A. (U) RESOURCES: ($ In Thousands)

Project Number & Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
IC-01*	Distributed Information Systems				Transferred to
	16,408	0	0	0	PE 0602301E
IC-02*	Advanced Command, Control & Communications Technology				Transferred to
	17,600	0	0	0	PE 0602301E
IC-03	High Definition Systems (HDS)				
	75,000	152,180	57,214	Continuing	Continuing
TOTAL	109,008	152,180	57,214		

*These projects reflect the Program Element/Project consolidation and realignment within ARPA.

B. (U) BRIEF DESCRIPTION OF ELEMENT: This Program Element developed and demonstrated technology under Distributed Information Systems for building systems that can fulfill DoD needs for information processing of DoD Command, Control and Communication Technology applications. In Advanced Command, Control and Communication Technology, development was aimed at secure, survivable, intelligent networks, utilizing advanced architectures and devices for controlling large-scale, high performance secure communication networks for world wide command and control. The High Definition Systems (HDS) Project is dedicated to the development of technology and manufacturing capability for high definition displays to be used in military systems. This effort will establish a domestic technical capability and demonstrate manufacturing capability of the components necessary for military systems that capture, process, store, distribute and display high resolution images. The programs contained in Project IC-03, High Definition System (HDS) reflect the Department's initiative to support dual-use technologies.

FY 1994 BUDGET ESTIMATES RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602708E
PE Title: Integrated Command and Control Technology
Project Number: IC-03
Budget Activity: 1. Technology Base
Date: April 1993

A. (U) RESOURCES: ($ In Thousands)

Project Number & Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
IC-03	High Definition Systems (HDS)				
	75,000	152,180	57,214	Continuing	Continuing

B. (U) BRIEF DESCRIPTION OF PROJECT: This program is an effort to develop the technology and manufacturing capability for high definition displays and is important for virtually all DoD applications which involve visual and graphic information. Major components of this program include: projection, head mounted and direct view displays based on multiple technologies; display architectures and processors; compression algorithms; and high speed data transmission. These efforts will establish a domestic technical capability and demonstrate manufacturing capability of the components necessary for military systems that capture, process, store, distribute and display high resolution images.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1992 Accomplishments:

- (U) Built 20-inch flat tension mask Cathode Ray Tube using interchangeable mask process.
- (U) Demonstrated full color electroluminescent display.
- (U) Completed, design of 2 megapixel deformable mirror device, associated projection optics, and drive electronics.
- (U) Demonstrated prototype rapid thermal annealing system.
- (U) Developed large area extrusion coater.
- (U) Developed precision large area LCD assembly system.
- (U) Identified materials and processes for LCD color filters.
- (U) Demonstrated 3-D volumetric display.
- (U) Completed plasma display 256 level gray scale driver IC design.
- (U) Demonstrated 19" 640x480 color plasma display with 64 gray levels.
- (U) Demonstrated fabrication of color EL devices by ion implantation.
- (U) Developed higher brightness electroluminescent displays

using low resistance address lines.

- (U) Completed high resolution video workstation design and software.
- (U) Completed second generation high performance scalable image computer design.
- (U) Demonstrated sub-band and fractal image compression technique.
- (U) Demonstrated 1 Gb/s LAN-based workstation architecture.

(U) FY 1993 Planned Program:

- (U) Initiate active matrix liquid crystal display (AMLCD) Pilot Demonstration Facility.
- (U) Initiate National Center for Advanced Information Components Manufacturing (NCAICM).
- (U) Deliver 2.3 million pixel 3-light valve digital micromirror projection display.
- (U) Demonstrate large area 51 inch diagonal tiled liquid crystal display.
- (U) Demonstrate high resolution 22" flat tension mask CRT.
- (U) Demonstrate stereo camera and stereo hard copy printer.
- (U) Develop offset printing equipment and process for color filter fabrication.
- (U) Develop new low voltage phosphors for field emission displays.
- (U) Establish cost projections for color TFEL pilot line.
- (U) Demonstrate 3" monochrome flat CRT.
- (U) Demonstrate proof-of-concept 3-D autostereoscopic display.
- (U) Design large area high performance microlithography tool.
- (U) Fabricate thin film transistors and displays using rapid thermal system.
- (U) Develop large area plasma deposition processes for liquid crystal display manufacturing.
- (U) Demonstrate 19" 640x480 color plasma display with 256 gray levels.
- (U) Demonstrate feasibility of 72 color pixels/inch plasma display.
- (U) Demonstrate 10" full color electroluminescent display.

(U) FY 1994 Planned Program:

- (U) Continue Phase II of Active Matrix Liquid Crystal Display Pilot Demonstration Facility.

FY 1994 BUDGET ESTIMATES RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602708E
PE Title: Integrated Command and Control Technology
Project Number: IC-03
Budget Activity: 1. Technology Base
Date: April 1993

- (U) Demonstrate 10" monochrome flat CRT.
- (U) Demonstrate 20" 1280x1024, 256 gray level color flat panel workstation display.
- (U) Deliver 1280x1024 8-bit driver for active matrix liquid crystal displays.
- (U) Demonstrate 10" color 1280x1024 active matrix liquid crystal display.
- (U) Demonstrate dyed polymer dispersed liquid crystal displays.
- (U) Demonstrate active matrix liquid crystal display using offset printed color filters.
- (U) Demonstrate 0.1% efficient blue light emitting diode.
- (U) Improve electroluminescent lamps for liquid crystal display backlights developed.
- (U) Demonstrate small area color field emission display.
- (U) Demonstrate gated diamond field emitter device structures.
- (U) Complete production of rapid thermal anneal system for poly-Si thin film transistors fabrication.
- (U) Complete liquid crystal display ion implanter system.
- (U) Demonstrate prototype multiprocessor scalable image computing environment.
- (U) Complete liquid crystal display laser annealing system.

D. (U) WORK PERFORMED BY: The major performers are: Xerox Corporation, Palo Alto, CA; Magnascreen Corporation, Pittsburgh, PA; Photon Dynamics, Inc., San Jose, CA; XMR, Inc., Santa Clara, CA; Texas Instruments, Dallas, TX; MRS Technology, Inc., Chelmsford, MA; Planar Systems, Beverton, OR; Sarnoff Research Center, NJ; and Zenith Corporation, Chicago, IL; and Sandia National Lab, Albuquerque, NM.

E. (U) RELATED ACTIVITIES: This project is coordinated with the advanced display technology being developed by the Army Electronics Devices and Technology Laboratory and the Air Force Aircraft Cockpit Integration Directorate and Manufacturing Technology (MANTECH) Directorate at Wright Laboratory. There is no unnecessary duplication within DoD.

F. (U) OTHER APPROPRIATION FUNDS: None.

G. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable.

FY 1994 BUDGET ESTIMATES RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602712E
PE Title: Materials and Electronics Technology
Budget Activity: 1. Technology Base
Date: April 1993

A. (U) RESOURCES: ($ in Thousands)

Project Number & Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
MPT-01	Materials Processing				
	85,264	73,529	81,328	Continuing	Continuing
MPT-02	Electronics Processing				
	22,511	37,952	79,386	Continuing	Continuing
MPT-03	Optoelectronics/GaAs				
	14,634	36,877	0	0	74,237
MPT-04	Advanced Lithography				
	76,000	71,293	0	0	236,820
MPT-06	High Temperature Superconductivity (HTSC)				
	0	35,461	37,788	Continuing	Continuing
TOTAL	198,409	255,112	198,502		

B. (U) BRIEF DESCRIPTION OF ELEMENT: The objective of this program element is to develop technology related to those materials and devices that make possible a wide range of new military and commercial capabilities. The programs contained in this Program Element reflect the Department's initiative to support dual-use technologies.

(U) The Materials Processing project (MPT-01) concentrates largely on the application of process modeling, sensors, and advanced control of materials manufacturing and flexible fabrication and assembly. It encompasses biosensor and chemical surveillance, metal matrix composite research, synthesis of diamond films for thermal management, and research in freeform manufacturing capabilities for high performance structural materials to fabricate functional components directly from Computer Aided Design (CAD) systems.

(U) The Electronics Processing project (MPT-02) develops advanced electronic and optoelectronic devices, semiconductor process tools and methodologies for infrared devices. It creates the technology base for advanced electronic and optoelectronic components to meet next-generation requirements. HTSC materials covered in project MPT-06 have reached a stage of development when specific applications can be identified in thin-film electronic devices and circuitry for military avionics with concurrent benefit to commercial electronics. ARPA is concentrating on radar and electronic detection systems and the continued fabrication of thin films.

FY 1994 BUDGET ESTIMATES RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602712E
PE Title: Materials and Electronics Technology
Project Number: MPT-01
Budget Activity: 1. Technology Base
Date: April 1993

A. (U) RESOURCES: ($ in Thousands)

Project Number & Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
MPT-01 Materials Processing Technology	85,264	73,529	81,328	Continuing	Continuing

B. (U) BRIEF DESCRIPTION OF PROJECT: The major goals of this project are to develop novel materials, processing techniques, and fabrication strategies for production of advanced structural composites with improved performance and at lower manufacturing costs. A major area of concentration is the application of process modeling, sensors, and advanced control to materials manufacturing and flexible fabrication and assembly. Other predominant areas include: biosensors for chemical surveillance, research into metal matrix composites for advanced aerospace structural materials to upgrade gas turbine engine and airframe components. Additional areas of focus are synthesis of diamond films for thermal management in electronic packaging; insertion of state-of-the-art ceramics into military system components (bearings, armor, gas turbine engine components); precision machining of high strength alloys, composites and ceramics using laser and electron beam energy sources, flexible energy delivery systems, and process diagnostic tools. Flexible solid freeform manufacturing capabilities are being developed for high performance structural materials which will fabricate functional components directly from Computer Aided Design (CAD) files and not require part-specific tooling or operator intervention.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1992 Accomplishments:

- (U) Demonstrated diamond film growth rates of greater than 150 microns per hour over 10 centimeter diameter area in a system which incorporates intelligent process control. Initiated diamond film manufacturing program for multiple chip modules.
- (U) Evaluated, in burner rig, ceramic composites supplied by various manufacturers for extended component use in a gas turbine environment.
- (U) Achieved enhanced performance of biosensors via manipulation of cellular 2nd messenger system.
- (U) Demonstrated hot isostatic pressing schedule to achieve full consolidation of 40% continuous fiber reinforced metal matrix composite specimens and demonstrated

feasibility of roll bonding consolidation technique for composite sheets.

- (U) Demonstrated feedback for intelligent control of chemical vapor deposition of silicon nitride coatings for carbon-carbon composites; transitioned technology to industrial coating manufacturer.
- (U) Developed fiber placement head for thermoplastic composite synthesis.
- (U) Developed preliminary design of flexible machine for polymer matrix composite fabrication.
- (U) Initiated research to process microlaminate metallic composites, ceramic fibers and solid-free-formed ceramic composites for Department of Defense (DoD) applications.
- (U) Established four advanced materials synthesis, processing and commercialization partnerships with the private sector.
- (U) Demonstrated continuous titanium matrix deposition on spread alumina fibers and non-damaging substrate release of green metal matrix composites (MMC) monotape.
- (U) Demonstrated Ceramic Matrix Composites (CMCs) with oxidative stability up to 2500°c using sheet silicate phases as the fiber debond layer.

(U) FY 1993 Planned Program:

- (U) Demonstrate thermal management capability of high conductivity diamond films in an electronic package.
- (U) Demonstrate 3 fold increase in diamond deposition rate (0.3 grams/hour).
- (U) Provide 6 layer interconnect Multi Chip Module (MCM) manufacturing unit step yields and program plan to improve module yields to make diamond MCMs cost effective.
- (U) Develop high throughput arrays for robotic screening of computer-designed military therapeutics.
- (U) Further increase biosensor sensitivity and dynamic range by regulation of genetically transferred cell surface receptors.
- (U) Demonstrate a five-fold increase in mean time between failures of ceramic hybrid bearings in air cycle machines used on jet aircraft.
- (U) Demonstrate a 30% improvement in accuracy of a heat-seeking missile through the use of ceramic hybrid bearings in the infrared (IR) seeker.
- (U) Demonstrate the fabrication of fibrous monolithic ceramics which combine the low cost component

fabrication characteristics of monolithic ceramics with the damage tolerant characteristics of Ceramic Matrix Composites (CMCs).

- (U) Initiate program to develop a logistic fuel cell for military installations.
- (U) Demonstrate production of low oxygen content, polymer derived silicon carbide fibers with strengths of one gigapascal up to 3000°F.
- (U) Demonstrate consistent ceramic fiber production - 400 KSI strength.
- (U) Manufacture 1800 ft of 1-inch and 1250 ft of 6-inch wide, continuous fiber, metal matrix composite monotape.

(U) FY 1994 Planned Program:

- (U) Develop a model for gas-phase manufacturing of copper-indium-diselenide (CIS) photovoltaic membranes for remote electric power generation.
- (U) Demonstrate a five fold decrease in manufacturing costs of a 6-inch diameter diamond wafer.
- (U) Demonstrate gene-specific inhibition of military specific disease bearing infectious agents.
- (U) Evaluate duration/magnitude of immune response to ultrasonically altered infectious organisms.
- (U) Demonstrate a three-fold increase in life of turbine nozzle components by replacing them with silicon nitride in an auxiliary power unit.
- (U) Initiate a program to establish process parameters and diagnostic tools for flexible processing of materials.
- (U) Develop methodology and designs for tooling systems for flexible delivery of energy for precision fabrication of parts.
- (U) Demonstrate the quality and cost benefits resulting from the application of Intelligent Processing of Materials (IPM) to the manufacture of silicon carbide monofilament fibers.
- (U) Demonstrate the solid freeform fabrication machine capability to produce engine quality silicon nitride components, with mechanical properties comparable to those manufactured by conventional methods.
- (U) Initiate program on mathematical modeling of microstructural evolution during materials processing.
- (U) Initiate program on smart material development for adaptive aerodynamic control surfaces.

FY 1994 BUDGET ESTIMATES RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602712E
PE Title: Materials and Electronics Technology
Project Number: MPT-01
Budget Activity: 1. Technology Base
Date: April 1993

- (U) Demonstrate metal matrix composites as a material for thermal management in electronic packaging.
- (U) Demonstrate first order process model of the Carbon/Carbon Rapid Densification Process.
- (U) Test brassboard logistic fuel processor for fuel cell power plant.
- (U) Demonstrate rapid prototyping battery manufacturing capability.

D. (U) WORK PERFORMED BY: Major performers are: United Technologies Research Center, East Hartford, CT; General Electric Corporation, Schenectady, NY; Sandia Laboratories, Livermore, CA; Norton Company, Northboro, MA; Williams International, Walled Lake, MI; 3M Corporation, St. Paul, MN; Allied Signal Aerospace Company, Phoenix, AZ; Pratt & Whitney, West Palm Beach, FL; Lanxide Corporation, Newark, DE; General Dynamics, Groton, CT; and Raytheon Corporation, Tewksbury, MA.

E. (U) RELATED ACTIVITIES: Advanced Research Projects Agency's (ARPA's) research on Materials Processing is coordinated within DoD and with other federal agencies via the National Science Foundation-hosted Interagency Materials Group, Office of Science and Technology Policy Committee on Material (COMAT) and various topical workshops on structural materials and materials processing.

F. (U) OTHER APPROPRIATION FUNDS: None.

G. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable.

FY 1994 BUDGET ESTIMATES RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602712E
PE Title: Materials and Electronics Technology
Project Number: MPT-02
Budget Activity: 1. Technology Base
Date: April 1993

A. (U) RESOURCES: ($ in Thousands)

Project Number & Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
MPT-02	Electronic Processing Technology				
	22,511	37,952	79,386	Continuing	Continuing
(MPT-03)	(14,634)*	(36,877)*			

*The associated FY 1993 and prior year funding and program accomplishments and plans for this project were included in Project MPT-03 and are shown here for continuity purposes.

B. (U) BRIEF DESCRIPTION OF PROJECT: This project develops advanced electronic and optoelectronic devices, semiconductor process tools and methodologies, and materials for infrared devices. Areas of emphasis include high-performance analog-to-digital converters (ADCs), military optical processors, novel optoelectronic devices and modules, artificial neural network technology, and semiconductor process design and synthesis. Beginning in FY 1994, efforts previously included in MPT-03 are consolidated within this project. Also, efforts in ADCs and optoelectronics previously funded in 6.1 basic research have transitioned to this project starting in FY 1994. This microelectronics development project creates the technology base for advanced electronic and optoelectronic components to meet DoD needs in all DDR&E thrust areas.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1992 Accomplishments:

- (U) Demonstrated process modules that performed fabrication steps for low-volume, state-of-the-art circuits.
- (U) Demonstrated closed-loop control of Microelectronics Manufacturing Science and Technology (MMST) processes.
- (U) Demonstrated 8-day cycle time on a 5-wafer MMST lot.
- (U) Initiated efforts to develop high-speed, low-power ADCs, in gallium arsenide (GaAs) heterojunction bipolar transistor (HBT) technology.
- (U) Demonstrated neural net system for recognizing electronic signal signatures.
- (U) Initiated procurement of Application Specific Electronic Module (ASEM) program.

FY 1994 BUDGET ESTIMATES RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602712E
PE Title: Materials and Electronics Technology

Project Number: MPT-02
Budget Activity: 1. Technology Base
Date: April 1993

- (U) Demonstrated a non-destructively-read, non-volatile ferroelectric memory transistor. (MPT-03)
- (U) Fabricated optical associative memory module for field test in data base management. (MPT-03)
- (U) Demonstrated optical, binary-phase-only, matched-filter module for pattern recognition. (MPT-03).
- (U) Fabricated quantum-well lasers (lattice-matched and strain layers) for ultra-low thresholds. (MPT-03)

(U) FY 1993 Planned Program:

- (U) Demonstrate Microelectronics Manufacturing Science and Technology (MMST) fabrication cycle time and yield improvements on a 1000-wafer demonstration.
- (U) Demonstrate MMST fabrication flexibility by processing two distinct process flows.
- (U) Demonstrate MMST capability to fabricate an externally designed circuit.
- (U) Complete design of GaAs HBT ADCs for ultra-high-speed conversion of microwave signals to digital form for advanced signal processing.
- (U) Complete fabrication line assembly for HBTs.
- (U) Initiate effort to develop models applicable to 100 gigahertz (GHz) HBTs.
- (U) Develop neural nets for automatic target recognizer.
- (U) Demonstrate compact neural network sensing, tracking, and recognition system.
- (U) Complete development of acoustic charged transport chip (ACT) manufacturing capability.
- (U) Scale infrared substrate growth process to produce wafers with twice the single-crystal area.
- (U) Develop process for low-cost ferroelectric non-volatile memory. (MPT-03)
- (U) Demonstrate real-time, compact synthetic aperture radar (SAR) with spotlight mode. (MPT-03)
- (U) Demonstrate steering of wide-band radar beam with optical control module. (MPT-03)
- (U) Initiate university-industry optoelectronics centers. (MPT-03)

(U) FY 1994 Planned Program:

- (U) Test first iteration GaAs HBT-based analog-to-digital converters (ADCs) for sampling speed and dynamic range.

FY 1994 BUDGET ESTIMATES RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602712E
PE Title: Materials and Electronics Technology
Project Number: MPT-02
Budget Activity: 1. Technology Base
Date: April 1993

- (U) Complete design of GaAs HBT-based ADC support components, such as multiplexers and demultiplexers.
- (U) Initiate effort to develop a design system for circuits operating above 10 GHz.
- (U) Demonstrate neural net target recognizer for specific aircraft platforms.
- (U) Demonstrate first neural net board-level systems.
- (U) Initiate development of neural network-based voice and pen commands for computer interfaces.
- (U) Demonstrate prototype neural network-based process control system.
- (U) Demonstrate fiber-optic-based bistatic radar.
- (U) Field demonstration of optical pattern recognition modules.
- (U) Field demonstration of real-time optical synthetic aperture radar (SAR) processors.
- (U) Develop integrated monolithic tunable laser arrays.
- (U) Develop packaged optoelectronic-microwave modules for microwave transmission.
- (U) Initiate efforts to develop low-cost optoelectronic module manufacturing technologies.
- (U) Develop optoelectronic packages that incorporate passive alignment techniques between fibers and component input/output (I/O).
- (U) Initiate effort to define methodologies to reduce the time and cost needed to design semiconductor processes and develop tools to address optimized cost modeling.

D. (U) WORK PERFORMED BY: Electronic Decisions Incorporated, Urbana, IL; Rockwell, Anaheim, CA; TRW, Los Angeles CA; Lincoln Lab, Lexington, MA; Hughes, Malibu, CA; Harris, Melbourne, FL; Texas Instruments, Dallas, TX; Westinghouse Electric, Baltimore, MD; and Stanford University, Palo Alto, CA.

E. (U) RELATED ACTIVITIES: The work is coordinated with Service research efforts through the Advisory Group on Electron Devices and via annual government-wide program reviews. These activities assure that no duplication of effort occurs.

F. (U) OTHER APPROPRIATION FUNDS: None.

G. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable.

FY 1994 BUDGET ESTIMATES RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602712E
PE Title: Materials and Electronics Technology
Project Number: MPT-06
Budget Activity: 1. Technology Base
Date: April 1993

A. (U) RESOURCES: ($ in Thousands)

Project Number & Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
MPT-06 High Temperature Superconductivity (HTSC)	(26,446)*	35,461	37,788	Continuing	Continuing

*The associated FY 1992 funding and program accomplishments and plans are funded in PE 0602301E, Project ST-16 and are shown here for continuity purposes.

B. (U) BRIEF DESCRIPTION OF PROJECT: High temperature superconducting (HTS) materials have reached a stage of development when specific applications can be identified in thin-film electronic devices and circuitry for military avionics, with concomitant benefit to commercial electronics. The ARPA program is building specific insertions for radar and electronic detection systems with extremely wide bandwidth and dynamic range, general avionics, and airframe guidance subsystems, while continuing with the development of the underlying fabrication technology for thin films, bulk wire and other forms. Particular demonstrations include a switched filterbank for the B-1B radar warning receiver, superconducting electronic packages for Electronic Intelligence (ELINT) and electronic warfare suites in reconnaissance aircraft, and safe and economical devices for riveting and clamping sheet metal sections for aircraft manufacturing.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1992 Accomplishments:

- (U) Production underway for bismuth-based HTS wire with higher transition temperature than yttrium barium copper oxide (YBCO), exhibiting current carrying capability of 10,000 amperes/cm^2 over kilometer lengths.
- (U) Demonstrated thin-film radio frequency components including filters, delay lines, resonators, etc., appropriate for wafer-scale integration to build superconducting transceiver.
- (U) Demonstrated HTS microwave component operation in prototype Navy satellite space experiment.
- (U) Initiated development of superconducting interconnects in multichip modules for performance improvement and enhanced manufacturing capability, and increased yield in high packing density requirements.

FY 1994 BUDGET ESTIMATES RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602712E
PE Title: Materials and Electronics Technology
Project Number: MPT-06
Budget Activity: 1. Technology Base
Date: April 1993

(U) FY 1993 Planned Program:

- (U) Demonstrate operation of multichip modules which employ High Temperature Superconductivity (HTS) interconnects in digital receiver circuits.
- (U) Demonstrate integrated HTS RF components in electronic warfare and communications systems.
- (U) Initiate active, digital, cryoelectronics development based on flux-trapped quantum logic, applied to high resolution analog/digital (A/D) converter or digital radio frequency memory.

(U) FY 1994 Planned Program:

- (U) Demonstrate functioning multichip module with superconducting interconnects utilizing 40 or more integrated circuit chips, showing performance enhancement, and simplicity of manufacturing.
- (U) Demonstrate state-of-the-art radar warning receiver (for B-1B bomber) with switchable HTS protective filters to enable system operation in a dense signals environment.
- (U) Transition technology to advanced development programs in the Navy and Air Force, to build sensors for air-to-air missile seekers, radar receivers incorporating superconducting channelized filters and stabilized oscillators, and high performance electronics using multichip modules with superconducting interconnects.

D. (U) WORK PERFORMED BY: Major performers include: Superconductor Technologies, Inc., Goeleta, CA; Conductus, Inc., Sunnyvale, CA; Massachusetts Institute of Technology, Cambridge, MA; nChip, San Jose, CA; E-Systems, Falls Church, VA; Honeywell Corporation, Minneapolis, MN; Ceramic Process Systems, Milford, MA; Boeing, Seattle, WA; Westinghouse Corporation, Baltimore, MD; and DuPont Corporation, Wilmington, DE.

E. (U) RELATED ACTIVITIES: Research is coordinated within DoD and with other federal agencies via the Office of Science and Technology Policy (OSTP) Committee on Materials (COMAT), HTS Coordinating Committee, the National Science Foundation (NSF) hosted Interagency Materials Group, and numerous workshops involving industry, universities and government laboratories.

F. (U) OTHER APPROPRIATION FUNDS: None.

G. (U) INTERNATIONAL COOPERATION AGREEMENTS: Not applicable.

FY 1994 BUDGET ESTIMATES RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602790E
PE Title: SBIR Program
Budget Activity: 1. Technology Base
Date: April 1993

A. (U) RESOURCES: ($ in Thousands)

Project Number & Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
SR-01 Small Business Innovation Research (SBIR)	12,115 *	16,182	**	Continuing	Continuing

*FY 1992 funding in PE 0605502E.
**FY 1994 funding in PE 0603570E.

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program is mandated by the Small Business Development Act of 1982, PL 97-219, PL 99-443 and PL 102-564. It is designed to stimulate technological innovation, strengthen the role of small business in meeting military and dual-use research and development needs, foster and encourage participation by minority and disadvantaged persons in technological innovation, and increase the commercial application of DoD-supported research and development results.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1992 Accomplishments:
- (U) Over 70 Phase I and 30 Phase II contracts awarded to small businesses.

(U) FY 1993 Planned Program:
- (U) ARPA is participating in SBIR solicitations with 119 topics for small businesses.

(U) FY 1994 Planned Program:
- (U) ARPA will solicit additional SBIR proposals.

D. (U) WORK PERFORMED BY: Over 100 small businesses.

E. (U) RELATED ACTIVITIES: The SBIR Program complements ongoing ARPA research programs.

F. (U) OTHER APPROPRIATION FUNDS: None.

G. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable.

FY 1994 BUDGET ESTIMATES RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603226E
PE Title: Experimental Evaluation of Major Innovative Technologies
Budget Activity: 2. Advanced Technology Development
Date: April 1993

A. (U) RESOURCES: ($ in Thousands)

Project Number & Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
EE-21	Close Combat				
	10,386	0	0	0	375,231
EE-23	Enhanced Fighter Maneuverability				
	12,800	8,758	0	0	103,194
EE-24	ASTOVL				
	0	4,770	19,712	Continuing	Continuing
EE-27	Advanced Space Technology Program				
	30,340	14,711	30,213	Continuing	Continuing
EE-30	Smart Weapons Application Program				
	27,800	7,203	0	0	50,131
EE-34	Guidance Technology				
	7,538	13,260	7,779	8,344	51,142
EE-36	Advanced ASW Technology				
	11,814	10,721	13,680	Continuing	Continuing
EE-37	Advanced Simulation				
	33,279	43,483	53,993	Continuing	Continuing
EE-39	Unmanned Undersea Vehicle Systems				
	18,679	15,880	17,952	Continuing	Continuing
EE-40	Critical Mobile Targets				
	(56,040)	34,724	105,103	Continuing	Continuing
EE-41	Air Defense Initiative				
	[1](95,645)	[1](32,018)	27,717	Continuing	Continuing
EE-43	Alternative Power Sources				
	0	54,539	0	0	54,539
EE-44	Wingship				
	0	5,000	0	0	5,000

FY 1994 BUDGET ESTIMATES RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603226E
PE Title: Experimental Evaluation of Major Innovative Technologies
Budget Activity: 2. Advanced Technology Development
Date: April 1993

EE-45 Global Grid Communications	0	0	20,881	Continuing	Continuing
EE-CLS/ADI	96,859 [1](106,000)	73,519 [1](129,169)	215,168	Continuing	Continuing
Total DARPA	249,495	286,568	512,198	Continuing	Continuing
Total ADI	201,645	161,187	0		
Total	451,140	447,755	512,198		

[1]Previously funded in OSD PE 0603741D.

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program element is dedicated to the demonstration and evaluation of advanced research and development concepts. Beginning in FY 1994, funding in this program element reflects the functional transfer of the Air Defense Initiative (ADI) from OSD to ARPA. In addition, the FY 1994 proposed budget reflects the transfer of the Balanced Technology Initiative (BTI) programs from OSD to ARPA and the subsequent inclusion of these programs within ARPA's affiliated technology or programmatic thrusts. The programs contained in Project EE-37, Advanced Simulation reflect the Department's initiative to support dual-use technologies.

(U) In addition to the individual project descriptions, this program element includes the FY 1993 congressional initiatives for Alternative Power Sources and Wingship.

(U) The Alternative Power Sources project supports the development of electric, hybrid, and natural gas vehicles. It explores their potential to enable the armed forces to achieve energy cost savings, comply with environmental requirements, and meet mission objectives.

(U) The Wingship project is investigating the feasibility of developing a large heavy lift air/sea vehicle that could provide the DoD with the capability to rapidly deploy forces in a global environment.

FY 1994 BUDGET ESTIMATES RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603226E
PE Title: Experimental Evaluation of Major Innovative Technologies

Project Number: EE-24
Budget Activity: 2. Advanced Technology Development
Date: April 1993

A. (U) RESOURCES: ($ In Thousands)

Project Title: Popular Name	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
EE-24	ASTOVL 0	4,770	19,712	Continuing	Continuing

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: In response to a Department of the Navy desired operational capability, the ASTOVL/CTOL Common Affordable Lightweight Fighter project was originated by ARPA to jointly investigate the technical feasibility of designing a single engine lightweight, affordable aircraft to conduct missions currently performed by the AV-8B, F-16, and F/A-18. As envisioned, the aircraft would be of modular design, providing for an Advanced Short Takeoff, Vertical Landing (ASTOVL) variant for use by the Navy and Marine Corps, and a Conventional Takeoff and Landing (CTOL) variant for use by the Air Force. These variants would share a common engine, airframe and avionics. The ASTOVL-enabling propulsive lift system would be removed from the Air Force variant and replaced with additional fuel capacity. Major perfromance goals for the operational aircraft and demonstrator include: Weight Empty: <24,000lb; Size: <F-18C; Powerplant: (Single Engine) Derivative of the F-119 or YF-120 Advanced Tactical Fighter Engine (ATFE) augmented in the STOVL variant by a shaft or gas-driven lift fan; maneuvering and airspeed flight envelope equal to or greater than the F-18; Flyaway cost: <F-18C.

(U) The program consists of four phases. Phase I, which has been completed, investigated propulsive lift concepts. Phase II will validate critical technologies relevant to the two most promising propulsive lift concepts. ARPA has awarded two Phase II contracts, each investigating a different augmented lift concept. Each contract will address the system design and operational performance potential of a particular concept. This will be accomplished by performing system design and capability goal trade-off analyses. Additionally, this effort will explore the critical powered lift transition corridor using large scale model demonstrations. Full or large scale demonstrations of selected critical propulsion components will similarly be required. The degree of hardware development difficulty and hardware manufacturability will be analyzed, and where practical proven, in parallel with the maturation of the aircraft design. The goal of this approach is not

FY 1994 BUDGET ESTIMATES RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603226E
PE Title: Experimental Evaluation of Major Innovative Technologies

Project Number: EE-24
Budget Activity: 2. Advanced Technology Development
Date: April 1993

just to show that traditional engineering and manufacturing methods can be employed to produce the proposed design, but more importantly, to encourage developing and proving innovative processes for reducing engineering and manufacturing costs. If Phase II is successful, a single propulsive lift concept will be selected and Phase III will consist of design and fabrication of a full-scale technology demonstrator aircraft. Phase IV will consist of flight testing of the demonstrator aircraft.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1992 Accomplishments: Not applicable.

(U) FY 1993 Planned Program:
- (U) Begin Critical Technology Validation (Phase II) of the project.
- (U) Award two contracts: one to investigate the Shaft Coupled Lift Fan Concept and another to investigate the Gas Coupled Lift Fan Concept.
- (U) Conduct operational aircraft concept design refinement.

(U) FY 1994 Planned Program:
- (U) Conduct analysis and demonstration of affordability-enhancing technologies and processes.
- (U) Construct large scale wind tunnel models.
- (U) Construct large scale propulsion system components for rig testing.

(U) Program to Completion:
- (U) Complete Critical Technology Validation (Phase II)
- (U) Design and fabricate full-scale technology demonstrator aircraft (Phase III)
- (U) Conduct flight testing of the demonstrator aircraft (Phase IV)

D. (U) WORK PERFORMED BY: Contracted work is being performed by Lockheed Advanced Development Company, Palmdale, CA and McDonnell Douglas Aerospace, St. Louis, MO; NASA Ames Research Center, Moffett Field, CA, is providing technical support.

E. (U) COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY: FY 1993 funding was provided by Congressional action.

FY 1994 BUDGET ESTIMATES RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603226E
PE Title: Experimental Evaluation of Major Innovative Technologies

Project Number: EE-24
Budget Activity: 2. Advanced Technology Development
Date: April 1993

F. (U) PROGRAM DOCUMENTATION: Joint ARPA/U.S. Navy project established by Memorandum of Agreement dated 16 March 1993.

G. (U) RELATED ACTIVITIES: Program Element: 0603217N (Air Systems Advanced Technology Development).

H. (U) OTHER APPROPRIATION FUNDS: None.

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable.

J. (U) MILESTONE SCHEDULE:

Planned	Milestones
Apr 94	Model Designs Complete
Oct 95	Model Fabrication Complete
Jan 96	Commence Wind Tunnel Test
Sep 96	Phase II Final Report

FY 1994 BUDGET ESTIMATES RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603226E
PE Title: Experimental Evaluation of Major Innovative Technologies

Project Number: EE-27
Budget Activity: 2. Advanced Technology Development
Date: April 1993

A. (U) RESOURCES: ($ In Thousands)

Project Title: Advanced Space Technology Program

Popular Name	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
EE-27	Advanced Space Technology Program				
	30,340	14,711	30,213	Continuing	Continuing

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: The Advanced Space Technology Program (ASTP) is aimed at enhancing access to space and reducing the cost of space systems. The ASTP has several components: Satellite subsystems and payload technologies; PEGASUS Air-Launched Space booster and the TAURUS ground-transportable Standard, Small Launch Vehicle; demonstration of lightweight satellites; and several advanced technology demonstrations (ATDs) supporting the DDR&E Global Surveillance and Communications (GS&E) thrust.

(U) Enabling subsystem technology developments include autonomous navigation; attitude control; communications; tactical surveillance; advanced computing; power sources; and other lightweight components. These form the foundation for development of a scalable, high-performance Advanced Technology Standard Satellite Bus (ATSSB) providing improved payload mass fraction and a simplified "bolt-on" interface to support operationally useful, advanced payloads in a wide range of orbits at greatly reduced cost and acquisition time.

(U) ARPA is beginning the brassboard development phases of two possible demonstration payloads. Both these payloads can be integrated into the ATSSB for space demonstrations. Specific activities are as follows:

(U) Extremely High Frequency (EHF) lower cost, communication technologies (ASTEC) will be developed to support the ASD/C^{3}I MILSATCOM modernization decision. The emphasis is to reduce the system acquistion costs and the "time-to-market" of future advanced communications satellites. In addition, affordable, robust hyperspectral/multispectral sensor technologies (CAMEO) will be developed and assessed. Their intent is to service a number of DoD and commercial users with a minimal set of sensor assets. These technologies could be integrated into a payload and launched in time to satisfy the National LANDSAT Policy Act which mandates an Advanced Technology Demonstration in space by 1997.

FY 1994 BUDGET ESTIMATES RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603226E
PE Title: Experimental Evaluation of Major Innovative Technologies

Project Number: EE-27
Budget Activity: 2. Advanced Technology Development
Date: April 1993

(U) The Insertion into MILSATCOM Products of Advanced Communications Technology (IMPACT) Program will apply advanced technologies to reduce the life-cycle cost of the MILSATCOM terminal segment by reducing size, weight and power consumption while increasing reliability and performance.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1992 Accomplishments:
- (U) Continued Satellite Component Technology development.
- (U) Completed MACSAT, MICROSAT satellite demonstration.
- (U) Transitioned MACSATs/ground terminals to Navy/Air Force.
- (U) Continued development of DARPASAT.
- (U) Continued development of the TAURUS launch vehicle.

(U) FY 1993 Planned Program:
- (U) Complete satellite component technology developments.
- (U) Support space demonstration of component technologies.
- (U) Transition PEGASUS Air-Launched Vehicle to the Air Force.
- (U) Launch the TAURUS transportable launch vehicle.
- (U) Launch DARPASAT satellite on TAURUS.
- (U) Proceed with contract award of payload system elements.
- (U) Initiate the IMPACT program

(U) FY 1994 Planned Program:
- (U) Complete the DARPASAT demonstration program.
- (U) Transition the DARPASAT to user.
- (U) Transition TAURUS launch vehicle to the Air Force.
- (U) Initiate development of the ATSSB.
- (U) Proceed with contract award of payload system elements.
- (U) Continue the IMPACT Program.

(U) Program to Completion:
- (U) Conduct qualification testing of the ATSSB.
- (U) Continue development of payload system elements.
- (U) Continue the IMPACT Program.
- (U) Launch and demonstrate payloads.
- (U) Field and demonstrate IMPACT terminal testbed.

D. (U) WORK PERFORMED BY: Orbital Sciences Corporation, Fairfax, VA; Space Applications Corporation, Vienna, VA; Ball Aerospace Corporation, Boulder, CO; Honeywell, Minneapolis, MN; Hughes Space and Communications, Los Angeles, CA; Massachusetts Institute of Technology/

FY 1994 BUDGET ESTIMATES RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603226E
PE Title: Experimental Evaluation of Major Innovative Technologies

Project Number: EE-27
Budget Activity: 2. Advanced Technology Development
Date: April 1993

Lincoln Laboratory, Lexington, MA; Phillips Laboratory, Kirtland Air Force Base, NM; Rome Laboratory, Rome, NY; Air Force Space and Missile Systems Center, Los Angeles, CA; Western Test Range, Vandenberg Air Force Base, Communications Electronics Command, Fort Monmouth, NJ; and others..

E. (U) COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY: The ATSSB start had been delayed until FY 1994. The Advanced Technology Demonstration (ATD) mentioned in the previous Summary have been reduced in scope, restructured and formalized into the ASTEC, CAMEO and IMPACT Programs.

F. (U) PROGRAM DOCUMENTATION:

- (U) U.S. Air Force/DARPA MOA dated 1988
- (U) U.S. Army/DARPA MOA dated 1990
- (U) SDIO/DARPA MOA dated 1990
- (U) DARPA/U.S. Air Force TAOS MOA dated 1992
- (U) DARPA/Joint Services ASTEC MOA (in process)
- (U) DARPA/Joint Agency CAMEO MOA (in process)

G. (U) RELATED ACTIVITIES: ARPA has MOAs with the Army, Navy, Air Force, SDIO and others for ARPA space technology projects. The ASTEC Program is a joint development with the Army, Navy and Air Force. The CAMEO Program is a potential joint Agency technology demonstration. ARPA has developed the Joint Program Management Plan (PMP) for the DDR&E demonstrations. The existence of this joint PMP ensures there is no unnecessary duplication of effort within the Department of Defense. The related Program Element contributing to the ASTEC program in FY 1994 is: 0602702F - Command, Control and Communications, Air Force.

H. (U) OTHER APPROPRIATIONS FUNDS: None.

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable.

J. (U) MILESTONE SCHEDULE:

Planned	Milestone
May 93	Transition PEGASUS to Air Force
Summer 93	First launch of TAURUS (SSLV)/DARPASAT
Summer 94	Complete demonstration of DARPASAT
Aug 93	Award contracts for IMPACT
Aug 93	Technology development completions
Jan 94	Award contracts for ATSSB and critical payload elements for ASTEC and CAMEO
Sep 95	Critical Design Review for payloads
Dec 96	Qualification testing complete for ATSSB

FY 1994 BUDGET ESTIMATES RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603226E
PE Title: Experimental Evaluation of Major Innovative Technologies

Project Number: EE-34
Budget Activity: 2. Advanced Technology Development
Date: April 1993

A. (U) RESOURCES: ($ In Thousands)

Project Title: Guidance Technology

Popular Name	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
EE-34	Guidance Technology				
	7,538	13,260	7,779	8,344	51,139

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: Fire-and-Forget stand-off weapons require high-precision navigation capabilities to effectively eliminate prime targets with minimal collateral damage in the target area. This program develops the high-accuracy, low cost navigation subsystems technologies required for the next generation stand-off weapons, and for upgrading current weapon inventories. In addition, these capabilities can provide precision attitude control for space-based and theater search, surveillance and reconnaissance platforms. Potential transition opportunities include the AGM-130, the Tomahawk Land Attack Missile Block IV Upgrade, Minuteman, and unmanned, long endurance airborne battlefield support vehicles. Specific research areas include: Advanced all solid-state, low cost navigation-grade miniature inertial measurement unit (MIMU) systems; and multi-channel-on-a-chip, high dynamics, miniature Global Positioning System (GPS) receivers (MGRs).

(U) The GPS Guidance Package is the integration of the MGR, three MIMUs and an advanced navigation computer into a low-cost, precision navigation system. Phase 1 addresses the technology issues involved in: (1) miniaturizing inertial-grade IMUs into a compact, manufacturable configuration; and (2) developing a multi-channel-on-chip, high dynamics MGR. Upon successful demonstration of these technologies, they will be integrated into a test fixture-type brassboard for field testing and evaluation by ARPA and Air Force. Phase 2 will demonstrate the compact, affordable packaging of these technologies into a form compatible with a large range of unmanned and manned platforms, satellites and weapon systems. These latter units will be configured to provide precision guidance to the DoD's Short Range UAV.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1992 Accomplishments:

- (U) Executed a Memorandum of Agreement with the Air Force for a joint development program.
- (U) Demonstrated Light Source power and lifetime levels;

5-channel/chip signal processing chips; and silicon accelerometer technology necessary for Phase 2.

- (U) Completed GPS Guidance Package (GPP) brassboard Critical Design Reviews and began test fixture/brassboard development.

(U) FY 1993 Planned Program:

- (U) Integrate Miniature GPS Receiver (MGR) and Miniature Inertial Measurement Unit (MIMU) technologies in hot testbed and test its static integrated performance.
- (U) Conduct Preliminary Design Review of AF brassboards.
- (U) Begin test fixture/brassboard fabrication.
- (U) Complete development of Multi-Function Self-Aligned Gate technologies.

(U) FY 1994 Planned Program:

- (U) Conduct Phase 1 contractor field evaluation.
- (U) Delivery of Phase 1 brassboard to ARPA agent for Government testing.
- (U) Complete fabrication of AF GGP brassboards.
- (U) Begin Phase 2 Packaging effort to further reduce GGP in size, weight, power drain and cost.

(U) Program to Completion:

- (U) Complete Government Laboratory and field evaluations of GGP Phase 1 brassboards.
- (U) Conduct GGP Phase 2 Preliminary, Critical and Test Readiness Reviews Design Reviews.
- (U) Complete fabrication of GGP Phase 2 brassboards and laboratory/field test the units.

D. (U) WORK PERFORMED BY: NRaD, San Diego, CA; Charles Stark Draper Laboratory, Boston, MA; RAND Corporation, Washington, DC; Galaxy Scientific Corporation, Philadelphia, PA; Litton Industries, Woodlawn Hills, CA; Rockwell International/Collins Division, Cedar Rapids, IA; and ITT, Orlando, FL.

E. (U) COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY: The increase is the result of Congressional add for the Multi-Function Self-Aligned Gate (MSAG).

F. (U) PROGRAM DOCUMENTATION: None.

G. (U) RELATED ACTIVITIES: The Air Force is jointly funding GGP Phase

FY 1994 BUDGET ESTIMATES RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603226E
PE Title: Experimental Evaluation of Major Innovative Technologies

Project Number: EE-34
Budget Activity: 2. Advanced Technology Development
Date: April 1993

1 with ARPA from PE 0602204F, Avionics, and PE 0603311F, Ballistic Missile Technology. No other organizations are developing and integrating technologies for high-precision, tightly-coupled, advanced solid-state MIMU/MGR equipment.

H. (U) OTHER APPROPRIATION FUNDS: None.

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable.

J. (U) MILESTONE SCHEDULE:

GGP Phase 1B Award	3Q FY 1992
GGP Test Readiness Review	3Q FY 1993
Phase 1 Contractor brassboard Testing	4Q FY 1993
Phase 1 Brassboard Delivery	1Q FY 1994
Government Brassboard Tests Begin	1Q FY 1994
GGP Phase 2 Award	3Q FY 1994
GGP Phase 2 PDR	3Q FY 1995
GGP Phase 2 CDR	2Q FY 1996
Phase 2 Contractor Testing	3Q FY 1997
Phase 2 Brassboard Delivery	1Q FY 1998
Government Brassboard Tests Begin	1Q FY 1998

FY 1994 BUDGET ESTIMATES RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603226E
PE Title: Experimental Evaluation of Major Innovative Technologies

Project Number: EE-36
Budget Activity: 2. Advanced Technology Development
Date: April 1993

A. (U) RESOURCES: ($ In Thousands)

Project Title: Advanced Anti-Submarine Warfare (ASW) Technology

Popular Name	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
EE-36 ASW Technology	11,814	10,721	13,680	Continuing	Continuing

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: As ASW requirements changed from deep water to shallow water regional conflicts, the focus of the project shifted from examining innovative technologies for operations in deep ocean environments to those employed in the acoustically complex shallow water environment. This project develops technologies that will significantly enhance naval and maritime capabilities in littoral warfare environments.

(U) The project focuses on three areas of development: sonar technology, ASW scene management, and periscope detection. The Sonar Technology project demonstrates applications of advanced object detection, classification, and localization technologies using high performance computing (HPC). In particular, the project focuses on demonstrating autonomous target detection, localization, and tracking algorithms from distributed active and passive sensors. The project will also produce a demonstration of multi-sensor fusion through automatic detection and classification algorithms for combining non-acoustic sensor data with both active and passive acoustic data; and provide a capability to display, geographically, a complete description of the maritime tactical scene. In addition, the project develops and demonstrates vertically directive low frequency sources of both a continuous and impulsive nature. The ASW scene management project will develop signal processing techniques to integrate real-time information with background intelligence to provide a complete picture of the shallow water operational situation. The Periscope Detection project will determine the exploitability of ultra-wideband radar for periscope detection.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1992 Accomplishments:

- (U) Demonstrated Autonomous Target Acquisition and Relocation System (ATARS) relocalization performance (duct environment).

FY 1994 BUDGET ESTIMATES RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603226E
PE Title: Experimental Evaluation of Major Innovative Technologies

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- (U) Conducted ATARS shallow water algorithm development and preliminary testing.
- (U) Completed multi-sensor fusion requirements specification.
- (U) Initiated multi-sensor fusion algorithm development.
- (U) Conducted initial periscope detection experiments.

(U) FY 1993 Planned Program:

- (U) Characterize detection, classification, and localization performance (shallow water environment).
- (U) Analyze shallow water area characterization test data and update processing algorithms.
- (U) Develop shallow water low frequency (LF) acoustic sources for employment from tactical aircraft and ships.
- (U) Demonstrate multi-sensor fusion algorithm.
- (U) Determine the exploitability of periscope resonance.

(U) FY 1994 Planned Program:

- (U) Develop sensors and arrays for shallow water environment.
- (U) Develop and conduct at-sea testing of an active acoustic system for shallow water environments employing receiving arrays of various configurations and locations (multistatic active acoustic system).
- (U) Conduct at-sea wideband radar experiment for periscope detector.
- (U) Initiate the development of shallow water total scene management system that provides the operational commander with complete information on the tactical, acoustical, and bathymetric conditions of the area of operations.
- (U) Develop and conduct testing of low frequency (LF) acoustic sources.

(U) Program to Completion: This is a continuing program.

D. (U) WORK PERFORMED BY: Arete Associates, San Diego, CA; BBN Systems and Technologies, Arlington, VA; ESL Inc., Sunnyvale, CA; Alliant TechSystems, Arlington, VA; Raytheon Company, Portsmouth, RI; SRI International, Arlington, VA; ORINCON Corporation, San Diego, CA; Science Applications International Corporation, New London, CT; Applied Research Laboratory/University of Texas, Austin, TX; and Radix Systems, Inc., Gaithersburg, MD.

FY 1994 BUDGET ESTIMATES RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603226E
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E. (U) COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY: As discussed above, the focus of the project shifted from developing technologies for system operations in deep ocean environments to those employed in the acoustically complex shallow water environment. Data fusion and signal processing technology development is now being emphasized in order to enhance situation assessment in this environment. In addition, acoustic signal sources are being adapted for use in this environment. Shallow water scene management and signal processing systems are also being developed.

F. (U) PROGRAM DOCUMENTATION: Not applicable.

G. (U) RELATED ACTIVITIES: This program has been fully coordinated with the following programs to ensure no duplication of effort:

- (U) Surveillance, signal processing and acoustic science technology are being developed under Program Element 0602702E, Tactical Technology.
- (U) Supporting high performance computing efforts are ongoing under Program Element 0602301E, Computing Systems and Communications.
- (U) Acoustic Signal Processing efforts are being pursued under Program Element 0602702E, Tactical Technology.
- (U) Navy Enhanced Advanced Technology Demonstration (ATD) (Shallow Water Technology Initiative), Program Element 0603555N.
- (U) Navy Advanced Anti-Submarine Warfare (ASW) Technology, Program Element 0603747N.

H. (U) OTHER APPROPRIATION FUNDS: None.

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable.

J. (U) MILESTONE SCHEDULE:

Plan	Milestones
FY 93	Complete Autonomous Target Acquisition and Relocalization System (ATARS) performance characterization in a shallow water environment.
FY 94	Conduct multistatic active/passive system testing demonstration in a shallow water environment.
FY 94	Complete laboratory-scale testing of low frequency (LF) acoustic sources.
FY 94	Complete resonance periscope detector feasibility testing.

FY 1994 BUDGET ESTIMATES RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603226E
PE Title: Experimental Evaluation of Major Innovative Technologies
Project Number: EE-37
Budget Activity: 2. Advanced Technology Development
Date: April 1993

A. (U) RESOURCES: ($ In Thousands)

Project Title: Advanced Simulation

Popular Name	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
EE-37	Advanced Simulation				
	33,279	43,483	53,993	Continuing	Continuing

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: The Advanced Distributed Simulation program develops advanced interoperable technologies to enable a distributed, seamless warfighting simulation environment at the weapon level of detail for the Department of Defense (DOD). The ultimate goal is to provide the tools and standards necessary to create, on demand, a robust synthetic theater of war capable of supporting the following functions: Joint/Service readiness training; Joint/Service Doctrine refinement and development; requirements analysis; design, prototyping and manufacturing; and contingency planning, operations, after action review, and historical analysis. The focus is on the development and integration of key technologies such as environmental representation, intelligent computer generated forces, communications (advanced networking) and data flow, range instrumentation, and computer image generation. As technologies mature, they will be demonstrated and tested in joint theater war exercises of increasing size, complexity and utility which includes all forms of tactical simulation on a seamless electronic battlefield.

(U) The environmental programs concentrate on the creation of the digital environments for simulation including terrain representation, weather, diurnal variations and dynamic terrain. The intelligent computer-generated forces creates a scalable computer-generated military force that is representative and behaviorally accurate. The communications and data flow project concentrates the technology development to support 100,000 locations interoperating with each other in perceptible real time. The range instrumentation project addresses the problem of interfacing the live world to the synthetic environment. The computer image generation program (CIG) emphasizes the need for order of magnitude increase in CIG performance along with an order of magnitude decrease in cost.

(U) The Advance Simulation Technology developments support the DDR&E Science and Technology Thrust Panel for Synthetic Environments, Readiness and Training.

FY 1994 BUDGET ESTIMATES RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603226E
PE Title: Experimental Evaluation of Major Innovative Technologies

Project Number: EE-37
Budget Activity: 2. Advanced Technology Development
Date: April 1993

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1992 Accomplishments:

- (U) Demonstrated interoperation of multiple wargaming models in a secure distributed network between Europe, selected locations in the continental United States and Korea.
- (U) Initiated development of a prototype Intelligent Gateway supporting interoperation of aggregated simulation models with networks of individual weapons platforms, simulators and simulations.
- (U) Initiated development of CINC-level testbed combining distributed C⁴I with advanced mission planning and simulation capabilities.
- (U) Initiated development of low cost high performance networked aviation simulation and knowledge engineering for aviation intelligent automated forces.
- (U) Demonstrated man-in-the-loop simulation as a tool for acquisition streamlining.
- (U) Captured a stressing critical mobile target scenario and associated system architecture/statistical representation from recent Desert Storm experience.
- (U) Initiated a capability to network real mobile objects in a field environment for battalion-level simulation.

(U) FY 1993 Planned Program:

- (U) Demonstrate technical principles for development of technologies supporting networked interoperation representing 10,000 entities as individuals on the synthetic battlefield.
- (U) Development of rapid terrain database generation capability.
- (U) Complete critical mobile target technology simulation/development network testbed with six major sites.
- (U) Demonstrate initial prototype of intelligent computer generated automated forces with adaptive behavior for developmental evaluation of experimental aviation systems.
- (U) Continue development of a simulation/rehearsal node integrated with a CINC-level C⁴I system.
- (U) Demonstrate engineering feasibility of a low cost computer image generators for virtual battlefield simulation.

FY 1994 BUDGET ESTIMATES RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603226E
PE Title: Experimental Evaluation of Major Innovative Technologies

Project Number: EE-37
Budget Activity: 2. Advanced Technology Development
Date: April 1993

- (U) Demonstrate initial point-to-point gateways required to network instrumented real systems, ranges virtual simulators/simulations and constructive simulations.

(U) FY 1994 Planned Program:

- (U) Demonstrate expanded technologies supporting 10,000 entities as individuals on the synthetic battlefield, and the interoperation of higher-level aggregated simulation with networks of individual platform level simulators and battalion-level intelligent automated forces.
- (U) Demonstrate prototype rapid terrain generation system capability to produce 100K square terrain in 14 days.
- (U) Demonstrate working intelligent computer generated automated forces.
- (U) Demonstrate man-in-the-loop simulation in support of accelerated development and testing.
- (U) Demonstrate interoperation of simulated warfighting environment with service C^{3}I systems in large-scale simulated maneuver exercises.
- (U) Demonstrate integration of virtual warfighting simulation and instrumented ranges.
- (U) Demonstrate interactivity of high performance aviation in virtual simulation.

(U) Program to Completion:

- (U) Demonstrate a Joint Synthetic Theater of War supporting seamless land/sea/air warfighting simulation environment capable of representing 100,000 entities operating with a high degree of realism, fully integrated and supporting service and joint operational concepts.
- (U) Transition simulation in acquisition process to using weapon system development organizations.
- (U) Transition to services embedded, interoperable simulation capability spanning virtual (networked simulators), constructive (aggregate-level wargames), and real systems.
- (U) Demonstrate proof of principle capability leading to low cost computer image generation for simulation.
- (U) Demonstrate division level ground intelligent automated forces.

D. (U) WORK PERFORMED BY: Bolt, Baranek, and Newman, Cambridge, MA; Los Alamos National Laboratory, NM; MITRE Corporation, McLean, VA; SRI

FY 1994 BUDGET ESTIMATES RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603226E
PE Title: Experimental Evaluation of Major Innovative Technologies

Project Number: EE-37
Budget Activity: 2. Advanced Technology Development
Date: April 1993

International, Menlo Park, CA; and University of Central Florida, Orlando, FL.

E. (U) COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY: The FY93 decrease reflects a program re-scope based on technology availability and deferral of the Light Contingency Vehicle (LCV) simulation program.

F. (U) PROGRAM DOCUMENTATION: A memorandum of agreement has been completed with CINC, CENTCOM to support operational mission planning. Further, a memorandum of agreement with various Army agencies is in final staffing. All operational secure nodes on the Defense Simulation Internet have been certified and accredited.

G. (U) RELATED ACTIVITIES: Related work in technology development is closely coordinated with the Defense Modeling and Simulation Office to ensure that unnecessary duplication does not occur. Army funding is from PE 0604715A, Non-Systems Training Devices.

H. (U) OTHER APPROPRIATION FUNDS: None.

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable.

J. (U) MILESTONE SCHEDULE:

Planned	Milestones
Mar 93	Complete Phase I critical mobile target simulation.
Jun 93	Demonstrate working intelligent automated forces for aircraft.
Sep 93	Demonstrate joint simulation environment with high performance distributed simulation for acquisition and training.
Mar 94	Demonstrate communications technologies supporting 10,000 weapons platforms as individual objects on the synthetic battlefield.
Jun 94	Demonstrate man-in-the-loop simulation.
Sep 94	Demonstrate improved intelligent automated forces.

FY 1994 BUDGET ESTIMATES RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603226E
PE Title: Experimental Evaluation of Major Innovative Technologies

Project Number: EE-39
Budget Activity: 2. Advanced Technology Development
Date: April 1993

A. (U) RESOURCES: ($ In Thousands)

Project Title: Unmanned Undersea Vehicle (UUV) Systems

Popular Name	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
UUV/Mine Countermeasures (MCM)	18,679	15,880	17,952	Continuing	Continuing

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: The stockpile of underwater mines and stealthy nuclear and non-nuclear submarines throughout the world present a threat in both littoral warfare and strategic warfare situations. In the Unmanned Undersea Vehicle (UUV) Project fully autonomous, maritime UUV systems for near land warfare are being developed and demonstrated. Work under this project is focused in three areas: mine countermeasures (MCM), deployable surveillance systems (DSS), and UUV enabling technologies.

(U) In the MCM area, autonomous systems for detection and neutralization of mines are being developed. The Mine Search System (MSS) has demonstrated a basic minehunting capability that can survey an area for mines or lead a host vessel around a mined area and is transitioning to the Navy. The Autonomous Minehunting and Mapping (AMM) System will demonstrate the capability to autonomously locate and classify mines with sufficient precision for detailed mapping and subsequent reacquisition by a neutralization system. Once developed, this capability will also be applicable for commercial undersea environmental survey and sampling.

(U) In the deployable surveillance systems (DSS) area, underwater sensor systems for surveillance (of mines, surface ships and submarines) are being developed that can be rapidly deployed by an Unmanned Undersea Vehicle (UUV). Technologies currently being initiated are multi-sensor arrays containing acoustic and non-acoustic sensors and an in-situ signal processing capability.

(U) UUV enabling technologies being addressed include a high energy density fuel cell system to be used for UUV propulsion, underwater communications, and compact, high precision inertial navigation.

FY 1994 BUDGET ESTIMATES RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603226E
PE Title: Experimental Evaluation of Major Innovative Technologies

Project Number: EE-39
Budget Activity: 2. Advanced Technology Development
Date: April 1993

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1992 Accomplishments:

- (U) Demonstrated underwater laser communications system.
- (U) Completed Mine Search System (MSS) mine avoidance demonstration.
- (U) Demonstrated improved navigation for MSS mission.
- (U) Demonstrated 20-cell proton exchange membrane fuel cell for over 2100 hours; completed preliminary design review of the aluminum-oxygen fuel cell.

(U) FY 1993 Planned Program:

- (U) Complete MSS Program and transition to Navy.
- (U) Develop and implement automated mapping process.
- (U) Develop technology for autonomous vehicle operations in surf zone.
- (U) Fabricate multi-sensor fusion testbed and develop fusion algorithms.
- (U) Develop initial acoustic communications network capability.
- (U) Conduct proton exchange membrane fuel cell power plant demonstration; complete testing of aluminum-oxygen power system components, followed by testing of three and nine cell configurations.
- (U) Demonstrate advanced acoustic communications between Unmanned Undersea Vehicles (UUVs).
- (U) Investigate potential for underwater magnetic communications.

(U) FY 1994 Planned Program:

- (U) Conduct at-sea Autonomous Minehunting and Mapping (AMM) demonstration with UUV.
- (U) Develop technology for autonomous bottom-crawling vehicles.
- (U) Develop and fabricate a multi-sensor array tethered prototype system.
- (U) Complete design and development of the acoustic communications network.
- (U) Demonstrate complete UUV fuel cell power systems with reactant supply systems.
- (U) Develop underwater magnetic communications system for surf zone command-activated mine neutralization.
- (U) Test atomic interferometer inertial instrument.

FY 1994 BUDGET ESTIMATES RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603226E
PE Title: Experimental Evaluation of Major Innovative Technologies

Project Number: EE-39
Budget Activity: 2. Advanced Technology Development
Date: April 1993

(U) Program to Completion: This is a continuing program.

D. (U) WORK PERFORMED BY: Charles Stark Draper Laboratory, Cambridge, MA; Applied Research Laboratory, University of Texas, Austin TX; International Fuel Cells, South Windsor, CT; Loral Defense Systems, Akron, OH; Woods Hole Oceanographic Institution, Woods Hole, MA; and Lockheed Missiles & Space Company, Inc., Sunnyvale, CA.

E. (U) COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY: The Fuel Cell brassboard power system demonstration has been delayed from November 1993 to September 1994 due to unforeseen technical difficulties.

F. (U) PROGRAM DOCUMENTATION: Not applicable.

G. (U) RELATED ACTIVITIES: The Navy established an Unmanned Undersea Vehicles (UUV) Program Management Office (PMO 403) to transition these projects to the Navy.

H. (U) OTHER APPROPRIATION FUNDS: None.

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable.

J. (U) MILESTONE SCHEDULE:

Plan	Milestones
Apr 93	Complete Mine Search System (MSS). Transition to Navy.
Apr 94	Begin autonomous minefield mapping at-sea testing.
Jun 94	Demonstrate brassboard atomic interferometer navigator.
Sep 94	Complete brassboard fuel cell power system demonstration.
Sep 94	Demonstrate acoustic communications network.
Sep 94	Complete precision navigation system development.

FY 1994 BUDGET ESTIMATES RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603226E
PE Title: Experimental Evaluation of Major Innovative Technologies
Project Number: EE-40
Budget Activity: 2. Advanced Technology Development
Date: April 1993

A. (U) RESOURCES: ($ In Thousands)

Project Title: Critical Mobile Targets (WAR BREAKER)

Popular Name	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
EE-40	Critical Mobile Targets (WAR BREAKER)				
	0	34,724	105,103**	Continuing	Continuing
	(56,040)*	(7,203)*			

*The associated FY92 and FY93 funding and program accomplishments incorporate Project RT-01 (PE #0603227E) and Project EE-30 (PE #0603226E).

**Includes $4.4 million for the continuation of effort initiated in OSD PE #0603737D, Balanced Technology Initiative.

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: Prosecution of time-critical fixed and mobile targets has long been a concern of the Services. Our experience in Desert Storm has dramatically demonstrated our current inability to prosecute these targets, particularly tactical ballistic missile (TBM) launchers. ARPA's WAR BREAKER program will develop and demonstrate advanced technologies and systems to enable the detection, identification and prosecution of high value, time-critical fixed and mobile targets including TBM launchers, mobile command posts, tanks and artillery. This project serves as the framework for maturing and integrating advanced technologies developed within the Advanced Targeting Technology Project (TT-05) under PE 0602702E and developing and demonstrating system concepts supporting the prosecution of these targets. Key areas include advanced surveillance, target acquisition, automatic target detection and recognition, automated intelligence correlation, battlefield management, information distribution and terrain data generation technologies. This project is part of the ARPA contribution to the DoD Advanced Technology Demonstrations within the Global Surveillance and Communications and Precision Strike DDR&E thrust areas.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1992 Accomplishments:

- (U) Designed passive, three-dimensional infrared sensor system and assessed its performance.
- (U) Continued development of high resolution, polarimetric synthetic aperture radar (SAR) for wide area search.

FY 1994 BUDGET ESTIMATES RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603226E
PE Title: Experimental Evaluation of Major Innovative Technologies
Project Number: EE-40
Budget Activity: 2. Advanced Technology Development
Date: April 1993

- (U) Completed initial assessment of multi-mode, multispectral, passive/active electro-optic infrared (EO/IR) technology requirements for target discrimination.
- (U) Initiated foliage penetration (All Environment Sensor/FOPEN) radar technology development and phenomenology assessment.
- (U) Initiated analysis of utility and technical requirements for a 3-D interferometric synthetic aperture radar (IFSAR) to prosecution of critical mobile targets.
- (U) Initiated concept development and system studies for an integrated system for sensing, finding, localizing and destroying time-critical fixed and mobile targets (WAR BREAKER) using advanced distributed simulation tools.
- (U) Demonstrated the utility of 3-D IFSAR in support of automated digital terrain elevation (DTE) extraction.

(U) FY 1993 Planned Program:

- (U) Focus development of advanced Automatic Target Detection/Recognition algorithms for specific application to advanced SAR and Moving Target Indicator (MTI) radar for both wide area and focused surveillance.
- (U) Continue concept designs of integrated surveillance system employing advanced MTI/SAR radar and multispectral EO/IR sensor.
- (U) Continue FOPEN radar technology development.
- (U) Complete Thirsty Saber system and subsystem hardware fabrication.
- (U) Complete WAR BREAKER baseline concept development.
- (U) Continue WAR BREAKER systems studies incorporating initial distributed simulation system capability.
- (U) Begin design of Low-Cost Ultra-Wideband (UWB) radar for unmanned aerial vehicles (UAVs).
- (U) Continue IFSAR development.
- (U) Initiate Gamma-Gamma resonance imaging development.
- (U) Achieve terrain delimitation goal of providing reduced target search volumes with rapid turnaround.

(U) FY 1994 Planned Program:

- (U) Initiate tests on advanced Moving Target Indicator/ Synthetic Aperature Radar (MTI/SAR) Automatic Target Detection/Recognition algorithms.

FY 1994 BUDGET ESTIMATES RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603226E
PE Title: Experimental Evaluation of Major Innovative Technologies
Project Number: EE-40
Budget Activity: 2. Advanced Technology Development
Date: April 1993

- (U) Continue experiments designed to statistically validate advanced algorithms applicable to advanced target detection radars.
- (U) Conduct initial tests of 3-D digital terrain elevation (DTE) interferometric synthetic aperture radar (IFSAR).
- (U) Conduct Thirst Saber captive flight tests.
- (U) Complete baseline development of WAR BREAKER distributed simulation system.
- (U) Transition appropriate low-cost focal plane array technology to Multi-Spectral effort.
- (U) Begin development of Ultra-Wideband Foliage Penetration (All Environment Sensor/FOPEN) radar.
- (U) Continue development of components/systems which extract, correlate, fuse and display intelligence information to determine changes in force status, order of battle, and operational doctrine of time critical targets.
- (U) Initiate development of dynamic intelligence processor and tracking functions for the Local Attack Controller.
- (U) Demonstrate technology to rapidly fuse and distribute historical intelligence database information.
- (U) Initiate algorithm development for Multi-Spectral and IFSAR processing for feature extraction and elevation data fusion and for real-time modification of theater terrain data.

(U) Program to Completion:

- (U) Demonstrate advanced Automatic Target Detection/ Recognition algorithms for MTI/SAR radars.
- (U) Complete fabrication and test advanced, low-medium, altitude target acquisition/prosecution system.
- (U) Demonstrate improved unattended ground sensors (UGS) and the potential for an internetted UGS system.
- (U) Complete Ultra-Wideband (UWB) foliage penetration (All Environment Sensor/FOPEN).
- (U) Demonstrate capability to correlate all-source intelligence for detection, tracking, targeting, and destruction of time critical targets.
- (U) Demonstrate integrated intelligence correlation and battle management to facilitate local attack control.
- (U) Demonstrate technology to build and distribute over a wide area network, terrain and feature and intelligence and object data for a 1 million square KM theater.

FY 1994 BUDGET ESTIMATES RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603226E
PE Title: Experimental Evaluation of Major Innovative Technologies

Project Number: EE-40
Budget Activity: 2. Advanced Technology Development
Date: April 1993

- (U) Demonstrate Multi-Spectral and IFSAR processing feature extraction and elevation data fusion and real-time modification of theater terrain data.

D. (U) WORK PERFORMED BY: General Dynamics/Convair Division, San Diego, CA; Martin-Marietta, Orlando, FL; ERIM, Ann Arbor, MI; Lincoln Laboratory, Lexington, MA; Texas Instruments, Dallas, TX; BDM International, McLean, VA; SAIC International, Arlington, VA; Sandia National Lab, Santa Fe, NM; Lockheed Missile Systems, Austin, TX; ADS/Booz Allen, Palo Alto, CA; Pacific Sierra Research, Santa Monica, CA; Atlantic Aerospace, Greenbelt, MD; Grumman Aerospace Corporation, Melbourne, FL; LOGICON, San Pedro, CA; and others to be determined.

E. (U) COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY: The FY93 increases are the result of Congressional adds in the areas of IFSAR and Gamma-Gamma Resonance imaging development.

F. (U) PROGRAM DOCUMENTATION: Not applicable.

G. (U) RELATED ACTIVITIES: This effort builds directly upon and/or integrates with the following ongoing ARPA programs: Smart Weapons Application Program (EE-30); Advanced Targeting Technology (TT-05); Relocatable Targets (RT-01); and Advanced Simulation (EE-37). This project is a part of the ARPA contribution to the Joint DoD Advanced Technology Demonstration for Global Surveillance and Communication and Precision Strike Thrust Areas.

H. (U) OTHER APPROPRIATION FUNDS: None.

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable.

J. (U) MILESTONE SCHEDULE:

Plan	Milestones
Feb 93	Complete WAR BREAKER baseline concept.
May 93	Demonstrate 3-D IFSAR in support of automated mapping.
May 93	Installation of Generic Monitoring System at USAREUR Joint Analysis Center.
Aug 93	Complete Thirsty Saber system/subsystem hardware fabrication.
Mar 94	Demonstrate capability to temporarily use intelligence information to track time critical targets (TCTs).
Mar 94	Complete Thirsty Saber captive flight tests.
Feb 95	Complete WAR BREAKER distributed simulation.

FY 1994 BUDGET ESTIMATES RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603226E
PE Title: Experimental Evaluation of Major Innovative Technologies

Project Number: EE-40
Budget Activity: 2. Advanced Technology Development
Date: April 1993

Nov 95	Demonstrate automapping capability using IFSAR.
Nov 95	Initial demonstration of automatic cue development from contextual analysis of MTI Radar data (MTI ATR).
Nov 97	Demonstrate integrated intelligence correlation and battle management to facilitate local attack control.
Nov 97	Demonstrate technology to build and distribute over a wide area network, terrain and feature and intelligence and object data for a 1 million square KM theater.
May 98	Conduct integrated wide area/focused surveillance system demonstration.
Nov 98	Demonstrate capability to correlate all-source intelligence to detection, tracking, targeting, and destruction of time critical targets.
Sep 98	Demonstrate Multi-Spectral and IFSAR processing feature extraction and elevation data fusion and real-time modification of theater terrain data.
Jun 99	Conduct fully integrated WAR BREAKER demonstration.

FY 1994 BUDGET ESTIMATES RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603226E
PE Title: Experimental Evaluation of Major Innovative Technologies

Project Number: EE-41
Budget Activity: 2. Advanced Technology Development
Date: April 1993

A. (U) RESOURCES: ($ In Thousands)

Project Title: Popular Name	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
EE-41	Air Defense Initiative (ADI)				
	(95,645)*	(32,018)*	27,717	Continuing	Continuing

*Formerly funded in OSD PE 0603741D.

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: ADI is a companion to the Strategic Defense Initiative (SDI) program. To ensure defenses against manned aircraft and cruise missiles are developed concurrently with defenses against ballistic missiles, the program approach entails vigorous concept exploration, with coordination among the Services and SDIO, and early involvement by the operational community. Technical developments in surveillance and identification, engagement, and battle management/C^3 are incorporated into a series of projects to demonstrate key concepts. Individual ADI efforts under EE-41 are described below. Other ADI efforts are in the EE-CLS/ADI Project.

(U) The Mountaintop Program is to determine how current radar technology can be extended to meet more stressing airborne threat requirements. An existing radar developed by the Navy will be used as the primary sensor for Mountaintop testing. Mountaintop provides a cost effective approach, avoiding new hardware development, to evaluate new and innovative technologies, especially in signal processing. Mountaintop is a joint activity with the following principal radar technology development and demonstration subprojects: (1) Development of a phenomenology and propagation data base; (2) Development of advanced adaptive space-time processing architectures, hardware and algorithms required for future surveillance radars; and (3) Support of integrated architecture testing.

(U) The Airship program completes an earlier Navy program. Airship platforms have unique capabilities as an airborne sensor platform. Airship features for cruise missile and area defense include long flight endurance, payload volume, flight speed, and vibration characteristics. The design of the Operational Development Model (ODM) Airship program will continue through Critical Design Review (CDR) and testing. Demonstrations on the S-1000 Airship will be conducted.

FY 1994 BUDGET ESTIMATES RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603226E
PE Title: Experimental Evaluation of Major Innovative Technologies

Project Number: EE-41
Budget Activity: 2. Advanced Technology Development
Date: April 1993

(U) The HAVE DUNGEON project continues funding of the Proof-of-Concept Aerospace Defense Location (PADL) in Colorado Springs. This facility allows for intense user/developer working relationships to demonstrate the value of ADI technology using a mixture of live and simulated data, plus advanced visualization techniques. By integrating National Sensor and other data sources, HAVE DUNGEON will continue to support the ADI program in the critical areas of wide-area surveillance and detection of cruise missiles and their carriers, with the goal of "birth-to-death" tracking of airborne threats.

(U) An improved modeling and simulation system will be created called Air Defense Initiative Simulated Technologies (ADIST). Its mission is to support the Services' transition of innovative air defense technologies, including efforts in the EE-CLS/ADI project. To that end, it will emphasize the cruise missile threat and its integration into ongoing service Theater Missile Defense activities. It will combine and develop software tools that aid in technology conception, design, test, and system visualization. It will build on the PADL software capabilities and link them with existing Service modeling and manned simulator facilities. It has these thrusts: ADI architecture trade-off studies with analytic models and interface with the Air Force Theater Air Command and Control Simulator Facility (TACCSF) and the Navy Weapons and Tactic Analyses Center (WEPTAC) for man-in-the-loop simulation exercises; development of sensor/platform models within a prototype distributed simulation environment; and extension of the prototype environment to interact with the ARPA WAR BREAKER Defense Distributed Simulation System.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1992 Accomplishments:

- (U) Navy ADI-ASW efforts support timely detection of SLCM-carrying submarines in marginal waters. Projects included active and passive acoustics, signal processing, and architecture requirements. ASW sea tests conducted and analyzed in 1992 included E-1, CST-6, AIREM, and SHAREM.
- (U) The ADI Mountaintop program began planning and testing of hardware and test capabilities to provide cost-effective testing of advanced sensor concepts.
- (U) The HAVE DUNGEON program applied their user/developer simulation environment at PADL to demonstrate and test ADI technologies for tracking, fusion, identification, and C^3.

FY 1994 BUDGET ESTIMATES RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603226E
PE Title: Experimental Evaluation of Major Innovative Technologies
Project Number: EE-41
Budget Activity: 2. Advanced Technology Development
Date: April 1993

- (U) Under the Airship program, tasking to complete the ODM CDR was continued, and critical technology tests and demonstrations were planned.

(U) FY 1993 Planned Program:

- (U) The completion of the Airship program is planned. The CDR for ODM will be completed, and critical technology testing and demonstrations accomplished.
- (U) HAVE DUNGEON will address wide area surveillance capabilities, battle management, and cruise missile and carrier detection and identification.
- (U) For the Simulation program, ADIST actions will address requirements definition and allocation, prototype simulation development, architectural trade-off studies, and initial linkage of PADL and the AF Theater Command and Control Simulation Facility.

(U) FY 1994 Planned Program:

- (U) Mountaintop testing, data gathering and analysis will continue, including phenomenology and propagation measurements and siting of the UHF radar at PMRF Barking Sands, Kauai, Hawaii.
- (U) HAVE DUNGEON will adapt capabilities to address regional situations of interest.
- (U) Simulation will continue ADIST activities and begin linkage of geographically separate models and manned simulators within the ARPA WAR BREAKER Defense Distributed Simulation System.

(U) Program To Completion: This is a continuing program.

D. (U) WORK PERFORMED BY: The organizations currently contracting and performing work on ADI include: SPAWAR, NCCOSC, and NUSC for Navy activities; AF Materiel Command: ESC, Rome Lab, and Aeronautical Systems Command; and Army SDC and Missile Command.

E. (U) COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY: ADI funding has been transferred to ARPA in FY 1994. Funds and programs that were formerly in OSD PE 0603741D now are described under the EE-41 and EE-CLS/ADI projects. ASW responsibility and funding was transferred to the Navy in FY 1993. Completion of the Airship program with FY 1993 funding is planned.

F. (U) PROGRAM DOCUMENTATION: ADI Program Plan, February 1991.

FY 1994 BUDGET ESTIMATES RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603226E
PE Title: Experimental Evaluation of Major Innovative Technologies

Project Number: EE-41
Budget Activity: 2. Advanced Technology Development
Date: April 1993

G. (U) RELATED ACTIVITIES: The ADI program is coordinated with other technology efforts and plans for tactical and strategic air defense. Applicable related program elements include: SDIO PEs developing theater, national, and global ballistic missile defenses and Advanced ASW Technology Programs. ADI activities are integrated with a number of related ARPA efforts.

H. (U) OTHER APPROPRIATION FUNDS: None.

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable.

J. (U) MILESTONE SCHEDULE:

Plan	Milestone
	Mountaintop Project:
Jan 94 -	Initiate ŒNavy ADS-18S antenna/radar testing at White Sands Missile Range (WSMR).
Mar 94 -	Complete land clutter experiments at WSMR.
Jun 94 -	Initiate operational experiments at Pacific Missile Range Facility with RSTER Antenna/Radar.
	Simulation Project:
Jan 94 -	Complete ADIST integration with PADL.
Mar 94 -	Begin analytic studies with ADIST prototype simulation system on advanced sensor and architecture concepts.
Jul 94 -	Complete platform/sensor model development efforts and integrate into simulation.

FY 1994 BUDGET ESTIMATES RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603226E
PE Title: Experimental Evaluation of Major Innovative Technologies

Project Number: EE-45
Budget Activity: 2. Advanced Technology Development
Date: April 1993

A. (U) RESOURCES: ($ In Thousands)

Project Title: Global Grid Communications

Popular Name	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
EE-45 Global Grid Communications	0	0	20,881	Continuing	Continuing

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: This program develops and demonstrates advanced communications technologies needed for defense and intelligence operations for the 21st century. The program will demonstrate that commercial communications resources and technologies can be integrated with advanced optical components developed in this program as well as DoD tactical and satellite technology developed elsewhere. Interoperability between diverse networks such as existing commercial, optical and secure wireless will be demonstrated. Key elements are:

(U) Research and development of optical components that will permit the DoD to substantially reduce the number of fibers, switches, and repeaters required for deployment of gigabit network capability. Electronic content will be reduced so that the cost of electronic upgrades is minimized.

(U) Research and development of network control, management, and security software technologies to enable sensor-to shooter applications combining all network media.

(U) Demonstration networks that validate the R&D and enable early application development and technology transition into DoD efforts such as Defense Information System Networks.

(U) Advanced services, such as scalable file systems, databases, and distributed computing support that are integrated with high performance computing, and free applications from the necessity to work down to the raw data transport level.

(U) Applications, including intelligent decision aids, that enable a geographically distributed planning staff to develop and analyze a course of action within 4 hours.

FY 1994 BUDGET ESTIMATES RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603226E
PE Title: Experimental Evaluation of Major Innovative Technologies

Project Number: EE-45
Budget Activity: 2. Advanced Technology Development
Date: April 1993

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1992 Accomplishments: N/A (New FY94 start)

(U) FY 1993 Planned Program: N/A (New FY94 start)

(U) FY 1994 Planned Program:
- (U) Optical component development.
- (U) Software architecture for joint task force planning/execution including weather, intelligence, strike planning, and logistics.
- (U) Demonstrate interoperability between commercial and DoD network assets.
- (U) Initiate network management, control, signalling efforts.

(U) Program to Completion:
- (U) Integrate DoD and commercial networks with military attributes such as crypto, surge capability.
- (U) Demonstrate advanced optical network capability.
- (U) Demonstrate integration on a CONUS scale using all networks.
- (U) Demonstrations of planning exercises.

D. (U) WORK PERFORMED BY: Competitive award of contracts. Major performers will include telecommunications, electronic and computing companies.

E. (U) COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY: N/A (New FY94 start)

F. (U) PROGRAM DOCUMENTATION: None.

G. (U) RELATED ACTIVITIES: The program is coordinated with: The national High Performance Computing and Communication Program (that will provide theory and limited-area experience), the ARPA consortia on all-optical network and optoelectronic components, the component crypto development by NSA, and the JDL C3 and Computer Science panels. This program will produce the system technologies required by Global Surveillance and Communication thrust area activities.

FY 1994 BUDGET ESTIMATES RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603226E
PE Title: Experimental Evaluation of Major Innovative Technologies

Project Number: EE-45
Budget Activity: 2. Advanced Technology Development
Date: April 1993

H. (U) OTHER APPROPRIATION FUNDS: None.

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable.

J. (U) MILESTONE SCHEDULE:

Planned	Milestone
Apr 95	Demonstrate optical component prototypes.
Jul 95	Multiple crisis scenario (integrated simulation and modelling tools, more powerful trade-off analysis).
Oct 95	Integrate defense high performance networks with cross country backbone using SONET/ATM. Early planning support demonstrations.
May 96	Demonstrate network combining crypto, commercial communications, and defense secure wireless, satellite.
May 97	Demonstrate integration with advanced optical testbeds. Large scale planning demonstrations.
Jul 97	Deployable JTF C3 (mobile C3, plan rehearsal and refinement during deployment, intelligent interfaces).
May 98	Cross-country demonstration of optical and advanced network management.

FY 1994 BUDGET ESTIMATES RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603569E
PE Title: Advanced Submarine Technology

Project Number: AS-01
Budget Activity: 2. Advanced Technology Development
Date: April 1993

A. (U) RESOURCES: ($ In Thousands)

Project Title: Advanced Submarine Technology (SUBTECH)

Popular Name	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
AS-01	SUBTECH 71,458	52,049	32,556	Continuing	Continuing

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: The objectives of this project are to develop and demonstrate advanced concepts and to pursue critical enabling technologies for future ship classes. The evolving worldwide threat of quiet diesel submarines and the proliferation of sophisticated submarine and weapons capabilities available to third world countries necessitate a continued superior U.S. submarine force. U.S. submarine technologies must keep pace with the changing threats and remain immune to technological surprises. The main thrust of this project is to provide, in the specific areas of active structural vibration control and advanced materials, far-term solutions to ship affordability and capability in this new operational environment.

(U) This project brings to fruition the development of structural technologies under the Active Impedance Modification (AIM) and Advanced Vibration Reducer (AVR) efforts to reduce submarine observables. These technologies will significantly enhance submarine stealth and survivability. They form the basis for efforts addressing affordability of ultra-high precision machinery used for submarine noise-critical applications and high reliability propulsion systems. Advanced thick section composites and embedded sensors efforts are demonstrating the advanced structural fabrication processes and strength monitoring capabilities necessary to introduce affordable advanced lightweight structural materials into submarine construction programs.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1992 Accomplishments:

- (U) Transitioned Enhanced Surface Tube Condenser, Submarine Advanced Integrated Life Support System, Silver Zinc Battery, Axial Flow Shaftless Pump, Advanced Turbine Generator Seals, Electromagnetic Signature Reduction, Project I, Project S, Intermediate Scale Measurement System (ISMS), and Submarine Compute-Off (SUBOFF) projects to the Navy.

FY 1994 BUDGET ESTIMATES RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603569E
PE Title: Advanced Submarine Technology
Project Number: AS-01
Budget Activity: 2. Advanced Technology Development
Date: April 1993

- (U) Demonstrated Low Frequency Active (LFA) target strength reduction at 30:1 scale model.
- (U) Completed Magnetohydrodynamic (MHD) large-scale thruster experiment.
- (U) Completed Proton Exchange Membrane (PEM) fuel cell subsystem demonstrations.
- (U) Completed shaftless pump acoustic and performance testing.
- (U) Completed land and sea tests of Non-Penetrating Periscope.
- (U) Conducted Radio Control Model (RCM) free running hydrodynamic maneuvering tests.
- (U) Commenced Active Impedance Modification (AIM) algorithm development and completed development of a specialized digital signal processor; fabricated Active Impedance Modification (AIM) prototype transflexural elements.
- (U) Completed site preparation for Advanced Vibration Reducer (AVR) Full Scale Land Based tests.
- (U) Completed stable magnetic levitation demonstration of machinery raft model.
- (U) Commenced design of Stealth Designer's Workbench (SDW).
- (U) Completed SUPRELITE quarter-scale water tests.

(U) FY 1993 Planned Program:

- (U) Complete corrosion studies to predict calendar life of the roll-bonded nickel electrode of the nickel-cadmium (Ni-Cd) battery.
- (U) Demonstrate benefit of Metal Oxide Semiconductor (MOS) Controlled Thyristor (MCT) and Auxiliary Resonant Commutated Pole in an adjustable speed 200 horsepower motor drive.
- (U) Commence testing of Active Impedance Modification (AIM) prototypes; complete development of AIM algorithms.
- (U) Fabricate Advanced Vibration Reducer (AVR) Components; transition to Navy.
- (U) Investigate techniques for affordable high precision fabrication of noise-critical machinery components.
- (U) Develop and optimize mid-frequency structural acoustics code for Stealth Designer's Workbench (SDW); develop Dimension-Adaptive Mesh Generator for SDW.

FY 1994 BUDGET ESTIMATES RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603569E
PE Title: Advanced Submarine Technology
Project Number: AS-01
Budget Activity: 2. Advanced Technology Development
Date: April 1993

- (U) Determine feasibility of active turbulence control.
- (U) Transition Submarine Hydrodynamic/Hydroacoustic Technology Center (SH/HTC) to Navy.
- (U) Develop structured modeling techniques required to analyze innovative ship construction and noise isolation technologies.

(U) FY 1994 Planned Program:

- (U) Fabricate non-autoclave cure thermoplastic-stiffened composite cylinders (4-foot diameter); begin testing thermoset sphere (4-foot diameter).
- (U) Complete fabrication of SUPRELITE components; complete SUPRELITE first-year fatigue test; install SUPRELITE on submarine and conduct at-sea testing.
- (U) Commence array testing of Active Impedance Modification (AIM).
- (U) Integrate vector and parallel processors for Stealth Designer's Workbench (SDW).
- (U) Demonstrate feasibility of affordable high precision machining operations for fabrication of noise-critical machinery components.
- (U) Investigate techniques for active suppression of vibration and noise in turbines.
- (U) Analyze and optimize selected innovative ship construction and noise isolation techniques.

(U) Program to Completion: This is a continuing program.

D. (U) WORK PERFORMED BY: AT&T Bell Laboratories, Whippany, NJ; GEC-Marconi, United Kingdom; Pennsylvania State University/Applied Research Laboratory, State College, PA; McDonnell Douglas Aircraft, St. Louis, MO; General Dynamics/Electric Boat Division, Groton, CT; Grumman Aerospace, Bethpage, NY.; and Lockheed Missiles and Space, Palo Alto, CA.

E. (U) COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY: This program is a continuation of the Congressionally-mandated Submarine Technology Program (STP).

F. (U) PROGRAM DOCUMENTATION: Not applicable.

FY 1994 BUDGET ESTIMATES RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603569E
PE Title: Advanced Submarine Technology

Project Number: AS-01
Budget Activity: 2. Advanced Technology Development
Date: April 1993

G. (U) RELATED ACTIVITIES: This program has been coordinated with the Program Executive Officer, Submarines (PEO-SUB-R) to ensure there is no duplication of effort and that developed technologies are properly transitioned to the Navy.

H. (U) OTHER APPROPRIATION FUNDS: None.

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable.

J. (U) MILESTONE SCHEDULE:

Plan	Milestones	
Apr 93	(U)	Commence testing of Active Impedance Modification (AIM) prototypes.
Nov 93	(U)	Complete initial SUPRELITE fatigue tests.
Jan 94	(U)	Complete fabrication of full scale propulsor rotor.
Feb 94	(U)	Perform initial testing of thick section composites 4-foot thermoset sphere structures.
May 94	(U)	Commence Active Impedance Modification (AIM) array testing.
Jul 94	(U)	Conduct demonstration of high precision machine operations for noise critical machinery.
Dec 94	(U)	Conduct initial Stealth Designer's Workbench (SDW) validation tests.

FY 1994 BUDGET ESTIMATES RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603570E
PE Title: Defense Reinvestment

Budget Activity: 2. Advanced Technology Development
Date: April 1993

A. (U) RESOURCES: ($ In Thousands)

Project Title: Defense Reinvestment

Popular Name	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
Defense Reinvestment	60,000	561,633	349,000*	N/A	Continuing

*Includes $25.0 million of FY 1993 Title VIII funds that will be applied to FY 1994 Manufacturing Extension and Dual-Use Assistance Extension Programs.

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: The purpose of this program is to invest in activities to stimulate development of technologies that have dual-use application that can enable new military capabilities as well as have potential for enabling new commercial products and lead to an integration of commercial and military production and processes. As a result, technologies will be developed and deployed to increase both national security and the national economy. This will be accomplished through the application of defense and commercial resources to develop dual-use technologies, manufacturing and technology assistance to small firms, and education and training programs that enhance U.S. manufacturing skills and target displaced defense industry workers. The program consists of multiple programs.

(U) **Defense Dual-Use Critical Technology Partnerships** -- supports partnerships aimed at developing technologies that have both military and commercial applications.

(U) **Commercial-Military Integration Partnerships** -- supports partnerships aimed at developing and maturing dual-use technologies with clear commercial viability.

(U) **Defense Advanced Manufacturing Technology Partnerships** -- funds partnerships aimed at developing new manufacturing technologies with dual-use applications.

(U) **Manufacturing Engineering Education Grant Program**-- supports manufacturing engineering education programs at colleges, universities and other institutions of higher education on a matching basis.

FY 1994 BUDGET ESTIMATES RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603570E
PE Title: Defense Reinvestment

Budget Activity: 2. Advanced Technology Development
Date: April 1993

(U) **Manufacturing Extension Program** -- assists small manufacturers (with up to 500 employees) in upgrading their capabilities to serve commercial and defense needs.

(U) **Defense Dual-Use Assistance Extension Program** -- assists businesses economically dependent on Department of Defense expenditures to acquire dual-use capabilities through a variety of mechanisms.

(U) **Regional Technology Alliances Assistance Program** -- supports the development and maturing of dual-use technologies in one or more focused geographical regions of the U.S., implemented through eligible regional technology alliances.

(U) **Agile Manufacturing/Enterprise Integration Program** -- is designed to capitalize on the emerging shift from mass production to flexible "agile" manufacturing. Enterprise Integration allows independently-owned companies to form instantaneous partnerships with firms that have complementary capabilities in order to exploit market opportunities.

(U) **Advanced Materials Synthesis and Processing Partnerships** -- supports partnerships aimed at improving industry's ability to take new materials from the laboratory to commercial production.

(U) **U.S.-Japan Management Training Program** -- provides training for U.S. scientists, engineers and managers in Japanese technology management, language and culture, and provides research opportunities in Japan.

(U) The program will be executed primarily based on a formal solicitation in May 1993, with proposals due in July. The proposals will be reviewed in an inter-agency selection process with award of contracts, grants and agreements planned for September 1993. Allocation of the FY 1994 funds by individual program category will be made based on the response to the solicitation and FY 1993 awards.

(U) The FY 1994 program includes the entire ARPA Small Business Innovation Research (SBIR) Program of $28.0 million that will be applied to focused dual-use programs.

FY 1994 BUDGET ESTIMATES RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603570E
PE Title: Defense Reinvestment

Budget Activity: 2. Advanced Technology Development
Date: April 1993

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1992 Accomplishments:
- (U) Developed pre-competitive technology consortia in areas of precision investment casting, optical networks, data storage, micromagnetic components, ultra-dense capacitor materials, and electromagnetic codes.

(U) FY 1993 Planned Program:
- (U) Hold regional meetings throughout the U.S. to brief interested organizations and individuals on defense reinvestment participation.
- (U) Publish solicitation for proposed partnerships.
- (U) Select and award new partnership agreements.

(U) FY 1994 Planned Program:
- (U) Execute FY 1994 increments of ongoing FY 1993 programs and establish new partnerships.

(U) Program to Completion: Not applicable.

D. (U) WORK PERFORMED BY: Partnerships are composed of industry, federal laboratories, institutions of higher education, state government agencies, Government-owned and operated industrial facilities, and other entities that support the activities of the firms or non-profit research corporations.

E. (U) COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY: Not applicable

F. (U) PROGRAM DOCUMENTATION: Not applicable.

G. (U) RELATED ACTIVITIES: Ongoing government research projects.

H. (U) OTHER APPROPRIATION FUNDS: None.

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable.

J. (U) MILESTONE SCHEDULE: Not applicable.

FY 1994 BUDGET ESTIMATES RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603739E
PE Title: Electronics Manufacturing Technology
Budget Activity: 2. Advanced Technology Development
Date: April 1993

A. (U) RESOURCES: ($ in Thousands)

Project Number & Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
MT-01	Microelectronics Manufacturing				
	98,000	0	0	Continuing	Transferred to PE 0603745E
MT-02	Microwave/Millimeter Wave Monolithic Integrated Circuits (MIMIC)				
	85,528	80,179	80,181	37,552	596,209
MT-03	IR Focal Plane Array (IRFPA)				
	17,404	34,150	41,429	Continuing	Continuing
MT-04	Electronic Module Technology				
	5,129	67,258	97,080	Continuing	Continuing
MT-05	Tactical Display Systems				
	0	10,078	9,467	Continuing	Continuing
MT-07	Centers of Excellence				
	0	27,665	4,837	Continuing	Continuing
MT-08	Manufacturing Technology Initiatives				
	0	0	19,146	Continuing	Contionuing
MT-10*	Advanced Lithography				
	0	0	47,457	Continuing	Continuing
TOTAL	206,061	219,330	299,597		

*Previously funded in PE 0602712E, Project MPT-04.

B. (U) BRIEF DESCRIPTION OF ELEMENT: The Electronics Manufacturing Technology program element focuses on seven specific projects to develop and enhance various microelectronics systems. The programs contained in Projects MT-02, MT-03, MT-04, MT-08 and MT-10 reflect the Department's initiative to support dual-use technologies.

(U) Microwave/Millimeter Wave Monolithic Integrated Circuits (MIMIC) works to accelerate the development, manufacturing and demonstration of affordable microwave and millimeter wave analog integrated circuits.

FY 1994 BUDGET ESTIMATES RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603739E
PE Title: Electronics Manufacturing Technology

Budget Activity: 2. Advanced Technology Development
Date: April 1993

(U) The IR Focal Plane Array project focuses on the establishment of a manufacturing base for advanced infrared sensor arrays for major weapons systems. This base will allow the systems to meet operating requirements at approximately 1% of the current cost.

(U) Electronic Module Technology's goal is to allow for the timely insertion and rapid acquisition of three components into major military systems. These systems include automatic target recognition, electronic countermeasures and Signal Intelligence (SIGINT). The three components are state-of-the-art microsensors and actuators, conformal electronics and affordable, high performance application specific electronic modules (ASEM).

(U) Tactical Display Systems develops and demonstrates high definition miniature displays to provide visual information to troops who are remotely located from conventional visual information sources.

(U) Centers of Excellence focus on the demonstration, deployment of and training on advanced manufacturing technologies. The goal of this technology is to reduce unit and life cycle costs while improving quality.

(U) Manufacturing Technology Initiatives advance the capability of the U.S. industrial base to respond rapidly and flexibly to both military and commercial demands.

(U) Advanced Lithography seeks to advance the current microelectronics manufacturing capabilities using advanced lithography technology.

FY 1994 BUDGET ESTIMATES RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603739E
PE Title: Electronics Manufacturing Technology
Project Number: MT-02
Budget Activity: 2. Advanced Technology Development
Date: April 1993

A. (U) RESOURCES: ($ In Thousands)

Project Title: Microwave/Millimeter Wave Monolithic Integrated Circuits

Popular Name	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
MT-02	MIMIC 85,528	80,179	80,181	37,552	596,209

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: This project provides for the acceleration of development, manufacturing and demonstration of affordable microwave and millimeter wave analog integrated circuits (ICs). The Microwave/ Millimeter Wave Monolithic Integrated Circuits (MIMIC) program is providing previously unavailable microwave and millimeter-wave integrated circuits to enable DoD systems to meet size, weight and power constraints at the lowest possible cost. Its primary thrust is to develop affordable circuits operating in the 1 to 100 GHz frequency range with required characteristics and in sufficient quantity to satisfy military systems needs. The use of reliable and maintainable semiconductor devices and circuits for selected system demonstrations will be accelerated and, thus provide the United States with a technological lead in deploying MIMIC-based military systems.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1992 Accomplishments:

- (U) Continued enhancement of capabilities to produce devices, circuits and subsystems with needed characteristics for DoD systems.
- (U) Continued integration of Computer Aided Design (CAD) capabilities with manufacturing lines and on-line test capabilities.
- (U) Began transfer of advanced materials, devices, design software, packaging and testing technologies into MIMIC fabrication lines.
- (U) Integrated Multi-function Self-Aligned Gate (MSAG) Technology into military radar systems.
- (U) Continued work on Microwave Hardware Description Language (MHDL).
- (U) Initiated technology support programs in the following areas: materials, fabrication processes, computer aided design, testing, integration and packaging, and innovative circuit technologies.

FY 1994 BUDGET ESTIMATES RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603739E
PE Title: Electronics Manufacturing Technology

Project Number: MT-02
Budget Activity: 2. Advanced Technology Development
Date: April 1993

(U) FY 1993 Planned Program:
- (U) Deliver first multi-function MIMICs meeting required system specifications.
- (U) Begin assembly of advanced MIMIC modules and system brassboards.
- (U) Continue development of advanced materials, devices, design software, packaging and testing technologies.

(U) FY 1994 Planned Program:
- (U) Continue work on Microwave Hardware Description Language.
- (U) Complete delivery of process demonstration wafers.
- (U) Complete fabrication of MIMIC Phase 2 chips.
- (U) Begin assembly of MIMIC modules and brassboards.
- (U) Begin to make available to all DoD system contractors the MIMIC pilot lines, CAD and test facilities.

(U) Program to Completion:
- (U) Continue work on Microwave Hardware Description Language.
- (U) Deliver MIMIC chips, modules and brassboards.
- (U) Conduct advanced demonstrations of cost reductions and expanded system applications.
- (U) Reach cost goal of $.80/mm² for MIMIC gallium arsenide chips.
- (U) Make available to all DoD system contractors the MIMIC pilot lines, CAD and test facilities.
- (U) Make available second sources of supply for MIMIC chips.
- (U) Program completes in FY 1995.

D. (U) WORK PERFORMED BY: In-house work will be performed by: Army Research Laboratory; Naval Air Systems Command; U.S. Naval Research Laboratory; Air Force Wright Laboratory, and Rome Laboratory. Hardware development phase prime contractors are: Hughes Aircraft Company, El Segundo, CA; General Electric, Syracuse, NY; Martin-Marietta, Orlando,FL; ITT, Roanoke, VA; Raytheon Co., Bedford, MA; Texas Instruments, Dallas, TX; and TRW, Redondo Beach, CA.

E. (U) COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY: Consistent with the FY 1993 Descriptive Summary.

F. (U) PROGRAM DOCUMENTATION:
- (U) Managements Structure for the Microwave/Millimeter Wave Monolithic Integrated Circuits (MIMIC) Program, 9/85.

FY 1994 BUDGET ESTIMATES RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603739E
PE Title: Electronics Manufacturing Technology
Project Number: MT-02
Budget Activity: 2. Advanced Technology Development
Date: April 1993

- (U) Program Plan for MIMIC, 5/86.
- (U) Acquisition Plan No. DoD 86-X for MIMIC Program, 10/86.

G. (U) RELATED ACTIVITIES: Exploratory and advanced development of gallium arsenide monolithic components are being undertaken within Army, Navy, and Air Force RDT&E program elements.

(U) The work performed under this project within Program Element #0603739E is complementary to the work performed in the above service program elements. There is no duplication of effort within the Department of Defense.

H. (U) OTHER APPROPRIATION FUNDS: None.

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable.

J. (U) MILESTONE SCHEDULE:

Plan	Milestones
Jun 94	Complete fabrication of MIMIC chips.
Jan 95	Deliver MIMIC Phase 2 chips, modules and brassboards.
Jan 95	Complete integrated design/fabrication/test capabilities at MIMIC Phase 2 contractors.

FY 1994 BUDGET ESTIMATES RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603739E
PE Title: Electronics Manufacturing Technology

Project Number: MT-03
Budget Activity: 2. Advanced Technology Development
Date: April 1993

A. (U) RESOURCES: ($ In Thousands)

Project Title: IR Focal Plane Array

Popular Name	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	To Program
IRFPA	17,404	34,150	41,429	Continuing	Continuing

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: The Infrared Focal Plane Array (IRFPA) project establishes a manufacturing base for advanced infrared (IR) sensor arrays required for major weapon systems. Improvements in infrared materials, detector array fabrication, read-out electronics, cryogenic testing and module assembly are addressed in order to provide affordable infrared sensors to system developers. Systems requiring affordable tactical infrared focal plane arrays include missile seekers, airborne and ground-based target acquisition systems, and infrared search and track systems. Currently, the IRFPAs are produced at low rates and high cost with technology that is just emerging from the laboratory environment. The goal of this project is to produce IRFPAs that meet system requirements with a hundred-fold cost reduction relative to the cost at the beginning of the project.

(U) The project initially focused on sensors with response in the 8-to-10 micron infrared spectral region for use in tactical systems. The cost of these arrays is being reduced through the development of large-area, uniform material wafers, improved repeatability of 8-to-10 micron detector processes, increased functionality of the read-out integrated circuit; and automation of cryogenic test procedures. Integration of these advancements into manufacturing lines producing IRFPAs in weapon system configurations is providing affordable tactical IRFPAs in the quantities necessary to meet defense system needs.

(U) Beginning in FY 1993, the IRFPA project was expanded to include scalable infrared focal plane array manufacturing to meet the full spectrum of defense needs. Additional systems addressed by this program will include high-performance missile seekers, space surveillance systems, threat warning systems, and large-area staring arrays for improved ground and air-based target acquisition. In the future, smart weapons will employ infrared focal plane arrays for autonomous target

FY 1994 BUDGET ESTIMATES RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603739E
PE Title: Electronics Manufacturing Technology
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acquisition and identification. Because the production volume of any specific IRFPA is very low, the only way to ensure affordable IRFPAs for DoD is through the establishment of highly flexible, scalable manufacturing capability. The lines will have the flexibility to scale up to higher rates to meet production requirements. This project reflects the OSD Advanced Technology Demonstration for scalable IRFPA manufacturing and supports the Technology for Affordability DDR&E thrust area.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1992 Accomplishments:

- (U) Implemented improved material screening for the growth of infrared material on silicon substrates, resulting in the imaging demonstration of a high quality 480x4 IRFPA.
- (U) Demonstrated the feasibility of in-process sensors to control liquid phase epitaxial material growth and used improved material to fabricate 240x1 IRFPAs.
- (U) Fabricated, using the dry etching process, a 64x64 IRFPA meeting missile seeker specifications.

(U) FY 1993 Planned Program:

- (U) Demonstrate vapor phase growth on silicon substrates to produce large-area long-wavelength staring arrays.
- (U) Demonstrate improved screening of IR material; x2 increase in the arrays passing wafer-level evaluation.
- (U) Manufacture a large scanning IRFPA with improved reliability (greater than 1,000 thermal cycles without failure).
- (U) Implement manufacturing technology using a two-inch substrate, which contains more than 60 64x64 IRFPAs.
- (U) Implement improved control over infrared material growth process as initial demonstration of flexibility in IRFPA manufacturing.
- (U) Initiate activity for a physical model describing defects in IR material as the initial step toward flexible IRFPA manufacturing.

FY 1994 BUDGET ESTIMATES RDT&E DESCRIPTIVE SUMMARY

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PE Title: Electronics Manufacturing Technology

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Date: April 1993

(U) FY 1994 Planned Program:

- (U) Demonstrate improved wafer morphology to reduce defect density in long-wavelength staring arrays.
- (U) Complete physical model describing IR detector surface leakage mechanism.
- (U) Fabricate modules for tactical applications.
- (U) Complete read-out circuit design and fabricate read-out common to mid- and long-wavelength devices.
- (U) Demonstrate long wavelength scanning arrays with cut-off of 11.0 microns at 77°K.

(U) Program to Completion:

- (U) Demonstrate large-area 480x640 mercury cadmium telluride IRFPAs on a silicon substrate.
- (U) Demonstrate manufacturing technology for 64x64 staring arrays with greater than 90% operability at a cost of less than $2,000 per IRFPA.
- (U) Demonstrate 128x128 IRFPAs on a silicon substrate for greater ease of material handling and compatibility with commercial manufacturing equipment.
- (U) Demonstrate IRFPA manufacturing with 4-inch wafers.
- (U) Complete the development of an integrated manufacturing capability for large-area (4-inch wafers) infrared semiconductors demonstrating a 100 times cost reduction for both staring and scanning arrays.
- (U) Demonstrate flexible, modular IRFPA manufacturing with the capability to rapidly reconfigure the line to produce 3-5 and 8-12 micron arrays for tactical and space surveillance applications.

D. (U) WORK PERFORMED BY: Contractors include: Santa Barbara Research Center, Santa Barbara, CA; Loral Infrared and Imaging Systems, Lexington, MA; Rockwell, Anaheim, CA; and Texas Instruments, Dallas, TX.

E. (U) COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY: Consistent with the Amended FY 1992/1993 Descriptive Summary.

F. (U) PROGRAM DOCUMENTATION: Not applicable.

FY 1994 BUDGET ESTIMATES RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603739E
PE Title: Electronics Manufacturing Technology

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Date: April 1993

G. (U) RELATED ACTIVITIES: Development of Infrared Focal Plane Array (IRFPA) technology and devices is being undertaken under Army, Navy, Air Force and Advanced Research Projects Agency (ARPA) program elements. The related Service program elements are:

- (U) PE 0602709A, Night Vision Technology.
- (U) PE 0603774A, Night Vision System Advanced Development.
- (U) PE 0602234N, Systems Support Technology.
- (U) PE 0602204F, Aerospace Avionics.

The project supports development of flexible IRFPA manufacturing, capable of meeting tri-Service requirements. All Service and ARPA efforts are closely coordinated to assure that there is no duplication of effort.

H. (U) OTHER APPROPRIATION FUNDS: None.

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable.

J. (U) MILESTONE SCHEDULE:

Planned	Milestone
Jun 93	Complete fabrication of long-wavelength infrared focal plane arrays of various configurations ranging from 240x1 to 480x640.
Sep 93	Demonstrate feasibility of process module for infrared focal plane array manufacturing.
Aug 94	Demonstrate a x100 cost reduction in the manufacture of two-dimensional, staring IRFPAs.
Aug 94	Assemble scalable focal plane array facility.
Sep 95	Demonstrate process module concept for multi-purpose scanning arrays.
Sep 95	Demonstrate equipment with flexibility to produce various IRFPA configurations on the same line.
Sep 96	Demonstrate large-area staring and scanning array for search and track, target acquisition, and missile seeker systems.
Sep 96	Demonstrate high-yield IRFPA manufacturing facility capable of varying production rates from small lots to high throughput rates.

FY 1994 BUDGET ESTIMATES RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603739E
PE Title: Electronics Manufacturing Technology
Project Number: MT-04
Budget Activity: 2. Advanced Technology Development
Date: April 1993

A. (U) RESOURCES: ($ In Thousands)

Project Title: Electronic Module Technology

Popular Name	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	To Program
Electronic Module Technology	5,129	67,258	97,080	Continuing	Continuing

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: The Electronic Module Technology Project is a broad initiative to substantially decrease the cost while increasing the performance of weapon systems through the timely insertion of state-of-the-art electronic modules. Electronic module technology addresses the interconnection and physical packaging of various types of digital and analog integrated circuits, as well as other electronic, electrooptical, and micro-mechanical components. It includes traditional approaches such as printed circuit boards, emerging technologies such as high density multi-chip modules (MCMs), and revolutionary approaches such as "conformal electronics".

(U) The project has four major objectives: 1) shorten the overall design, manufacture, test, and insertion cycle for advanced electronic subsystems; 2) advance the state-of-the-art in electronic interconnection and physical packaging technology to allow circuits to operate close to their intrinsic maximum speed with less overhead in terms of volume, weight and cost; 3) provide a robust manufacturing infrastructure for electronic modules; and 4) demonstrate the system level payoff of electronic module technology through advanced technology demonstrators (ATDs) such as the Rapid Prototyping of Application Specific Signal Processor (RASSP).

(U) The RASSP program is a major DARPA/tri-Service initiative directed toward dramatic reduction in the "time to fielding" of advanced signal processing capability. The signal processors to be developed will be used in DoD systems such as those for automatic target acquisition, tracking and recognition, electronic countermeasures, communications and Signal Intelligence (SIGINT). This overall project is integral to the Department's Science and Technology Thrust initiative in Technology for Affordability.

FY 1994 BUDGET ESTIMATES RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603739E
PE Title: Electronics Manufacturing Technology
Project Number: MT-04
Budget Activity: 2. Advanced Technology Development
Date: April 1993

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1992 Accomplishments:
- (U) Initiated program to establish viable merchant infrastructure for Application Specific Electronic Modules (ASEMs).
- (U) Developed materials and processes for increased clock rate electronic multi-chip modules (MCMs).
- (U) Identified demonstration and insertion opportunities for advanced electronic modules.
- (U) Identified system applications for Rapid Prototyping of Application Specific Signal Processor (RASSP) program advanced technology demonstrator.

(U) FY 1993 Planned Program:
- (U) Develop a manufacturing line for MCMs capable of delivering a custom module in three months from the start date.
- (U) Demonstrate high yield production of 100-200 MHz MCMs.
- (U) Develop specifications for large area manufacturing equipment to support volume production of MCMs and flat panel displays.
- (U) Initiate efforts to integrate advanced optoelectronic devices into electronic modules.
- (U) Develop conformal printing and three-dimensional machine technologies for the manufacture of miniature electro-mechanical devices.
- (U) Commence work on RAASP including advanced computer aided design tools, extensions to hardware description languages, signal processor algorithm and architecture research, and manufacturing related efforts.

(U) FY 1994 Planned Program:
- (U) Demonstrate the ability to electronically transmit MCMs designs to multiple commercial foundries and receive completed modules in less than two months.
- (U) Develop a manufacturing pilot line capable of fabricating MCMs with 300 MHz performance and mixed digital technologies.
- (U) Demonstrate the technology to perform functional test of unpackaged die at their inherent speed of operation and

FY 1994 BUDGET ESTIMATES RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603739E
PE Title: Electronics Manufacturing Technology
Project Number: MT-04
Budget Activity: 2. Advanced Technology Development
Date: April 1993

also to demonstrate a built-in-self-test capability at the module level.

- (U) Insert high-performance MCMs with operating frequencies of 100-200 MHz in existing weapons systems.
- (U) Develop threshold sensors for wide-area, unattended surveillance applications in threat monitoring and border-control.
- (U) Continue research and development activities on signal processing architectures, methodologies, design environment development, process benchmarking and business planning. Demonstrate first advanced signal processing circuits developed using RASSP methodology. Demonstrate first versions of improved architecture strategies, algorithms, computer aided design tools and frameworks.
- (U) Establish capability to provide information, seminars, and applications assistance to promulgate RASSP capabilities.

(U) Program To Completion:

- (U) Demonstrate foundry capability for flexible production of modules with board-level integration.
- (U) Develop and demonstrate capabilities to remanufacture electronic modules from a choice of multiple technologies.
- (U) Demonstrate volume manufacturing of electronic modules for weapon system upgrades and insertions.
- (U) Demonstrate the capability to cost-effectively produce modules that integrate sensors, computional processors, memories, high-bandwidth communication circuits, signal processors, control circuits, and microactuators.
- (U) Extend the electronic module computer-integrated manufacturing system and process control architecture to encompass upstream and downstream technologies.
- (U) Complete and demonstrate comprehensive signal processing design environment.
- (U) Demonstrate advanced signal processor applications to several DoD systems clearly establishing advantages of RASSP approach for improving performance and reducing overall cost.

FY 1994 BUDGET ESTIMATES RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603739E
PE Title: Electronics Manufacturing Technology
Project Number: MT-04
Budget Activity: 2. Advanced Technology Development
Date: April 1993

- (U) Provide an established knowledge base of RASSP methodology and capabilities for continuing use.

D. (U) WORK PERFORMED BY: Major contractors include: The Mayo Foundation, Rochester MN; Massachusetts Institute of Technology, Cambridge, MA; E-Systems, Garland, TX; Texas Instruments, Dallas, TX; David Sarnoff Research Center, Princeton, NJ; Carnegie Mellon University, Pittsburgh, PA; and Westinghouse Corporation, Pittsburgh, PA. In-house work, including management and support of contractual efforts, will be performed by: Advanced Research Projects Agency (ARPA); Army Laboratory Command Electronics Technology and Devices Laboratory; Office of Naval Technology; and Department of the Air Force, Wright Laboratories.

E. (U) COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY: ARPA added programs in conformal electronics, microsensors and actuators, and application-specific signal processing in FY 1993 and 1994.

F. (U) PROGRAM DOCUMENTATION: Not applicable.

G. (U) RELATED ACTIVITIES: Effort is closely coordinated with ST-19, High Performance Computing and Communications (HPCC), MT-05, Tactical Display Systems, and IC-03, High Definition Systems (HDS) and programs that will provide vehicles for demonstrating the new technologies.

H. (U) OTHER APPROPRIATION FUNDS: None.

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable.

J. (U) MILESTONE SCHEDULE:

Plan	Milestone
Dec 93	High yield, 100-200 MHz MCM demonstrations.
Jun 93	Demonstrate manufacturability of microactuator.
Sep 93	System Insertion Plan for 100-200 MHz MCM.
Sep 93	Demonstrate manufacturability of conformal electronics packaging technology.
Mar 94	0.25-2 GHz MCM demonstrations.
Oct 95	Achieve MCM capability of non-recurring engineering time of 3-6 weeks and cost of $25,000.
Jul 96	Achieve Standard Electronic Module (SEM-E) Board capability.

FY 1994 BUDGET ESTIMATES RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603739E
PE Title: Electronics Manufacturing Technology
Project Number: MT-05
Budget Activity: 2. Advanced Technology Development
Date: April 1993

A. (U) RESOURCES: ($ In Thousands)

Project Title: Tactical Display Systems

Popular Name	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
Tactical Display Systems	0	10,078	9,467	Continuing	Continuing

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: This project is based upon the need to maintain our information technology superiority in the command and control battlefield infrastructure. Visual information provides a better understanding of tactical situations and aids in making critical decisions in time constrained environments. The demand for accurate and timely visual information will increase in the future and will be required at all levels in the command structure. The objective of this project is to provide visual information to troops who are remotely located from conventional visual information sources i.e., computer terminals, televisions, etc. This project focuses on the development and demonstration of miniature displays that can be mounted close to the eye and provide information in the form of text, graphics, and still or moving pictures. Intended users are fixed and rotary wing pilots, combat vehicle crews, and dismounted warriors. The initial effort supports an Army Combat Vehicle Crew Helmet.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1992 Accomplishments:
- (U) Initiated miniature display development.
- (U) Initiated project to integrate displays in a prototype helmet.

(U) FY 1993 Planned Program:
- (U) Complete development of 1280x1024 monochrome electroluminescent, and color liquid crystal miniature displays.
- (U) Continue Low Temperature Display Technology, including transient thermal processing, phosphors, and thin film IC's, and for system integration.

FY 1994 BUDGET ESTIMATES RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603739E
PE Title: Electronics Manufacturing Technology
Project Number: MT-05
Budget Activity: 2. Advanced Technology Development
Date: April 1993

- (U) Complete development of 640x512 color electroluminescent miniature display.
- (U) Initiate development of high efficiency backlight and color notch filters for liquid crystal displays.

(U) FY 1994 Planned Program:

- (U) Complete development of Army prototype Combat Vehicle Crew (CVC) helmet.
- (U) Initiate development of high resolution "eye-glass like" display devices and wide field of view displays.
- (U) Integrate voice input with helmet mounted displays.

(U) Program To Completion:

- (U) Complete prototype development of "eye-glass like" display devices.
- (U) Demonstrate wide field of view optical system.
- (U) Integrate head, hand, eye tracking devices into Army CVC helmet.
- (U) Demonstrate personal information presentation system.
- (U) Integrate personal information presentation system in operational warrior command and control system.

D. (U) WORK PERFORMED BY: The major performers are: Kopin Corporation, Taunton, MA; David Sarnoff Research Laboratory, Princeton, NJ; Planar Systems, Inc., Beaverton, OR; Standish Industries, Inc., Lake Mills, WI; Honeywell Inc., Phoenix, AZ; and Honeywell Inc., Bloomington, MN.

(U) Service support is provided by the U.S. Army Electronics Devices and Technology Laboratory, Ft. Monmouth, NJ; and the U.S. Army Natick Research, Development and Engineering Center, Natick, MA.

E. (U) COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY: Prior year funding for High Definition Systems is in PE 0602708E, Project IC-03.

F. (U) PROGRAM DOCUMENTATION: Not applicable.

G. (U) RELATED ACTIVITIES: Coordination is accomplished through the Joint Service Working Group on Head Mounted Displays with membership from ARPA, Army, Navy, Air Force and NASA. This project is coordinated with the following military programs: The Integrated Enhanced Soldier

FY 1994 BUDGET ESTIMATES RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603739E
PE Title: Electronics Manufacturing Technology
Project Number: MT-05
Budget Activity: 2. Advanced Technology Development
Date: April 1993

System (TIESS), Gen II Soldier, Soldier Integrated Protective Ensemble (SIPE), Advanced Integrated Man Portable System (AIMS), Advanced Pilotage Capabilities (APA), Covert Night/Day Operations in Rotorcraft (CONDOR), CONDOR Advanced Visionics System (CAVS).

H. (U) OTHER APPROPRIATION FUNDS: None.

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable.

J. (U) MILESTONE SCHEDULE:

Plan	Milestones
May 93	Deliver engineering samples of 1280x1024 monochrome electroluminescent display.
Jun 94	Deliver 1280x1024 monochrome electroluminescent display.
Jul 94	Deliver 640x512 color electroluminescent display and 1280x1024 color liquid crystal display.
Aug 94	Deliver Combat Vehicle Crew prototype helmet.
Jun 95	Demonstrate full color, high resolution helmet mounted displays in virtual environment application.

FY 1994 BUDGET ESTIMATES RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603739E
PE Title: Electronics Manufacturing Technology
Project Number: MT-07
Budget Activity: Advanced Technology Development
Date: April 1993

A. (U) RESOURCES: ($ in Thousands)

Project Number & Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
MT-07	Centers of Excellence (20,000)*	27,665	4,837	Continuing	Continuing

*FOCUS HOPE Program funded in OSD PE 63719D.

B. (U) BRIEF DESCRIPTION OF PROJECT: This project provides funding for three Technology Centers of Excellence: The National Center for Coal Utilization at Pennsylvania State University; Robert C. Byrd Institute for Advanced Manufacturing at Marshall University; and the Focus: Hope Center for Advanced Technologies in Detroit, Michigan. The purpose of these Centers is to demonstrate, deploy and provide advanced manufacturing technology to significantly reduce unit production and life cycle costs, improve product quality, and deploy manufacturing training systems.

(U) The National Center of Excellence for Coal Utilization is a consortium whose purpose is to expand the use of anthracite and bituminous coals.

(U) The Institute for Advanced Flexible Manufacturing Systems provides both a teaching factory and initiatives to local area industries to utilize computer-integrated manufacturing technologies and managerial techniques to improve productivity and competitiveness.

(U) The Center for Advanced Technology is a component of the Focus: Hope Project whose purpose is to train technicians/engineers in advanced manufacturing processes and methods, demonstrate state-of-the-art flexible manufacturing and serve as a testbed for emerging manufacturing research. The three program elements include: development of world-class manufacturing training/education to expand on current programs; development of a world-class flexible computer integrated manufacturing facility supporting education under full-scale production conditions; and development of an aggressive technology outreach program, serving to demonstrate the results of manufacturing research and integration technologies under production conditions, and to serve as a technology transfer activity.

FY 1994 BUDGET ESTIMATES RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603739E
PE Title: Electronics Manufacturing Technology

Project Number: MT-07
Budget Activity: Advanced Technology Development
Date: April 1993

(U) The FY 1994 program provides continued support for the Center for Advanced Technology. These funds will be used to acquire computer integrated manufacturing systems including computers, software, scheduling systems, and statistical process control software.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1992 Accomplishments:

- (U) Completed the installation of three flexible manufacturing neighborhoods including 78 machine tools at the National Center for Advanced Technologies at Focus Hope.
- (U) Completed specification for computer integrated manufacturing system including networked access of advanced computer aided instruction materials, work flow management, statistical process control, computer aided design, and computer aided manufacturing software tools at Focus Hope.

(U) FY 1993 Planned Program:

- (U) Complete staffing of engineering management and dean of education at National Center for Advanced Technology (NCAT).
- (U) Demonstrate full art-to-part capability of automotive parts manufacture.
- (U) Provide manufacturing process support to a regional manufacturer from the Robert C. Byrd Institute for Advanced Technology.
- (U) Complete curriculum development for hands-on production center manufacturing systems training supporting certificate, associates, bachelors and masters degrees.
- (U) Develop further reductions in gaseous and particulate emission when firing coal-based fuels in industrial-scale boilers.
- (U) Prepare and characterize fuels compatible with coal pre-combustors.
- (U) Investigate pre-combustion as a means of using high ash and sulfur coals.

(U) FY 1994 Planned Program:

- (U) Develop contracts, determine manufacturing requirements, purchase and install manufacturing equipment and enter production for the 4th and 5th of eleven planned

FY 1994 BUDGET ESTIMATES RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603739E
PE Title: Electronics Manufacturing Technology
Project Number: MT-07
Budget Activity: Advanced Technology Development
Date: April 1993

manufacturing neighborhoods at NCAT increasing overall defense production rates to 10,000 parts per month.

D. (U) WORK PERFORMED BY: PROJECT: FOCUS HOPE, Detroit, MI; Center of Excellence and Coal Utilization, University Park, PA; and Marshall University, Huntington, WV.

E. (U) RELATED ACTIVITIES: This program augments the Director of Defense Research and Engineering S&T "Thrust 7" technology for affordability. Capabilities that will be deployed to centers of excellence include technologies developed under project #MT-08, Manufacturing Technology Initiatives.

F. (U) OTHER APPROPRIATION FUNDS: None.

G. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable.

FY 1994 BUDGET ESTIMATES RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603739E
PE Title: Electronics Manufacturing Technology
Project Number: MT-08
Budget Activity: 2. Advanced Technology Development
Date: April 1993

A. (U) RESOURCES: ($ In Thousands)

Project Title: Manufacturing Technology Initiatives

Popular Name	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
Manufacturing Technology Initiatives	0	0	19,146	Continuing	Continuing

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: This program's focus is on process technology demonstrations, providing prototype factories as well as prototype products. Included are the initiation of two Advanced Technology Demonstrations (ATDs) and additional technology base demonstrations of affordable manufacturing processes for composite materials and a prototype networked manufacturing systems infrastructure. The composites manufacturing demonstrations will focus on improving productivity in fabrication of polymer matrix composite structures and assemblies. The networked infrastructure will link computer aided design and manufacturing systems, and will reduce the overhead burden of translators among dissimilar systems.

(U) The two ATDs are Active Electronically Scanned Arrays (AESA), and Flexible Design and Assembly of Missile and Munition Seekers (FDAMMS). AESA will put into place the advanced design and manufacturing capabilities needed to implement enhanced high-rate transmit-receive (T/R) module production and will address the assembly of T/R modules into affordable arrays for radar (military and civilian), electronic warfare and missile applications. FDAMMS will develop and integrate automated design-for-assembly tools, process planning and control systems, advanced factory simulations, and flexible high precision assembly and checkout systems to control the cost of complex electro-mechanical products such as missile and munition seeker assemblies.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1992 Program:
- (U) None. (FY 1994 start)

(U) FY 1993 Planned Program:
- (U) None. (FY 1994 start)

FY 1994 BUDGET ESTIMATES RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603739E
PE Title: Electronics Manufacturing Technology
Project Number: MT-08
Budget Activity: 2. Advanced Technology Development
Date: April 1993

(U) FY 1994 Planned Program:

- (U) Issue solicitations and make competitive awards for AESA, FDAMMS, manufacturing systems infrastructure prototypes and affordable composites manufacturing
- (U) Initiate program aimed at lowering the cost of polymer matrix composites via improved manufacturing processes.
- (U) Begin development of advanced computer aided design (CAD) tools and enhancements of existing tools for active electronically scanned arrays, missile and munition seekers, and their components.
- (U) Begin development of feature based solid models and object oriented process modeling tools for electronic assemblies (e.g. T/R modules and arrays) and mechanical assemblies (e.g. gimballed seeker mechanisms).
- (U) Begin development of "flexible factory" simulation and control systems for high volume production of T/R modules and low volume production of seeker assemblies and other electro-mechanical systems.
- (U) Begin AESA development of low cost fabrication and assembly approaches for T/R modules that make use of advanced technologies such as photonic interconnects.
- (U) Begin FDAMMS development of design for assembly tools, flexible manufacturing and assembly processes and equipment, and supporting information infrastructure components.

(U) Program to Completion:

- (U) The program will be completed in FY 1998.
- (U) A prototype flexible factory for fabricating and assembling arrays of required quantities of T/R modules at the lowest possible cost for a wide variety of DoD applications will be fully operational.
- (U) A prototype flexible factory for designing and assembling complex electro-mechanical assemblies will be operational, with demonstrated improvements in the cost, leadtime and quality of missile and munition seeker assemblies.
- (U) The resulting software tools, processes, networked infrastructure and intelligent control systems will be available for application to a wide range of products for both military and civilian applications.

FY 1994 BUDGET ESTIMATES RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603739E
PE Title: Electronics Manufacturing Technology
Project Number: MT-08
Budget Activity: 2. Advanced Technology Development
Date: April 1993

D. (U) WORK PERFORMED BY: In-house work will be performed by U.S. Air Force Wright Laboratory; Naval Air Systems Command; U.S. Naval Research Laboratory; U.S. Army Missile Command; U.S. Army Research Laboratory; and National Institute of Standards and Technology.

E. (U) COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY: Not applicable.

F. (U) PROGRAM DOCUMENTATION: None.

G. (U) RELATED ACTIVITIES: These programs complement ongoing S&T Thrust 7 ATDs in Rapid Prototyping of Application Specific Signal Processors (RASSP), and Infrared Focal Plane Array Flexible Manufacturing (IRFPA-FM). Closely related AESA-precursor work is being undertaken under the ARPA sponsored High Density Microwave Packaging for Next Generation Phased Array Radar Program. These programs are also under program element 0603739E, and are coordinated by the DoD S&T Thrust 7 Technical Planning Team.

H. (U) OTHER APPROPRIATION FUNDS: None.

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable.

J. (U) MILESTONE SCHEDULE:

Plan	Milestones
Jun 94	Award contracts for computer aided design developments, modeling, fabrication and assembly of advanced T/R modules and missile seekers.
Jun 95	Initial demonstrations and benchmarking of integrated product/process development approach for T/R modules, seeker components and higher level assemblies.
Jun 96	Complete development and alpha test of advanced CAD tools, process planners and simulation models.
Jun 97	Complete flexible factory systems for AESA and FDAMMS. Demonstrate capabilities to meet cost, cycle time and quantity requirements.
Sep 98	Deliver final versions of software and manufacturing equipment and processes, and transfer technology for both military and commercial use.

FY 1994 BUDGET ESTIMATES RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603739E
PE Title: Electronics Manufacturing Technology
Project Number: MT-10
Budget Activity: 2. Advanced Technology Development
Date: April 1993

A. (U) RESOURCES: ($ In Thousands)

Project Title: Advanced Lithography

Popular Name	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
Advanced Lithography	76,000*	71,293*	47,457	Continuing	Continuing

*Funded under PE 0602712E in FY 1993 and prior years

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: Lithography technology has enabled the dramatic growth of integrated circuit (IC) capability over the past two decades. Advances in lithography lead directly to improvements in electronic and computing systems performance in terms of speed, power, weight and reliability. Advanced microelectronics technology is essential for computing, data and signal processing, communications for both civilian and military needs. Specific defense applications include smart weapons, radar, electronic warfare, sensing, communications, command and control, and surveillance. Further improvements in areas such as target recognition, autonomous guided missiles and beam forming for sonar and radar will require microcircuits with smaller features in order to meet the power, weight and volume constraints of these systems.

(U) Current microelectronics manufacturing utilizes 0.5 micron minimum feature sizes. This effort develops subsystems and systems to establish manufacturing capability at 0.18 - 0.1 microns for late 1990s manufacturing. Because the optimal cost-effective lithography approach for these future generations of technology are not known today, this effort balances investment in competing approaches with a strong emphasis on the common crosscutting techniques that will be required. Key developments include mask technology (electron-beam tools for pattern writing, mask fabrication demonstration, mask repair tools, and membranes), improved alignment and overlay techniques, metrology, systems development and integration utilizing various radiation sources (x-ray, electron-beam, ion-beam, and optics), and device demonstrations to establish viability of the developed sytems.

FY 1994 BUDGET ESTIMATES RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603739E
PE Title: Electronics Manufacturing Technology

Project Number: MT-10
Budget Activity: 2. Advanced Technology Development

Date: April 1993

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1992 Accomplishments:

- (U) Installed the first x-ray point source lithography tool in an industrial lab for evaluation.
- (U) Demonstrated 0.2 micron pattern definition with x-ray point source.
- (U) Fabricated 512K static random access memory (SRAM) chips with x-ray 0.35 micron lithography.
- (U) Demonstrated a new plasma focus head which generates 12 joules of x-rays per pulse.
- (U) Completed mask repair tool for 0.50 micron design rules.
- (U) Demonstrated through modeling and experimental work that proximity x-ray lithography may extend to 0.1 micron features with a mask-wafer gap of > 10 microns.

(U) FY 1993 Planned Program:

- (U) Use x-ray lithography to fabricate 512K SRAM chips with 0.25 micron gate lengths.
- (U) Evaluate diode pumping for the laser plasma x-ray source.
- (U) Develop a multi-shot power supply for the focus plasma x-ray source.
- (U) Complete mask repair tool for masks with 0.25 micron features.
- (U) Release a standard configuration for x-ray masks.
- (U) Initiate efforts in ion-beam and e-beam lithographies, directed at prototype systems for 0.18 micron features.

(U) FY 1994 Planned Program:

- (U) Characterize 193 nm optical lithography tool for IC fabrication with 0.25 micron features.
- (U) Evaluate optics design for ion-beam lithography tool.
- (U) Demonstrate mask writer for 0.25 micron features.
- (U) Deliver masks (both x-ray and phase shift) for 0.35 micron features.
- (U) Demonstrate first diode laser pumped point source x-ray stepper capable of .35 micron design rules.

FY 1994 BUDGET ESTIMATES RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603739E
PE Title: Electronics Manufacturing Technology
Project Number: MT-10
Budget Activity: 2. Advanced Technology Development
Date: April 1993

(U) Program To Completion:

- (U) Demonstrate a "nanowriter" e-beam tool for writing zone plates with sub-50-nm features.
- (U) Demonstrate prototype projection e-beam lithography.
- (U) Demonstrate repair tool for repair of masks with 0.15 micron features.
- (U) Demonstrate aligner for x-ray lithography for 0.25 micron features.
- (U) Demonstrate stage control for lithography tools with 0.12 micron capability.
- (U) Fabricate devices using soft x-ray reduction techniques.

D. (U) WORK PERFORMED BY: IBM, Essex Junction, VT; Lawrence Berkeley, Berkeley, CA; ETEC, Hayward, CA; University of Wisconsin, Madison, WI; Hampshire, Rochester, NY; ALG, Rockville, MD; Lockheed-Sanders, Nashua, NH; AT&T, Murray Hill, NJ.

E. (U) COMPARISON FY 1993 DESCRIPTIVE SUMMARY: Not applicable.

F. (U) PROGRAM DOCUMENTATION: Not applicable.

G. (U) RELATED ACTIVITIES: Not applicable.

H. (U) OTHER APPROPRIATION FUNDS: None.

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable.

J. (U) MILESTONE SCHEDULE:

Plan	Milestones
Jun 94	Characterize 193 nm optical lithography tool.
Aug 94	Deliver masks from the Microlithographic Mask Development Program.
Sep 94	Demonstrate diode-pumped, laser plasma source x-ray tool.
Mar 95	Demonstrate a "nanowriter" e-beam tool for writing features at 50 nm.
Jun 95	Demonstrate mask repair tool for masks with 0.15 micron features.

FY 1994 BUDGET ESTIMATES RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603744E
PE Title: Advanced Simulation
Budget Activity: 2. Advanced Technology Development
Date: April 1993

A. (U) RESOURCES: ($ in Thousands)

Project Number & Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
SM-01	ARPA/ARNG Advanced Distributed Simulation				
	0	28,522	9,207	Continuing	Continuing

B. (U) BRIEF DESCRIPTION OF ELEMENT: In FY 1992, Congress appropriated funds to the Office of the Secretary of Defense for advanced technology training of National Guard roundout brigades. Based on a recommendation from the Defense Science Board, the Director, Defense Research and Engineering made this effort an Advanced Technology Demonstration in his Science and Technology Thrust 6, Synthetic Environments.

(U) The goal of this program is to achieve a 200-300 percent increase in National Guard training effectiveness through the use of advanced distributed information technologies and innovative training strategies. The intent is to develop and integrate affordable technologies that enable National Guard soldiers to conduct sophisticated training either at the local community armory, or at the soldier's home. The program will capitalize on existing commercial technologies, when possible, and develop advanced technologies with potential dual use, otherwise.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1992 Accomplishments:
- (U) Initiated studies to identify candidate applications and to assess the networking of dissimilar devices.
- (U) Conducted technology assessment studies which identified appropriate technologies.
- (U) Conducted informational and decision briefings to Senior DoD and Service Officials.
- (U) Established Senior Advisory Group.

(U) FY 1993 Planned Program:
- (U) Modify mobile Army Reserve National Guard Simulation Networks (SIMNETs).
- (U) Establish a National Guard Simulation Training Site at Fort Knox, Kentucky.
- (U) Develop an affordable table top staff synchronization trainer.

FY 1994 BUDGET ESTIMATES RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603744E
PE Title: Advanced Simulation

Budget Activity: 2. Advanced Technology Development
Date: April 1993

- (U) Initiate development of a reconfigurable ground simulator.
- (U) Develop strategies for distributed training.

(U) FY 1994 Planned Program:

- (U) Continue development of the reconfigurable ground simulator and desk top synchronization trainer.
- (U) Continue development and trial of experimental training programs.
- (U) Continue the development of individual learning technologies and networks (e.g., artificial intelligence tools, virtual reality applications, and authoring tools).
- (U) Establish an instrumented force-on-force test facility in each experimental brigade area.
- (U) Continue program assessment and applications research.

D. (U) WORK PERFORMED BY: Bolt, Baranek, and Newman, Cambridge, MA; Texas Instruments, Houston, TX; DEC Computers, Boston, MA; Silicon Graphics Inc., Sunnyvale, CA; SUN Computers, CA; BDM Corp, Monterey, CA/Fort Knox, KY/Fort Benning, GA/Des Moines, IA; SYSCO, Vienna, VA; and Northwestern University, Chicago, IL. Government developers include the Army Research Institute Field Units in CA, GA, ID, and KY; Naval Postgraduate School, Monterey, CA; and the Institute for Defense Analyses, Alexandria, VA.

E. (U) RELATED ACTIVITIES: Related work is closely coordinated with the Defense Modeling and Simulation Office to ensure that unnecessary duplication does not occur.

- (U) Army: PE 0604715A, Non-Systems Training Devices.
- (U) ARPA: PE 0603226E, Experimental Evaluation of Major Innovative Technologies.

F. (U) OTHER APPROPRIATION FUNDS: None.

G. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable.

FY 1994 BUDGET ESTIMATES RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603745E
PE Title: Microelectronics Manufacturing Technology
Project Number: EM-01
Budget Activity: 2. Advanced Technology Development
Date: April 1993

A. (U) RESOURCES: ($ in Thousands)

Project Title: Microelectronics Manufacturing Technology

Popular Name	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
SEMATECH	98,000*	94,845	100,000	Continuing	Continuing

*Funded under PE0603739E in FY 92 and prior years.

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: The cost-effective capability to manufacture differentiated integrated circuits (ICs) -- i.e., logic, application-specific ICs, microprocessors -- at the state of the art and in any volume with rapid turnaround is vital to the creation of leading-edge information systems. In FY 1993 and beyond, this project is focused on the manufacturing tools and methodologies needed for low-cost, flexible, scalable manufacturing to meet defense and commercial needs. Today's microelectronics manufacturing technology is optimized to produce a single part type in large volumes. This project will combine advances in physical equipment (modular cluster tools with real-time model-based process control, ultraclean infrastructure, and cost-effective lithography) with software advances (fully integrated computer-integrated manufacturing (CIM) systems and modeling and simulation tools for designing processes, tools, and factories) to enable state-of-the-art microelectronics manufacturing facilities capable of producing many part types in any volume at low cost.

(U) The project builds on the prior SEMATECH effort funded in this project as well as the development efforts in the Microelectronics Manufacturing Science and Technology (MMST) contract in PE 0602712E. SEMATECH comprises the companies that supply the majority of the ICs used in defense systems, and it has a proven track record of working with equipment suppliers effectively. Therefore, SEMATECH will be the primary performer, with continued cost sharing from its member companies. In addition, a small portion of the funds in this project will support related longer-term efforts outside of SEMATECH that enhance the overall goal of achieving flexible, scalable semiconductor manufacturing.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1992 Accomplishments:
- (U) Completed transfer of 0.5 micron technology to SEMATECH member companies.
- (U) Demonstrated 0.35 micron unit processes.

FY 1994 BUDGET ESTIMATES RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603745E
PE Title: Microelectronics Manufacturing Technology
Project Number: EM-01
Budget Activity: 2. Advanced Technology Development
Date: April 1993

- (U) Initiated technology development for 0.25 micron unit manufacturing processes.
- (U) Upgraded SEMATECH fab with tools capable of handling and processing 200 mm diameter wafers.
- (U) Initiated development of an advanced factory control system based on MMST-developed technologies.

(U) FY 1993 Planned Program:

- (U) Initiate projects to produce equipment, materials and factory control systems that will enable the manufacture of high-quality 0.25 and 0.18 micron semiconductor devices in low-cost flexible facilities.
- (U) Establish new technical thrusts in computer modeling and contamination-free manufacturing.
- (U) Expand development of pollution-preventing, environmentally safe manufacturing processes.

(U) FY 1994 Planned Program:

- (U) Develop operations models of plasma etch and lithography cell.
- (U) Develop specifications for key production-grade manufacturing equipment for the 0.18 micron generation.
- (U) Develop in-process sensors for plasma, implant, rapid-thermal and lithographic processes.
- (U) Demonstrate mechanical and electrical interface standards for micro- and mini-environments.
- (U) Demonstrate standard equipment control platform including sensor bus and model-based control algorithms.

(U) Program to Completion:

- (U) Complete factory specifications for a 0.18 micron factory, including equipment, facilities and methods.
- (U) Complete the material optimization for low-contaminant robust manufacturing process chambers.
- (U) Optimize micro- and mini-environments for contamination-free manufacturing.
- (U) Demonstrate open factory integration platform for wafer fab, assembly, and test.
- (U) Demonstrate fully automated production, including closed-loop process control.

D. (U) WORK PERFORMED BY: The primary performer is the SEMATECH consortium in Austin, TX.

E. (U) COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY: Consistent with the FY 1993 Descriptive Summaries.

FY 1994 BUDGET ESTIMATES RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603745E
PE Title: Microelectronics Manufacturing Technology

Project Number: EM-01
Budget Activity: 2. Advanced Technology Development
Date: April 1993

F. (U) PROGRAM DOCUMENTATION: Not applicable.

G. (U) RELATED ACTIVITIES: Not applicable.

H. (U) OTHER APPROPRIATION FUNDS: None.

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable.

J. (U) MILESTONE SCHEDULE:

Plan	Milestone
Mar 94	Complete gas monitoring strategy for environmentally safe semiconductor manufacturing.
Dec 94	Develop and transfer unit processes and generic manufacturing methods for integration into production facilities for 0.25µm features.
Dec 94	Demonstrate operation of a distributed manufacturing system enabling incremental refinement and supporting tighter process control.
Dec 95	Develop software tools that reduce overall development cycles through application of modeling and simulation prior to hardware design and development.
Dec 95	Demonstrate the operation of key elements of a fully integrated advance manufacturing system enabling maximum flexibility and rapid response to process modifications.
Dec 96	Develop and transfer unit processes and generic manufacturing methods for integration into production facilities for 0.18 features.

FY 1994 BUDGET ESTIMATES RDT&E DESCRIPTIVE SUMMARY

Program Element: #0605898E
PE Title: Management Headquarters (R&D)
Budget Activity: 6. Defensewide Mission Support
Date: April 1993

A. (U) RESOURCES: ($ in Thousands)

Project Number & Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
MH-01	Management Headquarters				
	19,644	22,150	24,005	Continuing	Continuing

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program element provides funding for the administrative support costs of the Advanced Research Projects Agency (ARPA). This funding provides for the personnel compensation and benefits for civilians as well as costs for building rent, physical and information security, travel, supplies and equipment, communications, printing and reproduction. In addition, funds are included for reimbursing the Military Services for administrative support costs associated with contracts undertaken on the Agency's behalf.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1992 Accomplishments:

- (U) Funding under this program element in FY 1992 supported management and administration for the RDT&E program assigned to ARPA. The majority of the funds were required for the pay of personnel who operate the Agency. At the end of the year, additional end strength was transferred to ARPA.

(U) FY 1993 Planned Program:

- (U) ARPA will continue the basic management and administrative support efforts for headquarters at approximately the same level as FY 1992. End strength authorization has been increased over FY 1992 to support additional research efforts and the Defense Reinvestment initiative assigned to ARPA.

FY 1994 BUDGET ESTIMATES RDT&E DESCRIPTIVE SUMMARY

Program Element: #0605898E
PE Title: Management Headquarters (R&D)
Budget Activity: 6. Defensewide Mission Support
Date: April 1993

(U) FY 1994 Planned Program:

- (U) ARPA will continue the management and administrative support efforts for headquarters at approximately the same level as FY 1993. The increased funding reflects annualization of the additional end strength provided in FY 1993.

D. (U) WORK PERFORMED BY: Civilian and military personnel assigned to ARPA and by ARPA agent personnel operating within the Military Services.

E. (U) RELATED ACTIVITIES: Not applicable.

F. (U) OTHER APPROPRIATION FUNDS: None.

G. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable.

FY 1994 BUDGET ESTIMATES RDT&E DESCRIPTIVE SUMMARY

Program Element: #0901600E
PE Title: Contract Administration/Audit

Budget Activity: 6. Defensewide Mission Support
Date: April 1993

A. (U) RESOURCES: ($ in Thousands)

Project Number & Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
AA-01	Contract Administration/Audit				
	-	-	27,873	Continuing	Continuing

B. (U) BRIEF DESCRIPTION OF ELEMENT: The FY 1994 budget reflects the portion of the Department's estimate for contract audit and management services that will be incurred as a result of contract awards made in this appropriation. These funds will be used to finance Defense Contract Audit Agency (DCAA) and Defense Contract Management Command (DCMC) services that are performed in support of programs budgeted in this appropriation. This Program Element contains the contract audit/management funds associated with ARPA contracts awarded after FY 1993. Prior contracts will be funded from the FY 1994 O&M Defensewide appropriations.

(U) This represents a change from the budget presentation last year and reflects a Congressional and Departmental initiative to move toward mission budgeting which calls for an improved method of budgeting and justifying resources. The visibility of total costs related to contract awards and administrative requirements is improved in this presentation because support service funding for related contracts is included in this appropriation.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1992 Accomplishments: None.

(U) FY 1993 Planned Program: None.

(U) FY 1994 Planned Program:

- (U) DoD full funding policy for general contract administration support and contract audit management efforts associated with ARPA contracts begins in FY 1994.

D. (U) WORK PERFORMED BY: Defense Contract Management Command and the Defense Contract Audit Agency.

FY 1994 BUDGET ESTIMATES RDT&E DESCRIPTIVE SUMMARY

Program Element: #0901600E
PE Title: Contract Administration/Audit

Budget Activity: 6. Defensewide Mission Support
Date: April 1993

E. (U) RELATED ACTIVITIES: This has been implemented DoD wide.

F. (U) OTHER APPROPRIATION FUNDS: All O&M/investment accounts.

G. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable.

UNCLASSIFIED

FY 1994 BUDGET ESTIMATES

DESCRIPTIVE SUMMARIES

DEFENSE NUCLEAR AGENCY

APRIL 1993

UNCLASSIFIED

Program Element: #0602109H
PE Title: Superconductive Magnetic Energy Storage
Budget Activity: Technology Base
Date: April 1993

A. RESOURCES: ($ in Thousands)

Project Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
Superconductive Magnetic Energy Storage (SMES)	40,000	20,000	- 0 -

B. BRIEF DESCRIPTION OF ELEMENT: SMES is a research and engineering effort to develop technology for storing electrical energy in superconducting coils. Superconducting materials have no electrical resistance when they are cooled to cryogenic temperatures. Consequently, electrical currents in the superconducting coils and their induced magnetic fields persist as long as the coils maintain their electrical integrity and superconducting properties. Electrical energy is stored in the magnetic field surrounding the coil and is available to satisfy large, instantaneous power requirements for military applications such as advanced directed and kinetic energy weapons as well as for commercial applications such as utility load-leveling. If approved by Congress, the development effort will culminate in the construction of a SMES 20 megawatt-hour (MWh) Engineering Test Model (ETM) to demonstrate the feasibility of a full-scale (5000 MWh) SMES facility. DNA is supported by the Department of Energy (DOE) in the management of the Congressionally-mandated SMES program.

C. JUSTIFICATION FOR PROJECT:

FY 1992 Accomplishments:
- Initiated 18 month program to identify and reduce cost, schedule, and technical risks.
- Initiated 12 month program to complete the Environmental Impact Statement (EIS).
- Initiated military and civilian application surveys.

FY 1993 Plans:
- Complete Environmental Impact Statement.
- Complete Applications Surveys.
- Complete risk reduction activities.
- Issue RFP for SMES ETM.

Work Performed By: Bechtel National Incorporated, San Francisco, CA; Ebasco Services Incorporated, New York, NY; Mobile District, U.S. Army Corps of Engineers, Mobile, AL; U.S. Department of Energy, Washington, D.C.

Related Activities: The U.S. Navy is exploring uses of SMES systems less than 1 MWh, and the U.S. Air Force is exploring uses of SMES systems less than 1/10 MWh. DOE is exploring uses of SMES systems less than 1 MWh and incorporating advanced technologies. There is no duplication.

Other Appropriation Funds: None.

International Cooperative Agreements: None.

Program Element: #0602715H
PE Title: Defense Nuclear Agency
Budget Activity: Technology Base
Date: April 1993

A. RESOURCES ($ in Thousands)

Project Number & Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	Total Program
AA Underground Test	113,164	67,732	57,579	Continuing
AB Test & Simulation Technology	37,827	62,177	68,030	Continuing
AC Weapon Systems Lethality	57,994	66,961	41,226	Continuing
AD Biomedical/Lifesciences	17,169	17,142	-0-	Transferred
AE Weapon Safety & Operational Support	24,330	40,492	33,029	Continuing
AF Weapon Systems Operability	85,170	70,773	64,377	Continuing
AG Scientific Computations & Information Systems	21,992	41,345	22,496	Continuing
AH Counter Proliferation Technical Support	- 0 -	100	2,951	Continuing
AY Bioenvironmental Hazards Research	- 0 -	3,000	- 0 -	
AZ Los Alamos National Lab, Meson Physics Facility	- 0 -	15,000	- 0 -	
Total	357,646	384,722	289,688	

B. BRIEF DESCRIPTION OF ELEMENT: This program develops the technology base for operability and effectiveness of U.S. defensive and offensive systems and forces, plus the associated command, control, communications, and intelligence (C3I) assets. With the end of the cold war, a nuclear engagement between superpowers is increasingly unlikely; more likely is a regional conflict involving one or more adversaries that possess nuclear, biological or chemical (NBC) weapons. Deterring the proliferation of NBC weapons by rogue nations is paramount; but, should deterrence fail, the U.S. must possess forces to respond to a proliferator's use or threatened use of NBC weapons. It is also imperative to preserve survivable, effective forces as a hedge against a resurgent of the Former Soviet Union or any other nation aspiring to nuclear superpower status.

This new world order places a premium on defensive systems that can survive and operate without interruption in a nuclear environment. Especially critical are space-based sensor and communication platforms. It also requires that the U.S. possess a set of discriminate conventional and nuclear weapons to effectively attack an aggressor's most precious assets with minimal collateral effects, even if those assets are protected in hardened underground structures.

To meet stated objectives, DNA is restructuring its work to eliminate activities based solely on cold war threats, and to meet the challenges of regional conflict contingencies. Specifically, the development of more capable above-ground radiation simulators will be accelerated; one additional underground test is planned in FY 1995 to validate correlations between simulated and underground test environments and to verify reliability and operability of critical space-based C3I systems; new activities are planned to support DoD counter proliferation responsibilities and U.S. nuclear weapon safety and security are receiving added emphasis. Efforts encompass:

- Development and operation of simulators (radiation, blast, thermal, radio propagation and optical background effects) to evaluate nuclear weapon effects on military systems.
- Development of theoretical and experimental techniques for predicting the prompt and enduring environments created by endo- and exo-atmospheric explosions and the response of military systems operating in these environments.

- Development of hardness design methodologies and hardness assessment tools to support the acquisition of survivable weapon systems.
- Development and validation of a design and testing methodology to underwrite the survivability of defensive and offensive systems with minimal reliance on underground testing.
- Evaluation of weapons effectiveness against hardened underground facilities associated with the proliferation of weapons of mass destruction throughout the world.
- Utilization of weapons effects information to support development of adaptive targeting methodologies.
- Conduct of quantitative safety assessments of stockpiled nuclear weapons systems and development and maintenance of nuclear weapons system safety data bases.
- Technical activities to underwrite DoD counter proliferation programs.

Program Element: #0602715H
PE Title: Defense Nuclear Agency
Project Number: AA
Budget Activity: Technology Base

A. RESOURCES ($ in Thousands)

Project Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
Underground Test	113,164	67,732	57,579

B. BRIEF DESCRIPTION OF PROJECT: The Defense Nuclear Agency will conduct one underground nuclear effects test in FY 1995. The 1995 test will be designed to allow reuse of the testbed at a significantly lower cost and to place the program in standby status after either one or two tests. This will maintain the capability to resume underground nuclear effects testing in the future and comply with environmental safety and health standards. The primary purpose of the FY 1995 test is to develop a correlation between results obtained from underground nuclear effects tests and those from aboveground nuclear effects simulation testing. This correlation is imperative because the U.S. may become totally dependent on simulators to address the operability and reliability of its military systems in a nuclear environment. In addition, the scheduled test will meet DNA customers' highest priority reliability test requirements. These requirements encompass: (1) reliability testing of strategic missile reentry systems that will remain in the U.S. inventory after START reductions; (2) survivable communication, navigation, sensor seekers, and intelligence systems necessary for national security; and (3) the nuclear effects qualification of new nuclear weapon safety and security features prior to their incorporation into the U.S. nuclear weapon inventory.

C. PROGRAM ACCOMPLISHMENT AND PLANS:

FY 1992 Accomplishments:
- Conducted an underground nuclear cavity test to better understand nuclear air blast over real surfaces and assess lethality criteria for hardened underground facilities.
- Conducted a full system level radiation test to evaluate the reliability of space systems (optics, seeker/sensors, focal plane arrays, and components of advanced defense and offense systems).
- Began program to exploit state-of-the-art fiber optic technologies to improve data acquisition capabilities.

FY 1993 Plans:
- Continue underground testbed design, fabrication and construction for radiation tests scheduled for 1995 (MIGHTY UNCLE) and plan for a possible future test.
- Close all but one tunnel complex.
- Conduct environmental cleanup in the tunnel complexes to be closed.

FY 1994 Plans:
- Continue underground testbed design, fabrication and construction for radiation tests scheduled for 1995 (MIGHTY UNCLE) and plan for a possible future test.
- Continue environmental cleanup in the closed tunnel complexes and surrounding area.

Work Performed By: Lockheed Missile & Space Corporation, Sunnyvale, CA and Huntsville, AL; Science Applications International, Inc., San Diego, CA; EG&G Energy Measurements, Inc., Las Vegas, NV; S-Cubed, La Jolla, CA; Department of Energy, Nevada Operations Office, Las Vegas, NV; Lawrence Livermore National Laboratory, Livermore, CA and Los Alamos National Laboratory, Los Alamos, NM.

Related Activities: This project is conducted in coordination with the Director of Test and Evaluation, Chairman, Joint Chief of Staff, STRATCOM, Military Departments, Strategic Defense Initiative Organization, and Commanders in Chief of Unified and Specified Commands to satisfy system and operational requirements. There is no duplication.

Other Appropriation Funds: None.

International Cooperative Agreements: Joint Working Group 26.

Program Element: #0602715H
PE Title: Defense Nuclear Agency
Project Number: AB
Budget Activity: Technology Base

A. RESOURCES ($ in Thousands)

Project Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
Test & Simulation Technology	37,827	62,177	68,030

B. BRIEF DESCRIPTION OF PROJECT: This project provides the non-nuclear simulation test facilities and technologies that are used by the Services to evaluate the performance and operability of DoD systems across the spectrum of nuclear environments. Aboveground simulation facilities support DoD test requirements for high explosive (HE), radiation, blast/thermal, communications link and optical background effects. This project funds the operations, maintenance and upgrades of the aboveground nuclear weapons effects radiation simulators for x-ray, gamma ray, and electromagnetic pulse effects; the DNA Tri-Service Thermal Radiation Test facility; and the future Large Blast Thermal Simulator (LBTS). The project also includes the development of the simulation technologies that are needed to reduce future reliance on underground testing. In recognition of the need for an aggressive program in this area, this project has been enhanced to allow for acceleration of the development of non-nuclear simulators with the goal of satisfying most of the projected nuclear effects test requirements by the year 2002. This strategy requires the development of "testable hardware," funded under Project AF, which complies with constrained hardening design procedures that allow verification via aboveground simulators. This project will develop the requisite hardware testing protocols.

This project includes the continued development of (1) the DECADE x-ray simulator, which will be operational by FY 1996 and will satisfy most requirements for electronics testing with hard x-rays; (2) radio propagation effects simulators, and (3) infrared and optical scene generators. This project also supports the initiation of a joint program with the Department of Energy, Sandia National Laboratories, to develop JUPITER, an advanced soft x-ray simulator that will satisfy most of the projected nuclear underground testing requirements for materials, optics and structures. The project also includes the development of the innovative enabling technologies in pulsed power, electrical switches, radiation sources and high energy density capacitors that future nuclear effects simulators will require. This project will also closely monitor the technical progress of Inertial Confinement Fusion (ICF) technologies and capitalize on potential breakthroughs as they occur.

C. PROGRAM ACCOMPLISHMENT AND PLANS:

FY 1992 Accomplishments:
- Initiated construction of LBTS.
- DECADE simulator contract awarded; DECADE building design completed; building construction contract out for bids.
- Demonstrated DECADE inductive energy storage prototypes.
- Supported development and hardness validation testing for the Services military weapons systems and surveillance systems.
- Completed development of a Nuclear Infrared Clutter Simulator.
- Initiated development of a Nuclear Optical Dynamic Display System.

FY 1993 Plans:
- Conduct three HE tests to evaluate ground shock propagation and structural survivability.
- Complete construction of the LBTS and the ARES simulator upgrade.
- Fabricate and test first full-scale DECADE module.
- Continue development of a Nuclear Optical Dynamic Display System.
- Continue x-ray source optimization, fidelity and cryogenic modifications to simulators to improve reliability, and efficiency.
- Begin technology development for JUPITER.
- Initiate conceptual design of ICF facility for nuclear effects testing.
- Provide radiation simulator test beds for validating system-level hardness in support of Service requirements.

FY 1994 Plans:
- Complete facility characterization of the LBTS.
- Execute seven ground shock effects tests.

- Procure prototype hardware for the new large area thermal simulator.
- Bring ARES on line for full scale High Altitude Electromagnetic Pulse simulator system testing to DoD Stnd 2169A.
- Complete the fabrication and assembly of the first four modules of the DECADE Simulator and the building construction.
- Continue technology development for JUPITER.
- Complete the Nuclear Optical Dynamic Display System.
- Identify shortcomings and upgrade requirements of radiation simulators based on Aboveground Test/Underground Test (AGT/UGT) correlation data base.
- Support AGT/UGT correlation study of electronic box response dependence upon direction of radiation source.

Work Performed By: Science Application Incorporated, San Diego, CA; Maxwell Laboratories, Inc., San Diego, CA; Mission Research Corporation, Santa Barbara, CA; Physics International Company, San Leandro, CA; General Electric, Valley Forge, PA; Honeywell, Inc., Minneapolis, MN; Bendix Field Engineering Corp., Columbia, MD; University of Dayton, OH; various DoE and DoD Service Labs; White Sands Missile Range, NM.

Related Activities: This project is conducted in coordination with the Office of the Secretary of Defense, Director of Test and Evaluation, Chairman, Joint Chiefs of Staff, Military Acquisitions Departments, Strategic Defense Initiative Organization, US Space Command, US Army Strategic Defense Command, Commanders in Chief of Unified and Specified Commands. There is no duplication.

Other Appropriation Funds: Program element 0602715H, Project #000092, DECADE Simulator (MILCON), and Project #000091, Large Blast Thermal Simulator (MILCON).

International Cooperative Agreements: Foreign Military Sales cases and Technical Exchange Agreements among our NATO Allies and the French government.

Program Element: #0602715H
PE Title: Defense Nuclear Agency
Project Number: AC
Budget Activity: Technology Base

A. RESOURCES ($ in Thousands)

Project Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
Weapon Systems Lethality	57,994	66,961	41,226

B. BRIEF DESCRIPTION OF PROJECT: This project develops lethality criteria for the full spectrum of conventional and nuclear weapons, including precision guided conventional and nuclear munitions, fuel air explosives, and electrothermal chemical (ETC) guns. The target base includes hard and superhard buried facilities, underwater targets, and missiles. The program seeks to quantify lethality in terms of functional and physical kill criteria for the response of critical high value targets to attacks from conventional and nuclear weapons. This project also evaluates the collateral effects resulting from such attacks with emphasis on the implications associated with targeting Nuclear, Biological and Chemical (NBC) weapon facilities. This project will develop an automated expert system to assist in pre-strike target planning and post-strike battle damage assessment. The understanding of weapon-target interaction resulting from this project will assist in generating weapon development requirements against the changing worldwide target base and provide a quantitative basis for contingency operations involving weapons of mass destruction.

C. PROGRAM ACCOMPLISHMENT AND PLANS:

FY 1992 Accomplishments:
- Archived DESERT STORM textual and visual data relating to weapons effects and performance in a multimedia data base.
- Initiated development of an expert system for target planning and battle damage assessment.
- Initiated development of a Joint Service Manual for the design and analysis of hardened structures against conventional weapons effects.
- Conducted calculations of airblast/thermal and fragment environments from conventional weapons.
- Executed 22 conventional weapons effects tests against hardened facilities.
- Demonstrated Electrothermal-chemical (ETC) gun with a world record performance (25.8 Kg @ 1.1 km/s).
- Performed trade-off calculations to evaluate the effectiveness of nuclear and conventional munitions in a theater missile defense role.
- Initiated efforts to characterize site geologies for prospective worldwide underground targets.
- Initiated construction of underground tunnels at Ft. Knox to investigate vulnerability of deep underground facilities to ground shock loading.
- Conducted successful non-ideal airblast experiments on the DIAMOND FORTUNE underground cavity nuclear test.
- Completed submarine precision model tests to assess fluid-structure interaction for double hull submarines.

FY 1993 Plans:
- Conduct full-scale operational validation of prototype automated target planning system for one target type.
- Execute 31 precision conventional weapons effects tests to validate lethality criteria.
- Issue preliminary lethality criteria for low yield nuclear warhead against the threat of chemical/biological/nuclear theater ballistic missile warheads.
- Conduct laboratory and field experiments to evaluate dispersal hazards from strikes on chemical/biological/nuclear weapons-related ground facilities.
- Commence testing to investigate shock effects of undersea bottom mines against shallow water targets.
- Conduct full-scale ETC gun feasibility demonstration.
- Develop advanced numerical methods for predicting dispersal of hazardous chemical/biological/radioactive clouds.
- Initiate study to evaluate dispersal hazard risk from strikes on nuclear reactors.
- Screen candidate sensors for hard target battle damage assessment.

FY 1994 Plans:
- Initiate target response modeling to high/hypervelocity projectiles.
- Conduct field tests to assess the collateral damage resulting from strikes on Nuclear, Biological and Chemical facilities.
- Incorporate non-visual damage signatures into battle damage assessment methodology.
- Publish the Joint Services Manual for the design and analysis of hardened structures to conventional weapons effects.
- Execute 10 precision conventional weapons tests against hardened structures.
- Field test existing sensor technology to assist in battle damage assessment of fixed hard structures.
- Optimize Electrothermal-chemical gun design for Service applications.
- Perform testing and analysis of shock induced submarine damage rules at all operating depths.
- Demonstrate computational effectiveness of boundary elements in layered media.
- Perform targeting effectiveness calculations in support of nuclear versus conventional trade-off studies for regional contingency planning.

Work Performed By: Science Applications International Corp., Alexandria, VA; Weidlinger Associates, New York, NY; S-Cubed, La Jolla, CA; Applied Research Associates, Inc., Albuquerque, NM; California Research & Technology, Inc., Chatsworth, CA; SRI International, Menlo Park, CA; APTEK, Colorado Springs, CO; AMI Research, Mystic, CT; BDM International, McLean, VA; Horizons Technology, San Diego, CA; Orlando Technology, Inc., Shalimar, FL; RE/SPEC, Rapid City, SD; Southwest Research Institute, San Antonio, TX; Applied Research Institute, South Royalton, VA; Karagozian and Case, Los Angeles, CA; DoD and DOE government laboratories.

Related Activities: This project is conducted in coordination with the Air Combat Command, STRATCOM, Strategic and Theater Nuclear Forces, Chairman, Joint Chiefs of Staff, Military Departments, Defense Intelligence Agency, Strategic Defense Initiative Organization and Commanders in Chief of Unified and Specified Commands. There is no duplication.

Other Appropriation Funds: None.

International Cooperative Agreements: United Kingdom - Joint Working Groups 36 and 43.

Program Element: #0602715H
PE Title: Defense Nuclear Agency
Project Number: AD
Budget Activity: Technology Base

A. RESOURCES ($ in Thousands)

Project Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
Biomedical/Lifesciences	17,169	17,142	- 0 -

B. BRIEF DESCRIPTION OF PROJECT: This program is the only in-house Department of Defense (DoD) effort that investigates the biomedical effects of radiation from nuclear weapons accidents or environmental contamination. This unique research is conducted by the Armed Forces Radiobiology Research Institute (AFRRI), which is scheduled to be transferred to the Uniformed Services University of the Health Sciences effective FY 1994. AFRRI is the leading DoD authority on radiation effects and is dedicated to research to support the requirements of the Surgeons General of the Armed Forces. The requirements related to nuclear proliferation and radionuclide contamination emphasize strategies to: 1) increase survival of personnel through use of radioprotective drugs given before irradiation and/or use of new modalities for treatment of radiation casualties, 2) minimize delirious effects, such as cancer and mutations that may result from radiation exposures encountered on earth or in space, and 3) maintain operational performance such as controlling a vehicle (aircraft, ship, or tank).

C. PROGRAM ACCOMPLISHMENT AND PLANS:

FY 1992 Accomplishments:
- Determined the neurochemical changes produced by gamma rays, neutrons and charged particles.
- Developed therapeutic protocols to enhance bone marrow recovery.
- Refined list of chemicals which increase resistance to radiation damage.
- Completed microdosimetry model of acute bone marrow damage.

FY 1993 Plans:
- Describe radiation effect on muscular fatigue and weakness.
- Develop treatment protocol to control immune suppression.
- Identify drug combinations which enhance survival and maintain performance.
- Initiate cancer studies in VIVO/in VITRO on heavy charged particles.
- Initiate program on microwave bioeffects.

Work Performed By: The National Academy of Sciences, Washington, DC; Merrifield Laboratory, Inc., Merrifield, VA; National Aeronautics and Space Administration, Langley Research Center, Hampton, VA; Lawrence Berkeley Laboratory, Berkeley, CA; National Institute of Science and Technology, Gaithersburg, MD; and the Uniformed Services University of Health Sciences, Bethesda, MD.

Related Activities: None.

Other Appropriation Funds: None.

International Cooperative Agreements: AFRRI has the following Memoranda of Understanding: began in 1982 and is an on-going project - Centre de Recherches du Service De Sante des Armees (DEA 1125), France, to conduct research on the mechanism of radiation damage from nuclear weapons; began in 1986 and is an on-going project - Defense Research Organization, Netherlands, (DEA 0096), to exchange information on physical, biological, and medical aspects of radiations associated with nuclear devices and other radiation sources.

FY 1994 BUDGET ESTIMATES

Program Element: #0602715H
PE Title: Defense Nuclear Agency
Project Number: AE
Budget Activity: Technology Base

A. RESOURCES ($ in Thousands)

Project Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
Weapon Safety & Operational Support	24,330	40,492	33,029

B. BRIEF DESCRIPTION OF PROJECT: This project: (1) improves nuclear weapons safety and survivability, employment planning, command and control, force structure, and force effectiveness; (2) addresses the contribution of nuclear weapons effects to strategic nuclear employment objectives; (3) develops alternative strategies for U.S. strategic weapons employment; (4) includes research to improve planning capabilities that provide nuclear commanders with more flexible weapons employment options; and (5) explores technology needed to enhance theater U.S. and Allied command operations on an integrated battlefield.

C. PROGRAM ACCOMPLISHMENT AND PLANS:

FY 1992 Accomplishments:
- Continued the quantitative Weapon System Safety Assessment (WSSA) of the MMIII/W78 weapon system.
- Conducted a WSSA excursion of the W87 system.
- Initiated Fire Resistant Enhancement (FRE) study of the Stockpile.
- Provided technical assessment support to the Nuclear Weapons Council (NWC) and Department of Defense offices responsible for nuclear weapons safety and operations.
- Completed construction of proof-of-principle demonstrator of Transportable Storage System.
- Provided continued support of Lateral Dispersal to SHAPE.
- Completed study of impact of Deceptive Practices (DP) during combat operations in Gulf War on Naval forces.
- Transitioned Automated Target Tie-Up system to STRATCOM.
- Completed nuclear weapons effects upgrade for Multiple Engagement Module.
- Installed NATO Nuclear Planning prototype.

FY 1993 Plans:
- Complete the MMIII/W78 WSSA.
- Initiate development of the WSSA Information Management System.
- Continue FRE study of the stockpile.
- Initiate follow-up program to exploit DP technologies for Naval/Joint DoD use.
- Complete Allied Command Europe Survivable Nuclear Command and Control Program; Transition to NATO.
- Complete effort on Transportable Storage System.
- Evaluate the NATO Nuclear Planning System during exercises.
- Assess survivability and effectiveness impacts of changes to force structure required by new U.S. nuclear strategy Quick Look III/Strategic Force Posture.
- Continue to provide safety assessment support to the NWC.
- Deliver Automated Routing and Maintenance System Version 3.0 to STRATCOM.

FY 1994 Plans:
- Continue nuclear stockpile FRE and WSSA Information Management System.
- Initiate W80 WSSA.
- Initiate examination for Command and Control issues.
- Complete assessment and plan for proof-of-principle demonstration of TSC-V Reentry Vehicle Safety container.
- Complete Dual Capable Aircraft Prelaunch Survivability study supporting NATO.
- Complete Weapons Secure Storage System regeneration testing with USAFE/SHAPE.
- Complete SHAPE Nuclear Planning System (NPS) and NATO NPS; transition to SHAPE/NATO.
- Begin development of near real-time Routing and Maintenance to support Adaptive Planning Systems.
- Complete program to exploit DP technologies for Naval/Joint DoD use.

Work Performed By: Science Applications International Corporation, La Jolla, CA; R&D Associates, Mons, Belgium; Lawrence Livermore National Laboratory, Livermore, CA; Sandia National Laboratory, Albuquerque, NM; Booz-Allen and Hamilton, Bethesda, MD, General Dynamics/CONVAIR Division, San Diego, CA; Analytical Systems Engineering Corp., Burlington, MA; Logicon Inc., San Pedro, CA; Applied Research Assoc., Alexandria, VA; Mitre Corp., Bedford, MA; Science Control Technology Corp., Los Angeles, CA.

Related Activities: This project is coordinated with Director of Strategic and Theater Nuclear Forces, Assistant to the Secretary of Defense (Atomic Energy), Defense Intelligence Agency and Commanders in Chief of Unified and Specified Commands to support various systems (Cruise Missiles, KC 135, SRAM, B52, B1, B2). There is no duplication.

Other Appropriation Funds: None.

International Cooperative Agreements: None.

Program Element: #0602715H
PE Title: Defense Nuclear Agency
Project Number: AF
Budget Activity: Technology Base

A. RESOURCES ($ in Thousands)

Project Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
Weapon Systems Operability	85,170	70,773	64,377

B. BRIEF DESCRIPTION OF PROJECT: This project provides the technology base and support to ensure that current and future DoD Systems such as Command, Control, Communications, Computers and Intelligence (C4I) systems, aircraft and missile defensive systems, as well as personnel can survive and operate effectively through the spectrum of conventional and nuclear weapon-disturbed environments. Planned efforts will place particular emphasis on developing the technology to preserve the "functional" survivability to combined hostile effects from low intensity nuclear conflict. Because DoD acquisition policy is to rely on commercial, multi-use technology whenever possible, it is essential to develop and demonstrate affordable, hardening and mitigation technologies that can be transferred to industry, the Services and system acquisition programs. The principal products from this project include radiation-resistant memories and computers; DoD-mandated environment and design guidelines and standards for nuclear survivable systems; nuclear environment avoidance and nuclear weapons effects hardening and mitigation techniques; correlations between aboveground and underground testing methodologies to support the hardness validation of electronics, optics materials and structures; development of "testable hardware" designed to be validated without the use of Underground Tests; and the unification of risk and casualty assessment models, training tools, and methods for evaluating soldier performance degradation to nuclear, biological, chemical and conventional effects.

C. PROGRAM ACCOMPLISHMENT AND PLANS:

FY 1992 Accomplishments:
- Initiated design of 1-megabit memory for Radiation-Hardened Space Computer.
- Completed draft of a handbook (MIL-HDBK-423) for high altitude electromagnetic pulse (HEMP) effects on groundbased C4I systems.
- Completed development of DoD's first magnetohydrodynamic (MHD) HEMP pulser; conducted MHD HEMP test at FEMA site in Olney, MD; initiated development of novel high power microwave sources.
- Evaluated PAVE PAWS radar using communication link simulator.
- Defined nuclear environments for Follow-on Early Warning System (FEWS), Brilliant Eyes (BE), Regency Net, the Defense Satellite Communications System (DSCS) Replenishment Program, and Theater High Altitude Air Defense.
- Provided new radiation shielding transport code and troop safety and casualty criteria to the Army and NATO allies.
- Initiated the development of aircraft sensors that will differentiate dust clouds from natural weather.
- Completed nuclear hardness assessment of space optics at operational (cryogenic) temperatures based on underground test data.

FY 1993 Plans:
- Complete design of radiation-hard 1-megabit memory for space applications and begin technology evaluation for 4-megabit memory.
- Conduct HEMP tests at Strategic Command's Alternative Processing Correlation Center and Army SATCOM facilities.
- Complete development of preliminary high power microwave source.
- Complete formal revision of DoD's official standard for HEMP.
- Continue nuclear environments support to FEWS, BE and DSCS.
- Evaluate HEMP effects in regional contingency scenarios.
- Conduct field trials of anti-emetic oral medication.
- Initiate virtual reality program to incorporate human factors into combat simulation training and evaluation tools.
- Evaluate survivability of PACOM aircraft shelters.
- Complete dust environment prediction methodology.
- Complete engine dust ingestion and air data sensor testing.
- Quantify radiation effects on hardened optics and publish design guidelines for Special Project Office use.

- Deliver software for Strategic Command to perform aircraft mission planning in nuclear environments.
- Initiate development of radiation-hardened cryogenic analog circuits for Infrared focal-plane applications.
- Test Ground Nuclear Detection System Terminal using Nuclear Effects Link Simulator.
- Start evaluation of PAVE PAWS phased array radar.
- Devise baseline concepts of design and test protocols for application to Testable Hardware Electronic System Demonstration.
- Conduct GAMBLE III Ion Beam Active Optic Experiment.

FY 1994 Plans:

- Fabricate and evaluate 1-megabit static random access memory circuits.
- Continue DoD standard for radar and communications system hardening.
- Initiate final proof-of-concept high power microwave sources; demonstrate effectiveness in generic system tests.
- Develop conceptual designs for hardened electronic and electro-optical space systems that can be validated in non-nuclear radiation simulators.
- Complete test and mitigation support for Universal Modem, Global Positioning System, and the Nuclear Detection System.
- Complete field trials of anti-emetic medication; issue new casualty prediction tool for Services' use.
- Apply survivability validations methodology to aircraft and cruise missiles systems.
- Test the Ground-Based Radar using the Radar Nuclear Effects Propagation Simulator.
- Initiate proof-of-principle tests on "testable hardware" designed to be validated without UGTs.
- Initiate fabrication of test object to implement "testable hardware" concepts on MIGHTY UNCLE UGT.
- Conduct E-Beam Complex Cryo-Mirror Experiment.
- Perform MOSAIC HUBBLE Telescope System Assessment Demo.
- Plan optics/critical tolerance structures AGT/UGT correlation experiment for MIGHTY UNCLE in FY 1995.

Work Performed By: Mission Research Corp., Santa Barbara, CA; Science Applications International Corp., Joppa, MD & Vienna, VA; Pacific Sierra Research Corp., Santa Monica, CA; JAYCOR, San Diego, CA; Los Alamos National Lab, Los Alamos, NM; Oak Ridge National Lab, Oak Ridge, TN; Sandia National Lab, Albuquerque, NM; US Army Strategic Defense Command, Huntsville, AL; US Air Force Phillips Lab, Albuquerque, NM; Naval Research Laboratory, Washington, DC; US Army Harry Diamond Laboratory, Woodbridge, VA; National Academy of Sciences, Washington, DC; BDM, International, McLean, VA; Kaman Sciences, Colorado Springs, CO; Calspan, Buffalo, NY; Texas Instruments, Dallas, TX; Honeywell, Minneapolis, MN; IBM, Manassas, VA; K-Tech, Albuquerque, NM; S-Cubed, La Jolla, CA.

Related Activities: This project is conducted in coordination with the Office of the Secretary of Defense, Chairman, Joint Chiefs of Staff, Military Departments, Strategic Defense Initiative Organization, Defense Information Systems Agency, Defense Intelligence Agency, National Security Agency, and Commanders in Chief of Unified and Specified Commands. There is no duplication.

Other Appropriation Funds: None.

International Cooperative Agreements: Joint Working Groups 35 and 36.

Program Element: #0602715H
PE Title: Defense Nuclear Agency
Project Number: AG
Budget Activity: Technology Base

A. RESOURCES ($ in Thousands)

Project Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
Scientific Computations & Information Systems	21,992	41,345	22,496

B. BRIEF DESCRIPTION OF PROJECT: This project provides the supercomputer (CRAY XMP/416) data base and modeling resources that enable DNA's RDT&E contractors to perform research into all aspects of weapons effects. The CRAY is used as an aid to the basic understanding of the exceedingly complex and interrelated physical phenomena that occur during and after a nuclear explosion. Calculations, models and codes are developed and used to aid the design of experiments, predict types and levels of measurements required, establish system design requirements and assess performance, and provide system-specific predictions of nuclear weapons effects to DoD planners. The principle thrust of the scientific computing activity is to conduct numerical simulation for shock effects of nuclear weapons; nuclear survivability and hardness of structures; radiation effects of nuclear weapons on communications systems, radars, and infrared and optical systems; and the effectiveness of conventional weapons. This project disseminates DNA research results by developing user-friendly interactive data bases, technical archives, and design aids for system developers.

C. PROGRAM ACCOMPLISHMENT AND PLANS:

FY 1992 Accomplishments:
- Continued to provide supercomputer scientific computing resources.
- Provided upgraded telecommunications circuits for the network.
- Completed High Performance Supercomputer Alternative Site Survey.
- Provided visualization support to improve analysis of results.
- Continued transition to the CRAY UNIX operating system.

FY 1993 Plans:
- Continue to provide supercomputer resources by replacing the current CRAY XMP supercomputer used to support contractor research.
- Establish tightly integrated Wide Area Network to interconnect DNA scientists, contractor researchers, other government agencies, and university sites to effectively support DNA research projects.
- Continue implementing visualization systems and techniques display.
- Complete transition to the CRAY UNIX operating system.
- Develop Data Archival and Retrieval Enhancement (DARE) system for Nuclear Weapons Effects data base.
- Begin research for establishing DNA's Defense Simulation Internet (DSI) Node.
- Disseminate user-friendly computational and archival information products.

FY 1994 Plans:
- Continue to provide state-of-the-art supercomputer resources through full utilization of the new supercomputer's unique capabilities.
- Acquire peripheral hardware and software to support improved remote visualization via the simulation of models and code results.
- Begin upgrade of communications network backbone to the T-3 level.
- Operate DSI node allowing complete interaction in the modeling and simulation arena.
- Populate DARE system with Nuclear Weapons Effects data and disseminate updated information products.

Work Performed By: Department of Energy, Albuquerque, NM; Los Alamos National Laboratory, Los Alamos, NM; Pacific Sierra Research, Los Angeles, CA; S-Cubed, Albuquerque, NM, San Diego, CA.

Related Activities: None.

Other Appropriation Funds: None.

International Cooperative Agreements: None.

Program Element: #0602715H
PE Title: Defense Nuclear Agency
Project Number: AH
Budget Activity: Technology Base

A. RESOURCES ($ in Thousands)

Project Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
Counter Proliferation Technical Support	- 0 -	100	2,951

B. BRIEF DESCRIPTION OF PROJECT: This project responds to the President's July 1992 initiative on Non-proliferation to combat the spread of weapons of mass destruction (WMD), (i.e., nuclear, biological, chemical (NBC) weapons and ballistic missiles). This project draws from current and past DNA research efforts and provides technical support to DoD and other organizations involved in all aspects of counter proliferation.

Deterrence Phase:
- Supports the Office of the Secretary of Defense (Policy) (OSD(P)) by conducting technical analysis of licensing applications and developing a net assessment of proliferation.
- Exploit technologies and data bases from arms control treaty verification activities to support proliferation monitoring.

Containment Phase:
- Evaluate and develop high confidence on-site inspection regimes.
- Assess safety, security and command/control of NBC materials or weapons in the possession of potential or actual proliferators.
- Develop avenues for sharing technologies and other data with countries joining the U.S. in international non-proliferation activities.
- Assist in training/equipment of International Inspectors.

Neutralization Phase:
- Support contingency planning for potential regional conflicts involving nations with NBC capabilities.
- Assess post-attack implications of collateral effects, associated with targeting NBC facilities, on theater military operations and evaluate hazards to civilian populations.

C. PROGRAM ACCOMPLISHMENT AND PLANS:

FY 1993 Plans:
- Assess the technical and operational impact of regional proliferation. Determine impact on the survivability of U.S. Forces.
- Support STRATCOM and OSD (Net Assessments) in gaming strategies pertaining to strategic use of conventional and nuclear weapons in regional contingency scenarios.

FY 1994 Plans:
- Provide export control support to OSD and Office of the Joint Chiefs of Staff (OJCS).
- Provide technical support to OSD(P), OJCS, and Commander in Chief of Unified and Specified Commands (CINCs).
- Develop a running net assessment for export controls.
- Develop, test and evaluate technical equipment for treaty and special operations use.
- Provide force response options for methods of attack on a specific region or country's WMD facilities, including underground storage and production sites. Options will minimize collateral damage.
- Provide Battlefield Management Tools in evaluating NBC attacks on CINCs.

Work Performed By: Science Applications International Corporation, San Diego, CA; Logicon R&D Associates, Marina Del Ray, CA; BDM International Incorporated, McLean, VA; Kaman Sciences Corporation, Colorado Springs, CO; Lawrence Livermore National Laboratory, Livermore, CA; Los Alamos National Laboratory, Los Alamos, NM; and Sandia National Laboratory, Albuquerque, NM.

Related Activities: None.

Other Appropriation Funds: None.

International Cooperative Agreements: Non-Proliferation Treaty, Treaty on Open Skies, Chemical Weapons Convention, and Threshold Test Ban Treaty Protocol, the 17 Nunn-Lugar "umbrella agreements" and specific agreements with the Former Soviet Union.

Program Element: #0602715H Project Number: AY
PE Title: Defense Nuclear Agency Budget Activity: Technology Base

A. RESOURCES: ($ in Thousands)

Project Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
Bioenvironmental Hazards Research	- 0 -	3,000	- 0 -

B. BRIEF DESCRIPTION OF PROJECT: This project provides for bioenvironmental hazards research activities to enable DoD to strengthen its efforts in developing technologies to protect DoD personnel, the civilian population and the environment from potential hazardous substances DoD generates and uses. Funds were provided as a Congressional addition to the FY 1993 President's Budget Submission and are intended to continue efforts begun by a grant in FY 1989 to Tulane and Xavier Universities.

C. PROGRAM ACCOMPLISHMENT AND PLANS:
FY 1993 Plans:
- Conduct research in the following areas related to bioenvironmental hazards of interest to DoD: genotoxicity, composting of munitions contaminated soil, treatment of waste water, contamination detection, and development of alternatives to hazardous chemicals.

Work Performed By: Tulane University, New Orleans, LA; Xavier University, New Orleans, LA.

Related Activities: None.

Other Appropriation Funds: None.

International Cooperation Agreements: None.

Program Element: #0602715H
PE Title: Defense Nuclear Agency
Project Number: AZ
Budget Activity: Technology Base

A. RESOURCES: ($ in Thousands)

Project Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
Los Alamos National Lab, Meson Physics Facility	- 0 -	15,000	- 0 -

B. BRIEF DESCRIPTION OF PROJECT: This project provides for the upgrade of the Los Alamos National Laboratory Meson Physics Facility (LAMPF), significantly enhancing the capabilities for Department of Defense (DoD) and other applications requiring a medium-energy, high current accelerator. Funds were provided as a Congressional addition to the FY 1993 President's Budget Submission.

C. PROGRAM ACCOMPLISHMENT AND PLANS:

FY 1993 Plans:

- Design and fabrication of an acceleration test stand called the Accelerator Performance Demonstration Facility and perform a comprehensive evaluation of the additional changes that would be needed to increase the average current and beam power of the LAMPF accelerator by up to a factor of 10.
- Conduct a feasibility study using LAMPF as part of an Integrated Test Facility for testing and evaluating the technologies required for the accelerator based conversion (transmutation) of surplus plutonium and radioactive waste products.
- Conduct a pre-conceptual design study of a facility extension at LAMPF that would produce intense, narrow bursts of neutrons and gammas for DoD testing programs.

Work Performed By: Los Alamos National Laboratory, Albuquerque, NM.

Related Activities: None.

Other Appropriation Funds: None.

International Cooperative Agreements: None.

Program Element: #09016000 Budget Activity: Technology Base
PE Title: Contract Administration/ Audit Date: April 1993

A. RESOURCES: ($ in Thousands)

Project Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
Contract Administration/Audit	- 0 -	- 0 -	5,534

B. BRIEF DESCRIPTION OF PROJECT: The FY 1994 budget reflects the portion of the Department's estimate as a result of contract awards made in this appropriation. This represents a change from the way the budget was presented last year and reflects a Congressional and Departmental initiative to move toward mission budgeting which calls for an improved method of budgeting and justifying resources. The visibility of total costs related to contract awards and administrative requirements is improved in this presentation because support service funding for related contracts is included in this appropriation.

C. JUSTIFICATION FOR PROJECT:
FY 1994 Plans:
- These funds will be used to finance contract services that are performed in support of program budgeted in this appropriation.

Work Performed By: Defense Contract Audit Agency.

Related Activities: Not applicable.

Other Appropriation Funds: Not applicable.

International Cooperative Agreements: Not applicable.

Program Element: #0602790H
PE Title: Small Business Innovative Research
Budget Activity: Technology Base
Date: April 1993

A. RESOURCES: ($ in Thousands)

Project Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
Small Business Innovative Research	- 0 -	4868	3851

B. BRIEF DESCRIPTION OF ELEMENT: This project is to stimulate technological innovation in the private sector, strengthen the role of small business in meeting DoD research and development needs, foster and encourage participation of minority and disadvantaged business in technological innovation, and increase the commercial application of DoD supported research and development results. This project responds to Public Law 102-564.

C. JUSTIFICATION FOR PROJECT:

FY 1993 Plans:
- Support the Small Business Administration (SBA) National Direction by actively seeking small business contractors to perform innovative nuclear weapons effects research.
- Continue active support of the SBA National Directive.

FY 1994 Plans:
- Continue active support of the SBA National Directive.

Work Performed By: Physitron, Inc., Huntsville, AL; Geo-Centers, Inc., Westwood, MA; Ares Corp., Arlington, VA; General Sciences, Inc., Norris, PA; Science & Engineering Assoc., Albuquerque, NM; Orion International Technologies, Albuquerque, NM; Carpenter Research Corp., Rolling Hill Estates, CA; Aptek, Inc., Colorado Springs, CO; Ktech Corp., Albuquerque, NM; Dese Research, Inc., Huntsville, AL; Anro Engineering Consultants, Inc., Bedford, MA; System Control Inc., Palo Alto, CA; Tetra Corp., Albuquerque, NM; Science Research Lab, Inc., Summerville, MA; ENSCO, Inc., Springfield, VA; Mission Research Corp., Santa Barbara, CA; Hy-Tech Research Corp., Redford, VA; Electro-Optek, Torrance, CA; Berkeley Research Assoc., Berkeley, CA; EIC Laboratories, Inc., Norwood, MA; North Star Research Corp., Albuquerque, NM; Optron Systems, Inc., Bedford, MA; D.H. Valles Assoc., Albuquerque, NM; Ibis Technology Corp., Danvers, MA; and UTD, Inc., Alexandria, VA.

Related Activities: None.

Other Appropriation Funds: None.

International Cooperation Agreements: None.

Program Element: #0603711H Budget Activity: Strategic Programs
PE Title: Verification Technology Demonstration Date: April 1993

A. RESOURCES ($ in Thousands)

Project Number & Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	Total Program
CA Strategic Arms Control Technology	21,245	9,531	13,462	Continuing
CB Conventional Arms Control Technology	16,739	14,888	11,423	Continuing
CC Chemical Weapons Convention Technology	22,500	21,604	21,465	Continuing
CD Yield Measurement Technology	12,520	10,818	- 0 -	51,621
CE Safe Secure Dismantlement	1,975	- 0 -	- 0 -	1,975
TOTAL	74,979	56,841	46,350	

B. BRIEF DESCRIPTION OF ELEMENT: This program element covers verification and compliance RDT&E for arms control treaties including Strategic Arms Reduction Talks (START) and START II, Conventional Forces in Europe (CFE), Threshold Test Ban Treaty, Peaceful Nuclear Explosions Treaty, Chemical Weapons Convention (CWC), Open Skies, Presidential arms control initiatives and other arms control related agreements such as the Conference on Security and Cooperation in Europe.

The program includes development of hardware and techniques for on-site inspections in treaty nations and assists the Office of the Secretary of Defense in preparing for U.S. compliance with treaty provisions. Hardware and procedures developed are transitioned to the On-Site Inspection Agency (OSIA) (or appropriate international inspectorate in the case of CWC) for use in conducting inspections as required by arms control treaties.

Where applicable, RDT&E to meet one treaty's requirements is applied in other areas, eliminating duplicative efforts and maximizing synergistic results. For example, the START Treaty requires monitoring of vehicles exiting a final assembly factory for treaty limited items. The Portal Perimeter Continuous Monitoring System was designed and developed to meet START specifications. It was transitioned to OSIA in March 1992 for use by Entry-Into-Force (EIF), 30 days after ratification. This same RDT&E effort resulted in valuable information for negotiators to use in developing the U.S. position for monitoring sites under a CWC regime.

Another example of the broad nature of the DNA effort is reflected by the data management development effort. Arms Control treaties require extensive exchanges of data describing treaty accountable items, initial declarations, movements, etc., of signatory nations. DNA has developed a data management system, the Compliance Monitoring Tracking System (CMTS), to accommodate these data exchanges and monitor U.S. compliance with treaty provisions. Currently CMTS can provide treaty required data exchanges for Intermediate Range Nuclear Forces, START, CFE and Confidence and Security Building Measurements. Work is underway to define START II Central Data System requirements. The Open Skies Notification System is being developed to support a July 93 EIF. The Chemical Weapons Convention Information Management System demonstration model is being reviewed by the U.S. Interagency to determine whether it will be provided to the International Organization at the Hague. At completion, DNA will turn over operation of CMTS to OSIA.

The Nunn-Lugar Soviet Nuclear Threat Reduction Act of 1991, provides for assistance in the safe secure dismantlement of nuclear and other weapons of mass destruction to the Former Soviet Union.

Program Element: #0603711H
PE Title: Verification Technology Demonstration
Project Number: CA
Budget Activity: Strategic Programs

A. RESOURCES: ($ in Thousands)

Project Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
Strategic Arms Control Technology	21,245	9,531	13,462

B. BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEMS CAPABILITIES: This project consists of RDT&E activities required to implement U.S. rights under the Strategic Arms Reduction Talks (START) and START II Treaties, assist U.S. manufacturers in compliance with the Treaty, and development of technology which will meet requirements of future nuclear arms control agreements. Treaty on-site inspection requirements resulted in a Portal and Perimeter Continuous Monitoring Systems (PPCMS) which is expected to be deployed in the Ukraine after the START Treaty Entry-Into-Force (EIF) during 3rd quarter, 1993. A portable weigh-in-motion system is being evaluated for accurately weighing ballistic missiles on their transporters. A START Central Data System (SCDS), as part of the Compliance and Monitoring Tracking System (CMTS) was developed to enable the U.S. to make Treaty required notifications and compliance assessments. The START II Treaty, signed in January 1993, must be assessed to determine future requirements. In addition, procedures to accommodate inspections at U.S. rocket motor production facilities were developed and demonstrated. Technology development efforts are planned to satisfy future treaty requirements in the most non-intrusive and cost effective manner. The primary focus of the efforts is on more effective methods of counting nuclear warheads in situ, determining missile throw-weight, measuring characteristic Treaty Limited Item (TLI) signatures, and providing monitoring/inspection capabilities at lower cost.

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

FY 1992 Program:
- PPCMS transitioned to On-Site Inspection Agency and long-lead time items transferred.
- Development of START Central Data System continued. Operational testing was successful and the Air Force and Navy data systems interface was accomplished. Notifications for Intermediate Range Nuclear Forces (INF) were added.
- Phase II Baseline Evaluation of portable scales was conducted. The effort was redirected since no system fully met requirements. A static system was tested and met requirements.
- Developed plans to facilitate preparation for suspect-site inspections, special access visit and other START Treaty implementation actions.
- Conducted analysis of START and INF implementation costs.
- Provided quick-reaction technical support to meet Joint Compliance and Inspection Commission (JCIC) requirements.
- Initiated the Re-entry Vehicle (RV) Counting concept study.
- Began development of signatures exploitation systems--gravimetry, acoustic, and nuclear.
- Defined gravity models and developed profiles for nuclear and non-nuclear cruise missiles.
- Completed a peer review and materials/mock-up experiments of Cosmic Ray Induced Neutron Signature lab-prototype system.
- Completed a study to identify alternatives to CARGOSCAN, identified specifications for a transportable system, and evaluated proposals for follow-on development efforts.
- Tested the Acoustic Resonance Spectroscopy lab-prototype on several ballistic missiles to determine if a signature could be identified.
- Defined requirements for throw-weight determination package sensors.
- Completed Secure Loop Inspectable Tag/Seal (SLITS) and Universal Reader development.
- Acquired the Small Intercontinental Ballistic Missile ground test missile from the Air Force.

- Initiated an Adjunct Monitoring Study to define scenarios and technology for remote monitoring tools.
- Initiated the Innovative Treaty Sensor Integrator project to provide inspectors with tools to assist in identifying Treaty Limited Items.
- Conducted adversarial analysis vulnerability testing of video motion detection systems.
- Manufactured three (3) sealed, tamper-protected container prototypes for the On-Site Inspection Agency.

FY 1993 Planned Program:
- Transition the Technical On-Site Inspection (TOSI) facility for use as a Testbed for Arms Control Technology (TACT), which could be used as a demonstration facility for equipment developed and procured under the Safe Secure Dismantlement Program. Install the SICBM at TOSI.
- Continue to demonstrate the static weighing system and continue research on a lighter weighing system.
- Revise planning aids to update manufacturers on arms control inspections requirements based on inputs from studies of potential new agreement verification regimes.
- Conduct modeling of systems to verify the number of RVs carried on a ballistic missile.
- Develop and test laboratory prototypes of spin resonance gravity gradiometer and other selected acoustic and nuclear signature exploitation systems.
- Begin development of one of the Adjunct Monitoring study recommendations.
- Begin development of new radiographic system(s) selected as a result of the radiography concept study recommendations and test laboratory prototype(s).
- Conduct prototype development and testing efforts on new systems and other instrumentation for remote monitoring applications. Validate selected data authentication systems.
- Develop a START II Central Data Systems (SCDSII).
- Provide technical support to the Joint Compliance and Inspection Commission (JCIC), Special Verification Commission and Bilateral Implementation Commission (BIC).
- Complete SCDS development and documentation.

FY 1994 Planned Program:
- Continue to maintain, operate and upgrade the TACT.
- Upgrade the SCDS based on user inputs.
- Complete SCDS II development and demonstration.
- Evaluate improved weigh-in-motion system.
- Conduct a missile demilitarization study.
- Provide technical/programmatic support to Office of the Secretary of Defense (OSD)/SAC&C (Strategic Arms Control and Compliance).
- Continue analysis of START/INF implementation costs and conduct cost benefit analyses of selected projects.
- Provide technical support to the JCIC, BIC, and Special Verification Commission (SVC).
- Continue development of improved systems to determine if limits on the number of reentry vehicles on a missile is in compliance with treaty provisions.
- Test, document and transition an improved non-damaging imaging system.
- Continue efforts on the gravity gradiometer development and demonstration.
- Test prototypes of adjunct monitoring systems.
- Cooperative teaming with national laboratories to identify advanced verification concepts and technologies.

D. WORK PERFORMED BY: Sandia National Laboratory, Albuquerque, NM; Lawrence Livermore National Laboratory, Livermore, CA; Los Alamos Laboratory, Los Alamos, NM; Institute for Defense Analyses, Alexandria, VA; Raytheon, Burlington, MA; Science Application International Corp., McLean, VA; BDM, Albuquerque, NM and McLean, VA; Systems Planning Corporation, Arlington, VA; Meridian, Alexandria, VA; MITRE, Burlington, MA; JAYCOR, Vienna, VA; Waterways Experimentation Station, Army Corps of Engineers, Vicksburg, MS; Electronic Systems Center, Hanscom AFB, MA; and the Analytic Sciences Corporation, Arlington, VA.

E. COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY: No significant change.

F. PROGRAM DOCUMENTATION: DNA conducts RDT&E programs for cooperative inspection technologies related to arms control treaty verification; requirements are provided by the DoD treaty manager and are reflected in the OSD Master Plan.

G. RELATED ACTIVITIES: None.

H. OTHER APPROPRIATION FUNDS: None.

I. INTERNATIONAL COOPERATIVE AGREEMENTS: START and Follow-on Treaties.

J. MILESTONE SCHEDULE:

- Treaty to Senate:	25 Nov 91
- Senate Vote:	1 Oct 92
- START II Treaty signed:	3 Jan 93
- START II to Senate:	15 Jan 93
- START EIF:	3rd Qtr FY93
- START II Entry-Into-Force:	3rd Qtr FY93
- START Baseline Inspections Begin:	3rd Qtr FY93
- PPCMS Deployment Begins:	3rd Qtr FY93
- START Special Access Visits Begin:	1st Qtr FY94

Program Element: #0603711H
PE Title: Verification Technology Demonstration
Project Number: CB
Budget Activity: Strategic Programs

A. RESOURCES ($ in Thousands)

Project Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
Conventional Arms Control Technology	16,739	14,888	11,423
(CFE Aerial Inspection/Open Skies)	(8,300)	(8,135)	(4,597)

B. BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEMS CAPABILITIES: This project covers RDT&E required to meet inspection technology requirements, ensure compliance, and implement existing, emerging, and potential treaties, agreements, and initiatives related to conventional arms control (CAC). Relevant agreements include: (1) the Conventional Forces in Europe (CFE) Treaty, ratified by the U.S. in December 1991 (and its follow-on, CFE-1A, signed by the member states July 1992), and entered into force July 1992; (2) the Treaty on Open Skies, signed by member states March 1992 (projected Entry-Into-Force June 1993); and (3) the Agreement on Confidence and Security Building Measures (CSBM's), signed November 1990. The RDT&E needs for emerging treaty and agreement areas include: (1) the Conference on Security and Cooperation in Europe (CSCE) Review Conferences, with its CSCE Forum for Security Cooperation; (2) regional/subregional peace-keeping and conventional arms proliferation issues; (3) enhancing Confidence and Security Building Measures; and (4) United Nations initiatives related to Transparency In Armaments (TIA) reporting. This project develops hardware and techniques to support on-site and other inspection modes, Open Skies, and provides technology and aids for U.S. compliance, e.g., a supporting data base for treaty information - the Data Management/Notification System (DMNS) and Open Skies Notification System (part of the Compliance Monitoring Tracking System (CMTS)).

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

FY 1992 Program:
- Assessed and recommended European inspection technologies for development.
- Completed initial DMNS development; established DNA DMNS test bed.
- Initiated assessment of Passive Millimeter Wave Imaging.
- Completed examination of signatures associated with conventional armaments proliferation scenarios for inspection requirements definition.
- Completed assessment of issues relating to transferability of U.S. technologies proposed for compliance monitoring.
- Assessed issues and inspection technology RDT&E requirements related to emerging and potential regional/subregional CAC regimes; determined technology issues and requirements associated with the UN's Transparency in Armaments initiative.
- Completed analysis of naval verification issues.
- Revised inspector Treaty Limited Equipment (TLE) identification aids.
- AI/OS: defended final user requirements for mission manager; defined synthetic aperture radar (SAR) requirements, initiated development program and recommendation; initiated assessment of U.S. vulnerabilities to Open Skies observation flights through modeling; initiated Open Skies notification system.
- Initiated analysis and evaluation of Russian film and processing for Open Skies.

FY 1993 Planned Program:
- Integrate CSBM reporting; transition central host nodes to UNIX operating system; integrate UNIX into DNA DMNS test bed; define requirements to develop automated analytical tool to access data from various arms control related data bases.
- Transition central host node of DMNS to the On-Site Inspection Agency (OSIA) and maintain the DNA test bed to implement potential upgraded software.
- Identify RDT&E requirements related to emerging and potential regional/subregional CAC regimes, including the Middle East, Northeast Asia, and India/Pakistan.
- Determine data integration, correlation, interpretation, and extrapolation requirements associated with CFE, Open Skies, and other arms-control regimes.
- Assess enhanced technologies for upgrading treaty regimes.

- Continue Open Skies SAR development; deliver Open Skies (OS) mission manager; continue vulnerabilities modeling; identify and execute OS unique compliance and implementation technology RDT&E requirements.
- Determine impact of existing and potential export controls on acquisitions related to modernization of conventional forces and to technologies associated with existing, emerging, and potential conventional arms-control regimes.
- Initiate RDT&E on Open Skies media archiving and processing needs.
- Analyze available, and recommend appropriate, environmental sensors for potential trainer integration with Open Skies observation platforms.
- Expand and/or modify CMTS/DMNS to meet Open Skies Notification System (OSNS) requirements.

FY 1994 Planned Program:
- Provide support to negotiators and maintain program continuity.
- Determine new technology RDT&E requirements related to allowed upgrades, enhancements, and improvements to Open Skies sensors; support negotiators; fully integrate upgrade mission manager capabilities for Open Skies regime; continue OSNS modification for Open Skies requirements.
- Determine new technology RDT&E requirements related to ensuring U.S. ability to implement and comply with provisions of existing, emerging, and potential CAC regimes.
- Develop and pursue technologies/techniques to meet identified data integration, correlation, interpretation, and extrapolation requirements.
- Determine requirements for discriminating advanced conventional weapons capabilities.
- Continue permitted Open Skies sensor improvements.

D. WORK PERFORMED BY: Institute for Defense Analysis, Alexandria, VA; BDM, McLean, VA; System Planning Corporation, Alexandria, VA; Argonne National Laboratory, Argonne, IL; Northrop Corporation, Pico Rivera, CA; Sandia National Laboratory, Albuquerque, NM; Science Applications International Corporation, McLean, VA; Jaycor, Vienna, VA; Meridian Corporation, Alexandria, VA; National Security Planning Associates, Washington, DC.

E. COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY: The current program emphasis reflects efforts to meet existing and emerging CAC requirements from the Conference on Security and Cooperation in Europe (CSCE) and from the Treaty on Open Skies in addition to specific CFE Treaty driven Research, Development, Test and Evaluation. This is a result of the signing of the Treaty on Open Skies and the provisional entry-into-force (EIF) of the CFE Treaty as well as provisions for confidence and security building measures. Programs now emphasize RDT&E efforts to support Open Skies, CSBM's, upgrade to CFE DMNS, RDT&E for Open Skies data management capabilities and its implementation, RDT&E to support the Forum for Security Cooperation, and other potential conventional arms limitations regimes and approaches which may emerge from initiatives by such organizations as the United Nations. Outyear programs continue to emphasize existing CAC regimes as well as the proactive RDT&E requirements identification related to emerging regional/subregional conventional arms control regimes (including the Middle East, Northeast Asia, southern republics of the former Soviet Union, India, and Pakistan) and conventional weapons proliferation verification and monitoring regimes.

NARRATIVE DESCRIPTION OF CHANGES

1. TECHNICAL CHANGES: None.
2. SCHEDULE CHANGES: Full UNIX migration is later than originally projected due to negotiated changes to the notifications; establishment of the Forum for Security Cooperation, to initially meet in September 1992, dictates earlier consideration of RDT&E to support any conventional arms control, CSBM's, or other initiatives.
3. COST CHANGES: Signature of the Treaty on Open Skies has shifted funding emphasis to meet the more immediate RDT&E requirements of providing an appropriate sensor suite, integrated on a satisfactory airborne platform, for fulfilling the provisions of the Treaty. The dynamics of the changing world political and security environment require more timely assessment of technology RDT&E needs related to emerging and potential, regional/subregional arms control issues and initiatives.

F. PROGRAM DOCUMENTATION: Appointed as executive agent for arms control treaty related RDT&E, requirements are developed in conjunction with the Conventional Arms Control and Compliance Directorate, OSD(A) and OSD(P)/ESN. Efforts affecting several treaties are coordinated through the Forum on Arms Control Technology.

G. RELATED ACTIVITIES: None.

H. OTHER APPROPRIATION FUNDS: None.

I. INTERNATIONAL COOPERATIVE AGREEMENTS: CFE Treaty signed 19 Nov 90, ratified Dec 91, entered into force 17 Jul 92; Confidence and Security Building Measures Agreement signed 19 Nov 90, expanded and modified in the Vienna Document 92, signed 29 Feb 92 and entered into force 1 May 92; the Treaty on Open Skies, signed 24 Mar 92, EIF anticipated in June 1993.

J. MILESTONE SCHEDULE:

- CFE Treaty ratified by U.S.:	Dec 91
- Vienna Document 92 Signature:	Feb 92
- CSCE Review Conference begins:	Mar 92
- Treaty on Open Skies Signature:	Mar 92
- Vienna Document 92 (CSBM's) Entry-Into-Force:	May 92
- CFE/CFE IA Treaty Entry-Into-Force:	Jul 92
- CFE updated data exchange:	Aug 92
- Forum for Security Cooperation (FSC) begins meeting:	Sep 92
- Annual CFE data exchange:	Dec 92
- Open Skies Entry-Into-Force:	Jun 93
- Initial TIA information submission:	Apr 93
- Open Skies Flights begin:	Sep 93
- TIA review:	Jul 95
- CFE Eliminations/Reduction Period Complete:	Nov 95
- Follow-on Open Skies aircraft with full sensor suite of Treaty-permitted sensors operational:	Jan 97

Program Element: #0603711H Project Number: CC
PE Title: Verification Technology Demonstration Budget Activity: Strategic Programs

A. RESOURCES ($ in Thousands)

Project Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
Chemical Weapons Convention Technology	22,500	21,604	21,465

B. BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEMS CAPABILITIES: This project conducts RDT&E required for multinational verification and U.S. compliance with the Draft Convention on the Prohibition of the Development, Production, Stockpiling, and Use of Chemical Weapons and on Their Destruction (CWC) and other chemical arms control agreements. It includes development of means to facilitate compliance with treaty provisions, primarily through conduct of on-site inspections and U.S. planning for compliance activities. The project also performs costing studies, technology assessments, impact, and implementation plans.

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

FY 1992 Program:
- Completed equipment field trials to validate operational concepts and identify baseline equipment requirements for inspections.
- Completed System Field Demonstrations to integrate equipment and procedures into baseline verification systems.
- Completed an assessment of CWC applications of site monitoring technologies.
- Completed an assessment of CWC applications of seals and tags.
- Continued to identify technology gaps for development of enhanced inspection equipment and began development of those systems.
- Continued development of a prototype international CWC Information Management System to process declarations and inspection data.
- Continued to assess the chemical signatures of CW activities applicable to compliance monitoring.
- Continued development and testing of non-destructive evaluation systems and selected final systems for engineering development.
- Established a capability for independent test and evaluation of CWC verification technologies and procedures.
- Initiated a program to identify, evaluate, and develop new sampling and analytical technologies for CWC applications.
- Initiated development of a CWC inspector training program.
- Initiated development of a hand-held microchip gas chromatograph chemical detector.

FY 1993 Planned Program:
- Complete development of the prototype international CWC Information Management System.
- Complete development of an integrated training program for CWC inspectors.
- Complete prototype of the hand-held microchip gas chromatograph chemical detector and begin engineering development.
- Continue to identify technology gaps during the test and evaluation of baseline verification inspection systems.
- Continue to evaluate emerging sampling and analytical technologies as they become available.
- Continue development of enhanced verification inspection systems.
- Provide technical support to U.S. compliance and implementation planning efforts.
- Begin development of a Toxin Detector for CWC listed toxins.
- Begin engineering development of selected non-destructive evaluation systems.
- Begin development of a methodology for assessing the adequacy of facility destruction verification measures.
- Begin to provide technical support to the U.S. representative to the CWC Preparatory Commission.
- Begin transition of baseline equipment and procedures to the Preparatory Commission and the Provisional Technical Secretariat.

FY 1994 Planned Program:
- Complete development of selected non-destructive evaluation systems.
- Complete development of a methodology for assessing the adequacy of facility destruction verification measures.
- Complete engineering development of the hand-held microchip gas chromatograph chemical detector.
- Continue to identify technology gaps during the test and evaluation of baseline verification inspection systems.
- Continue to evaluate emerging sampling and analytical technologies as they become available.
- Continue development of a CWC Toxin Detector.
- Continue to develop enhanced verification inspection systems.
- Continue to provide technical support to the U.S. representative to the CWC Preparatory Commission.
- Continue to provide technical support to U.S. compliance and implementation planning efforts.
- Develop prototype for managed access for CWC Inspections.
- Continue transition of baseline equipment and procedures to the Preparatory Commission and the Provisional Technical Secretariat.
- Begin development of the definitive international CWC Information Management System from the prototype.
- Support preparation for execution of the CWC inspector training program.

D. WORK PERFORMED BY: US Army Chemical Research, Development and Engineering Center, Aberdeen Proving Grounds, MD; US Army Dugway Proving Ground, Dugway, UT; US Army Chemical School, Anniston, AL; US Army Medical Research Institute of Infectious Diseases, Fort Detrick, MD; Tooele Army Depot, Tooele, UT; Air Force Technical Applications Center, Patrick AFB, FL; Los Alamos National Labs, Los Alamos, NM; Sandia National Labs, Albuquerque, NM; BDM International, Inc., McLean, VA; Systems Planning Corporation, Arlington, VA; Raytheon Services Company, Burlington, MA; Institute for Defense Analyses, Alexandria, VA; Battelle Memorial Institute, Edgewood, MD; Science Applications International Corporation, Newington, VA; General Research Corporation, Santa Barbara, CA; Meridian Corporation, Alexandria, VA; Jaycor, Vienna, VA.

E. COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY: No significant change.

F. PROGRAM DOCUMENTATION: The key document is the Convention on the Prohibition of the Development, Production, Stockpiling, and Use of Chemical Weapons and on Their Destruction (CWC). Requirements are also delineated by the treaty manager, the Assistant to the Secretary of Defense (Atomic Energy) OASD(AE), and are coordinated with the DoD's Forum for Arms Control Research and Development and the interagency Verification Technology Working Group CW Task Force.

G. RELATED ACTIVITIES: Work is being conducted as part of the Chemical Stockpile Disposal Program by the US Army Program Manager for Chemical Demilitarization to meet a Congressionally mandated requirement for destruction of the US chemical weapons stockpile. Also, compliance planning and implementation efforts related to the US/Russian bilateral agreements and the CWC are being conducted by the services with coordination provided by OASD(AE).

H. OTHER APPROPRIATED FUNDS: None.

I. INTERNATIONAL COOPERATIVE AGREEMENTS: The Convention on the Prohibition of the Development, Production, Stockpiling, and Use of Chemical Weapons and on Their Destruction; the US/USSR Memorandum of Understanding signed at Jackson Hole, WY, 23 Sep 89; the US/USSR Destruction Memorandum of Agreement signed at Moscow, May 90; the Research Agreement between the US Arms Control and Disarmament Agency

and the Japan Atomic Energy Research Institute for the development and testing of remote monitoring technology signed Jan 91; and the US/UK/Canada Memorandum of Understanding on the Cooperative Program on Research, Development, Production, and Procurement of Chemical and Biological Defense Material, ITF-11 Technologies for CWC Verification signed Mar 90.

J. MILESTONE SCHEDULE:

- CWC Signed	Jan 93
- Preparatory Commission Established	Feb 93
- CWC Entry-Into-Force	Mar 95

Program Element: #0603711H Project Number: CD
PE Title: Verification Technology Demonstration Budget Activity: Strategic Programs

A. RESOURCES ($ in Thousands)

Project Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
Yield Measurement Technology	12,520	10,818	- 0 -

B. BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEMS CAPABILITIES: Yield Measurement Technology provides the technical and operational capability to field the HYDROPLUS measurement package on underground nuclear tests in Russia to verify yield compliance in non-standard test geometries in accordance with Threshold Test Ban Treaty protocols. This technology program includes all necessary instrumentation and gauge construction, fielding support, data reduction, and analysis for technology validation in the U.S. and for actual yield verification operations in Russia. This also provides for creation and updating of the HYDROPLUS database and for improvements in HYDROPLUS instrumentation and gauge packages.

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

FY 1992 Program:
- Completed arctic climate practice deployment at the Army's Cold Regions Research Engineering Laboratory.
- Completed purchase of the third HYDROPLUS verification equipment system.
- Deployed complete instrumentation system on an underground test.

FY 1993 Planned Program:
- Develop detailed procedures manuals for HYDROPLUS deployment/assembly/installation, surveying/coring/logging, void detection, geology evaluation, laboratory testing, and yield analysis.
- Terminate effort to develop the "production" level HYDROPLUS monitoring equipment.
- Transport and "mothball" the prototype HYDROPLUS recording, power generation, command and monitoring, and geotechnical vans to a secure storage area.
- Complete assessment of improved void detection equipment and validate the new procedure.
- Complete field exercises to train HYDROPLUS designated personnel.
- Complete data analysis and document results from the FY 1992 underground test.

D. WORK PERFORMED BY: S-Cubed, La Jolla, CA; Science Applications International Corporation, San Diego, CA; California Research & Technology, Inc., Chatsworth, CA; Stanford Research International, Menlo Park, CA; R & D Associates, Albuquerque, NM; Bendix, Las Vegas, NV.

E. COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY: Recognizing the uncertainty of a resumption of nuclear testing by Russia, the yield measurement program has been terminated effective FY 1994.

F. PROGRAM DOCUMENTATION:
- Threshold Test Ban Treaty Protocol
- National Security Directive

G. RELATED ACTIVITIES: Program Elements 0305135BA (O&M, PDA, MILCON), On-Site Inspection Agency, Supporting Activities; 030589BA (O&M, PDA), OSIA Management Headquarters; 00305136BA (O&M, PDA), OSIA Operations Communications; 0602714E, DARPA. There is no duplication.

H. OTHER APPROPRIATION FUNDS: None.

I. INTERNATIONAL COOPERATIVE AGREEMENTS: The Threshold Test Ban Treaty and its Protocols.

J. MILESTONE SCHEDULE:

- Terminate effort to develop "production" level monitoring equipment	Oct 92
- High explosive test in saturated, fractured limestone	Jul 93
- High explosive test in hard rock (shale)	Aug 93
- Improve void detection equipment	Aug 93
- Validate void detection procedure	Oct 93
- "Mothball" prototype HYDROPLUS vans in secure storage area	Sep 93
- Complete detailed procedures manuals	Dec 93

Program Element: #0603711H Project Number: CE
PE Title: Verification Technology Demonstration Budget Activity: Strategic Programs

A. RESOURCES ($ in Thousands)

Project Title Popular Name	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
Safe Secure Dismantlement	1,975	-0-	-0-

B. BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEMS CAPABILITIES: On March 29, 1992, the President delegated to the Secretary of Defense the authority for establishing and executing a program to assist in the safe secure destruction of nuclear and other weapons of mass destruction in the Former Soviet Union (FSU), pursuant to House Resolution (H.R.) 3807 (Title II), as referenced in Public Law (P.L.) 102-229 (Section 108).

The Assistant to the Secretary of Defense for Atomic Energy, OASD(AE), has been delegated the management responsibility for this effort in the Department of Defense and in a memorandum dated January 11, 1993, delegated to DNA the responsibility to execute that portion of program management concerning individual projects, with the exception of the Russian Chemical Weapons Destruction Assistance program, from the time an implementing agreement with an FSU Republic is signed, through to final delivery of agreed products or services. Specific tasks will continue to be defined pursuant to agreements between the U.S. and FSU Republics. Funds will be provided for activities conducted FY 1993 - FY 1995 in the execution years as required.

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

FY 1992 Program:
- Developed, tested and evaluated prototype armored blankets. Developed specications for production.
- Developed, tested and evaluated prototype fissile material containers. Developed procurement specifications.
- Developed, tested and evaluated security systems for railcars to transport nuclear materials.

D. WORK PERFORMED BY: Science Applications International, McLean, VA.

E. COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY: This is a new start.

F. PROGRAM DOCUMENTATION:
a) 29 March 1992 Memorandum, from the President, delegating the Secretary of Defense the authority for establishing and executing a program for assistance in the safe secure destruction of nuclear and other weapons of mass destruction.
b) House Resolution (H.R.) 3807 (Title II) as referenced in Public Law (P.L.) 102-229 (Section 108).
c) 31 March 1992 Memorandum from USD(A), delegating the program management responsibility to OASD(AE).
d) 11 January 1993 Memorandum, from OASD(AE), delegating program management to DNA.

G. RELATED ACTIVITIES: Freedom for Russia and Emerging Eurasian Democracies and Open Markets Support Act of 1992.

H. OTHER APPROPRIATION FUNDS: Funds made available for the SSD efforts have been provided by appropriation as applicable for tasks. Other appropriation funds (PE 35115H) as follows:

	$000		
	92	93	94
(O&M)	1590	16629	-
(PDA)	8675	13860	-
(MILCON)	500	4500	-

I. INTERNATIONAL COOPERATIVE AGREEMENTS:

a) 17 June 1992: Umbrella Agreement between the U.S. Government (USG) and the Russian Federation concerning the Destruction and Safeguarding of Weapons and the Prevention of Weapons Proliferation.

b) 17 June 1992: Agreement between Department of Defense (DoD) and the Ministry of Atomic Energy, Russia (MINATOM) concerning The Safe and Secure Transportation and Storage of Nuclear Weapons Through the Provisions of Armored Blankets.

c) 17 June 1992: Agreement between DoD and MINATOM concerning The Safe and Secure Transportation and Storage of Nuclear Weapons through the Provision of Emergency Response Equipment.

d) 17 June 1992: Agreement between DoD and MINATOM concerning The Safe and Secure Transportation and Storage of Nuclear Weapons through the Provision of Fissile Materials Containers.

e) 17 June 1992: Agreement to provide financial assistance for detailed planning and resource management to expedite CW demilitarization activities.

f) 28 August 1992: Agreement between the DoD and MINATOM concerning the Provision of Cargo and Guard Railcar Conversion Kits.

g) 6 October 1992: Agreement between the DoD and Russia for design of a Safe Secure and Ecologically Sound Storage Facility for Fissile Material Derived from the Destruction of Nuclear Weapons.

h) 22 October 1992: Umbrella Agreement between the USG and Belarus concerning Emergency Response and the Prevention of Proliferation of Weapons of Mass Destruction.

i) 22 October 1992: Agreement between the DoD and Ministry of Defense of the Republic of Belarus concerning the establishment of Export Control Systems.

j) 22 October 1992: Agreement between the DoD and the Ministry of Defense of the Republic of Belarus concerning the provision of Emergency Response Equipment.

k) 27 November 1992: Agreement between the USG and Russia establishing an International Science and Technology Center.

l) 15 January 1993: Agreement between DoD and the Ministry of Defense of the Republic of Belarus concerning the establishment of Continuous Communications Links.

m) 18 February 1993: Agreement between the USG and Russia concerning the Disposition of Highly Enriched Uranium Extracted from Nuclear Weapons.

J. MILESTONE SCHEDULE:

- Performance accomplished in accordance with specific tasks as required.

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FY 1994 BUDGET ESTIMATES

DESCRIPTIVE SUMMARIES

DEFENSE INFORMATION SYSTEMS AGENCY

APRIL 1993

DEFENSE INFORMATION SYSTEMS AGENCY
FY 1994 BUDGET ESTIMATE
R-1 EXHIBIT

Program Element	FY 1992	FY 1993	FY 1994
0305108K C2 Research	0	0	1,847
Total Technology Base (BA 1)	0	0	1,847
0305108K C2 Research	1,956	1,740	0
Total Advanced Technology (BA 2)	1,956	1,740	0
0302016K NMCS-Wide Support	10,438	8,756	3,500
0302019K WWMCCS System Eng	11,798	8,765	9,253
0303131K MEECN	3,659	3,195	3,285
0303154K WWMCCS ADP Mod (WAM)	39,881	24,209	0
Total Strategic Programs (BA 3)	65,776	44,925	16,038
0201135K CINC C2 Initiatives	1,803	0	0
0208298K Management Hqs (JIEO)	6,893	0	0
0208045K C3 Interoperability (JIEO)	48,099	24,173	28,088
0901600K Contract Administration/Audit	0	0	1,283
Total Tactical Programs (BA 4)	56,795	24,173	29,371
0303126K Long-Haul Comm (DCS)	14,931	12,817	20,720
0303127K Support of NCS	3,454	3,155	3,839
0305830K CIM	0	3,284	0
Total Intell and Communications (BA 5)	18,385	19,256	24,559
TOTAL DISA RDT&E	142,912	90,094	71,815

DEFENSE INFORMATION SYSTEMS AGENCY
RESEARCH, DEVELOPMENT, TEST AND EVALUATION (RDT&E)
PROGRAM ELEMENT DESCRIPTIVE SUMMARIES

INTRODUCTION AND EXPLANATION OF CHANGES

1. General. This document has been prepared to provide information on the Defense Information Systems Agency's (DISA) Research, Development, Test and Evaluation (RDT&E) program to congressional committees during the FY 1994 budget hearings. The enclosed Program Element (PE) Descriptive Summaries provide narrative information on all DISA RDT&E programs and projects requested in the budget. There is a new PE included in the Descriptive Summaries, PE 0901600K (Contract Administration Audit). This effort reflects a DoD-wide realignment of funding from the Defense Contract Management Command of the Defense Logistics Agency, and the Defense Contract Audit Agency to the MILDEPS and Defense Agencies for reimbursement of contracting services rendered. Additionally, the Descriptive Summaries reflect the decision to terminate the WWMCCS ADP Modernization (WAM) Program, PE 0303154K. Finally, the exhibits reflect a functional transfer back to the Army of an Information Science Technology project under PE 0305830K.

2. Comparison of FY 1992 and FY 1993 Data. A direct comparison of data included in the PE Descriptive Summaries dated January 1992 with data included in the summaries for this year will reveal the following:

a. FY 1993: FY 1993 reductions are a result of Congressional action on the appropriation and a below threshold reprogramming action.

b. FY 1992: FY 1992 changes are due to RDT&E Reprogramming Actions as well as below threshold reprogramming adjustments.

3. Relationship of FY 1994 Budget Structure to the FY 1993 Budget Approved by Congress.

PROGRAM ELEMENT	REMARKS
BUDGET ACTIVITY 4: TACTICAL PROGRAMS	
0901600K Contract Administration/ Audit	New program element for resources to reimburse the DLA and the DCAA for services rendered but previously funded by DLA and DCAA direct appropriation

DEFENSE INFORMATION SYSTEMS AGENCY
RESEARCH, DEVELOPMENT, TEST AND EVALUATION (RDT&E)
PROGRAM ELEMENT DESCRIPTIVE SUMMARIES

4. Classification. These Descriptive Summaries are unclassified.

FY 1994 Budget Estimate Descriptive Summary

Program Element: #0305108K Budget Activity: 01 *
PE Title: Command & Control (C2) Research Center Date: April 1993

A. (U) RESOURCES ($ In Thousands)

Project Number & Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
A10	1,956	1,740	1,847	Cont.	Cont.
Total	1,956	1,740	1,847		

* Funding is in BA 2 in FY 1992 and FY 1993. Because efforts are applied research, funding has been realigned to BA 1 in FY 1994.

B. (U) BRIEF DESCRIPTION OF ELEMENT
This program element represents DISA's portion of a joint DISA multi-service effort that supports research into emerging technologies, methodologies and theories of military command and control (C2), the application of research results to resolve the problems of C2 associated with joint operations and to foster optimal use of MILDEP laboratory resources. The C2 research program was initiated to develop C2 as a scientific discipline, foster joint service techbase cooperation and demonstrations, and develop a C2 curriculum for DoD.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN FY 1994:

(U) Project Number and Title: A10 (Command and Control Research): The project supports command and control basic research and exploratory development. The project consists of research and studies for high level issues in command and control, and the development of curricula for National Defense University, Naval Post Graduate School, and the service war colleges. It investigates the effectiveness of headquarters information, decision flow, and associated times. It addresses joint tech base issues including joint distributed ADP, Joint War Gaming and technology sharing.

(U) FY 1992 Accomplishments:

- Coordinated and managed the Joint C3 Techbase Programs.
- Developed C2 theory and transitioned it into practical tools for C2 analysis.

FY 1994 Budget Estimates Descriptive Summary

Program Element: #0305108K Budget Activity: 01
PE Title: Command & Control (C2) Research Center Date: April 1993

- Published a book on the Science of C3.
- Distributed C2 development including a demonstration of distributed heterogeneous database management and module migration.
- Developed 3-D volumetric display including full color, full animation, finer resolution and interactive capability.
- Continued C2 curricula for National Defense University and other DoD Schools and analysis and studies of high level C3.

(U) FY1993 Plans:

- The Technical Panel for C3 (TPC3) continued coordinating and managing the Joint Service C3 Science and Technology Programs, developing annual Joint Service Program Plan for C3 Research and supporting the development and execution of the Deputy Director of Research and Engineering (DDR&E) Enhanced Advanced Technology Demonstration (EATD).
- Integrated distributed technologies and Joint Directors of Laboratories Network (JNET) capabilities into current EATD planning.
- Continue distributed C2 development including module migration, secure fiber optic, and graceful degradation of nodes.
- Continue development of 3-D volumetric display focusing on finer resolution.
- The Symposia for FY 92 have been held, and the information exchange through the TPC3 subpanels is a continuing process.
- Continued developing C2 curricula for National Defense University and other DoD Schools and analysis and studies of high level C3 issues.

FY 1994 Budget Estimates Descriptive Summary

Program Element: #0305108K Budget Activity: 01
PE Title: Command & Control (C2) Research Center Date: April 1993

(U) FY1994 Plans:

- Continue coordinating and managing the Joint Service C3 Science and Technology Programs, developing annual Joint Service Program Plan for C3 Research and supporting the development and execution of the DDR&E EATDs.
- Demonstrate a Copernican type architecture over JNET.
- Continue development of 3-D volumetric display including full color and full animation.
- Continue to integrate distributed technologies and JNET capabilities into EATD planning and execution.
- Continue Symposia and the information exchange through the TPC3 subpanels.
- Explore the possibility of formally expanding into the international arena by forming a C2 Research Group in the Technical Cooperative Program (TCP).
- Continue C2 curricula for National Defense University and other DoD Schools and analysis and studies of high level C3 issues.

(U) Work Performed by: The work is primarily done by the three Service C3 Laboratories, NCCOSC, CECOM and Rome Labs plus Science Applications International Corp., Calspan Inc., George Mason University, MIT, Harvard University, and Yale University.

(U) Related Activities: None
(U) Other Appropriation Funds: None
(U) International Cooperative Agreements: None

FY 1994 BUDGET ESTIMATES DESCRIPTIVE SUMMARY

Program Element: 0302016K | Budget Activity: 03
PE Title: NMCS-Wide Support | Date: April 1993

A. (U) Resources ($ in 000)

Project Number & Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
T50 NMCS Subsystem Engineering	2,206	2,169	1,145	Contg	Contg
S32 NMCS Command Center Engineering	1,662	1,452	1,533	Contg	Contg
S45 Secure Video Teleconferencing System (Funds transferred to PE 0303126K in FY 1993)	1,572	0	0	Contg	Contg
J60 Technical Support to USD(A), ASD(ISP) & ASD (PA&E)	520	398	388	Contg	Contg
W90 White House Situation Support Staff (Funds transferred to PE 0303126K beginning FY 1994)	0	295	0	Contg	Contg
T51 Contingency Planning for the President (CPP)	4,478	4,442	434	Contg	Contg
Totals	10,438	8,756	3,500		

B. (U) Brief Description of Program Element: This program element provides concept development, requirements definition, proof-of-principle experiments, rapid prototyping and technology insertions, technical specifications, systems engineering and integration, and technical assessments for NMCS Command and Control (C2) systems. This support provides informed decision-making linkage between the National Command Authorities (NCA) and the Commanders-in Chief (CINCs) of Unified and Specified Commands. Concentrating on the CINCs, this engineering draws upon improved C2 methodologies and technology insertion opportunities to meet the command, control and information system requirements of the CINCs for all crises and security threats involving US military forces. These efforts emphasize interoperability and are designed to contribute directly to the achievement of the global C4I infrastructure.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN FY 1994:

(U) Project T50 - NMCS Subsystem Engineering. This project provides NMCS subsystem engineering support to the JCS for fixed command centers by developing customized, interoperable C2 information systems from generic/standard information system architectures; identifies, prototypes and evaluates subsystem components in C2 environment; provides technology assessments of available and standard commercially furnished products; and evaluates the utility of advanced command center system support capabilities for interfacing with NCA and CINC C2 Information Systems (CCIS). A

major component of this project is security engineering support for the insertion of Multi-Level Secure (MLS) capabilities into military C2 information systems. This permits greater connectivity among secure users, leading, in turn, to increased operational effectiveness and lower costs as well as increased security. To accommodate rapid changes in requirements, coupled with increasing budget pressures, new approaches to reduce development and integration time, as well as costs for command centers, must be sought. Beginning in FY 1994, CCIS support efforts will be terminated due to a realignment of DISA priorities.

(U) Prior Accomplishments:

- o Completed El Paso Intelligence Center (EPIC) Interim Operational Capability (IOC).
- o Implemented Washington Area Security High-Speed Facsimile (WASHFAX) Interim Operational System.
- o Evolved the Intelligence System for Law Enforcement Support (ISLES) prototype.
- o Developed security engineering plans for USTRANSCOM and PACOM.
- o Established a central DoD MLS Testbed.
- o Developed a DoD MLS strategy in response to ASDC3I tasking.

(U) FY 1993 Plans:

- o Conduct Command and Control Demonstration and Evaluation Laboratory (CCDEL) activities in support of the Joint Staff's (JS) for the Warrior Concept.
- o Continue prototyping elements of the MROC 1-89 in Phase Three of the Integrated Workstation, incorporating comments from the Beta site test from Phase Two.
- o Continue to provide configuration control to SCAT software and to provide demonstrations and training to potential customers.
- o Provide continued DoD MLS program management and coordination support.
- o Provide continued security engineering support and oversight for the DoD MLS testbeds at TRANSCOM and CENTCOM, including transitioning prototypes at both testbeds to operational systems.

(U) FY 1994 Plans:

- o Enhance the CCDEL mission to include an information effectiveness capability for DISA, JS, CINCs, Services, and Agencies.
- o Field MLS LANs and workstations at CINCs, based on requirements identified in the CINC Engineering Plans, developed in FY92-FY93.
- o Update DoD MLS Strategy for ASDC3I.

FY 1994 BUDGET ESTIMATES DESCRIPTIVE SUMMARY

Program Element: 0302016K | Budget Activity: 03
PE Title: NMCS-Wide Support | Date: April 1993

(U) Work Performed By: MITRE, McLean, VA; Electrospace Systems Inc., Arlington, VA; Booz-Allen & Hamilton Inc., Arlington, VA; (DISA).

(U) Related Activities: NMCS Command Center Engineering and other command center support in Program Element #0302016K. There is no duplication of effort within the Agency or DoD.

(U) Other Appropriation Funds: None.

(U) International Cooperative Agreements: Not Applicable.

(U) Project S32 - NMCS Command Center Engineering. This project provides overall system engineering and technical integration activities for a broad spectrum of command center systems which provide the underpinning capabilities for the crisis/war decision-making processes of the NCA, NMCS, and the CINCs. Technical activities include requirements analysis, systems definition /engineering, and rapid prototyping. The project emphasizes the utilization of commercial off-the-shelf and emerging technologies for application in NMCS command centers in the areas of automated telecommunications and information processing and overall facility design to provide common solutions to theater, national, and world-wide crisis situations affecting the DoD and the Executive Office of the President.

(U) Prior Accomplishments:

- o Developed new, light-weight and low-cost voice switching and technical control design proposals to support the NEACP weight reduction program.
- o Developed an evolutionary standards application precept for the Crisis Management ADP System (CMAS).
- o Performed system engineering, integration, and test and evaluation for available NEACP Mod blocks and emerging connectivity improvements.

(U) FY 1993 Plans:

- o Provide required NMCS system engineering support for expanded Joint Situation Support Information System (JSSIS), NMCS ADP cutovers, and Defense Switch Network (DSN) service.
- o Identify alternative resolutions for issues identified in NEACP engineering plans.
- o Provide NMCC system engineering for implementation of the Washington tactical switch replacement.
- o Perform NEACP system engineering, integration, technology assessment, and Qualification Operational Test & Evaluation (QOT&E) for Mod blocks V and VI, broad band bus, and standard workstation.

(U) FY 1994 Plans:
- o Perform NEACP system engineering, integration, technology assessment, and QOT&E for Mod block VI, broad band bus, and automated workstation.
- o Provide engineering planning, technology assessment, and integration support for improvements to the President's aircraft, cabinet-level support aircraft, other SAM aircraft, the NEACP, Navy TACAMO relay aircraft, and other aircraft of the WABNRES fleet.
- o Assist the White House Military Office (WHMO) in developing an MCS upgrade for AF-1 and other SAM aircraft.

(U) Work Performed By: MITRE, McLean, VA; Electrospace Systems Inc., Arlington, VA; Booz-Allen & Hamilton Inc., Arlington, VA; DISA.

(U) Related Activities: NMCS Subsystem Engineering and other command center support in Program Element #0302016K. There is no duplication of effort within the Agency or DoD.

(U) Other Appropriation Funds: Operation and Maintenance: $979K (FY 1992); $746K (FY 1993); $713K (FY 1994).

(U) International Cooperative Agreements: Not applicable.

(U) S45 - Secure Video Teleconferencing System (SVTS). This project, tasked by Presidential Directive NSDD-314, provides a cost-effective highly secure teleconferencing system that is responsive to the urgent operational requirements of the Executive Departments which are involved in the development and implementation of National Security Policy. This system is designed primarily for use in the Executive Departments to manage national and international crises; however, those executives and their top staffs also use it for highly sensitive daily conferences.

(U) Prior Accomplishments:
- o Designed a knowledge-based system to significantly improve troubleshooting of the SVTS.
- o Designed high resolution graphics capability for SVTS users.
- o Designed a prototype SVTS mobile node, with capabilities that are limited by the size and weight restrictions required for portability.
- o Defined requirements for the high-priority enhancements to be developed and implemented next fiscal year.

(U) FY 1993 Plans:
- o Funds transferred to PE 0303126K, Project D16.

(U) J60 - Technical Support to USD(A), ASD(ISP), ASD(PA&E). This project provides direct support to the Under Secretary of Defense for Acquisition (USD(A)) and the Assistant Secretary of Defense for International Security Policy (ASD/ISP). This project

is unique in terms of policy decisions supported and that customers supported are actual DoD policy decision makers. J60 supports basic research in a number of areas of special interest to OSD's strategic nuclear targeting and phenomena community, the defense planning community, and the acquisition and employment policy making communities. It also supports system engineering, development of state of the art technologies, and the translation of these theories into analysis models. These funds support a Defense Support Activity designated in DoD Directive 5100.81, dated 5 Dec 91.

(U) Prior Accomplishments:

- o Provided analysis of Soviet Global Protection Against Limited Strikes (SGPALS) strategic defense system for years 2000 and 2000+, illustrating BLUE strategic force degradation.
- o Analyzed the effectiveness of currently deployed RED AntiBallistic Missile (ABM) systems.
- o Performed research into analytical techniques that can be utilized in building nonoverlapping RED ABM defenses.
- o Conducted study of the threat to CONUS posed by Third World cruise missiles.

(U) FY 1993 Plans:

- o Development of graphical analysis tools for study of logistical networks and strategic mobile targets.
- o Continue evolution of above and as directed by the customers in response to the world situation at that time.

(U) FY 1994 Plans:

- o Expand current analytical tools to perform a comprehensive Single Integrated Operational Plan (SIOP) database error analysis.
- o Study the effectiveness of both Air Defense Initiative (ADI) and Strategic Defense Iniative (SDI) system architectures and technologies.
- o Provide research support to the USD(A) as the ADI and SDI threat evolves.

(U) Work Performed By: DISA; Computer Based Systems, Inc. (CBSI), Fairfax, VA; Science International Applications Corporation (SAIC), McLean, VA; or other scientifically and technically qualified contractors.

(U) Related Activities: There is no duplication of effort either within the Agency or within DoD.

(U) Other Appropriation Funds: None.

(U) International Cooperative Agreements: Not applicable.

(U) Project W90 - White House Situation Support Staff. This project ensures that full level crisis management capabilities are provided to the President, Vice President, the National Security Advisor and his staff. This effort emphasizes information exchange and display products. It is part of the National Security Information and Situation Management System (NSI&SMS).

(U) Prior Accomplishments:

- o Tested modernized technical architectural structure.
- o Evaluated telecommunication capability.
- o Evaluated latest NDS technical proposal to insure overall NSI&SMS interoperability, survivability and performance is improved.

(U) FY 1993 Plans:

- o Evaluate optical storage potential and its overall impact on NSI&SMS.
- o Continue evaluation and begin prototype of telecommunication improvements.

(U) FY 1994 Plans:

- o Funds transferred to PE 0303126K, Project W90.

(U) Project T51 - Contingency Planning for the President (CPP). All aspects of this project are classified and require special access. Therefore, information on this project is not contained in this document but can be obtained upon request.

FY 1994 BUDGET ESTIMATES DESCRIPTIVE SUMMARY

Program Element: 0302019K
PE Title: WWMCCS SYSTEM ENGINEER
Budget Activity 03
Date: April 1993

A. (U) Resources ($ in 000)

PROJECT NUMBER & TITLES	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
T60 Command Center Commonality Engineering & Integration	2,150	1,501	0	0	11,533
T61 MILSATCOM System Planning	3,285	2,530	4,412	Contg	Contg
T62 Defense-Wide C3 Architecture & Planning	2,746	1,052	1,745	Contg	Contg
T63 Theater C3 Technical Integration	1,196	1,204	1,291	Contg	Contg
A19 Office of the Associate Director	450	411	490	Contg	Contg
D06 Forscom Support	380	445	400	Contg	Contg
T64 Special Projects	1,591	1,622	915	Contg	Contg
Totals	11,798	8,765	9,253		

B. (U) Brief Description of Program Element: This program element provides overall system analysis, architectural development, system engineering/integration, and developmental engineering responsibilities for joint and national level command, control, and communications (C3) systems to ensure the affected systems continue to be responsive in current, dynamically changing environments. These activities involve the Worldwide Military Command and Control Systems (WWMCCS), all MILSATCOM systems, and other joint/national level systems which necessitate a high degree of multi-service/agency planning and development. Included are technical support and engineering integration to facilitate compliance with standards and technical architectures and to improve the command centers of the Unified and Specified (U&S) Commands. Technical support in the above mentioned activities is provided to the Office of the Secretary of Defense (OSD), the Joint Staff (JS), Unified and Specified Commands (CINCs), the Military Departments and Defense Agencies. This program element develops planning guidance backed by analysis and data to support OSD, the JS, and the CINCs in prioritizing their WWMCCS requirements and acquisitions.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN FY 1994:

(U) Project T60 - Command Center Commonality Engineering and Integration. This project is aimed at improving the effectiveness of military command centers. Beginning in FY 1994, CINC support

operation and maintenance funds will be retained to complete updates to the Command Center Integrated Program (CCIP) architecture and design handbooks.

(U) Prior Accomplishments:

- o Evolved the DISA Command Center system architecture to incorporate the latest DoD guidance and policies, lessons learned, and forecasted changes in standards and protocols.
- o Developed a Joint Program Management Plan for implementing the Command Center MROC 1-89, including milestones, schedules, and participating organizations' responsibilities.
- o Deployed over 10 teams of engineering experts to the field for direct assistance to CINC, Service, and Agency requirements. Evaluated operational requirements and recommended technologies to satisfy those requirements and solutions to operational deficiencies.
- o Developed the National Military Command System (NMCS) Engineering Work Station (NEWS) relational database system for the command centers of the NMCS.
- o Developed an Integrated Program Summary for improvement and interoperability of the TRANSCOM command center.
- o Incorporated the new DoD 5000.2 Acquisition Regulations into the CCIP Summary guidance (formerly TA/CE guidance).

(U) FY 1993 Plans:

- o Perform Command Center Demonstration and Evaluation Laboratory (CCDEL) research and evaluation of distributed data bases and information networks applied to C2 functions.
- o Perform experiments and exercises in command center functional design and human factors.
- o Deploy two to four field engineering teams on-site to support CINC CCIP efforts.
- o Develop Cost and Operational Effectiveness Assessments (COEAs) for at least two CCIP upgrades as coordinated with the JS.
- o Validate and refine the enhanced Command Center Design (CCD) Expert System (ES) concepts and capabilities through use in select, real-world command center upgrades.

(U) Work Performed By: MITRE Corporation, McLean, VA; Booz-Allen & Hamilton, Inc., Arlington, VA; and DISA.

(U) Related Activities: NMCS Subsystem Engineering and NMCS Command Center Engineering in Program Element 0302016K.

(U) Other Appropriation Funds: Operation and Maintenance: $200K (FY 1994).

(U) International Cooperative Agreements: Not applicable.

(U) Project T61 - MILSATCOM System Planning. This project provides the DoD with the integrated MILSATCOM architecture and acquisition roadmap which are essential to achieve the DISA goal

of quality information services at an affordable cost. Changes in the world situation now place emphasis on the flexibility of MILSATCOM systems to meet tactical warfighting needs to project forces anywhere in the world quickly and responsively, as well as strategic needs. The coordinated engineering and management of all MILSATCOM system architectures is essential to achieve an interoperable and balanced capability for the DoD.

(U) Prior Accomplishments:
- o Developed integrated MILSATCOM Architecture & Roadmap.
- o Initial operations of Joint SATCOM Decision Support Center (JSDSC).
- o Established MILSATCOM Managers Review Group (MMRG) process.
- o Provided Decision Opportunity 1 integrated guidance.

(U) FY 1993 Plans:
- o Major revision to MILSATCOM Architecture & Roadmap.
- o Develop program guidance for Defense Satellite Communications System (DSCS) replenishment satellites.
- o Expand JSDSC modeling/simulation/requirements capabilities.
- o Develop MILSATCOM acquisition support documents.
- o Support International Telecommunications Union (ITU) & NATO planning and technology insertion.

(U) FY 1994 Plans:
- o Update MILSATCOM Architecture & Roadmap.
- o Develop commercial SATCOM architecture/implementation plan.
- o Provide architecture management for ASD(C3I) via MMRG.
- o Maintain JSDSC/integrated SATCOM requirements data base.
- o Support technology insertion & international planning.

(U) Work Performed By: AEROSPACE Corporation, El Segundo, CA; FEMME COMP, Manassas, VA; Science Applications International Corporation (SAIC), McLean, VA; The MITRE Corporation, McLean, VA; Institute for Defense Analysis (IDA), Alexandria, VA; Logicon, Reston VA; and DISA.

(U) Related Activities: This project relates to other ongoing satellite communications programs such as Program Element #0303126K (Long Haul Communications) and #0303127K (Support of the NCS).

(U) Other Appropriation Funds: None.

(U) International Cooperative Agreements: Not applicable.

(U) Project T62 - Defense-Wide C3 Architecture & Planning. This project will provide the interoperability and integration of resources essential to the achievement of a Global C3I Infrastructure that will be "seamless" to the user. This is accomplished through a multi-level planning program which includes four elements: (1) The Defense Information System (DIS), which integrates all DoD information systems, sensors, data storage services, communications networks, and computer storage devices to provide col-

lection, processing, storage, display and information transfer, giving DoD overall improved operational performance and reduced costs through common standards/interfaces and a sharing of assets and capabilities; (2) DIS Technology Insertion, which provides assessment of the utility of new technology through high level performance simulation of the DIS; (3) The Defense Information Systems Network (DISN) which addresses the fixed common-user system, treating the Defense Communications System (DCS), base-level, and rear-area tactical communications as an end-to-end system with particular focus on user requirements, technology and standards, features and services, security, and network management; (4) The DIS Security Program which includes current and future DIS security initiatives for communications and automated information systems.

(U) Prior Accomplishments:

- o Initiated Corporate Information Management (CIM) Communication & Server Architecture for Medical systems.
- o Produced and distributed initial CIM C2 mission level architecture, including standards survey for the Center for Standards DoD.
- o Produced & coordinated initial WWMCCS ADP Modernization (WAM) architecture for the WAM Project Manager (PM).
- o Developed near-term architecture for the CIM DoD Tech Architecture.
- o Developed DISN Goal Architecture & Transition Strategy document.

(U) FY 1993 Plans:

- o Provide major update of architectural guidance to reflect information systems technology/standards evolution.
- o Develop DIS 21 Architecture; adopt portions of the Command Center Information Systems (CCIS) architecture for DIS.
- o Develop CIM Distributed Computing Environment definition /direction for DoD Information Systems.
- o Develop the DoD Directory Service Architecture.
- o Develop the DISN Network Management Architecture.

(U) FY 1994 Plans:

- o Manage/participate in DoD Architectural Steering Group to assist Joint Staff (JS) in assuring required interoperability and adherence to architectural guidance for DIS C3I information systems.
- o Provide system engineering/integration support for critical (JS assigned) systems to ensure architectural convergence.
- o Update the DISN Goal Architecture and Transision Strategy document with emphasis on Tactical Communications, CINCs' Strategic Systems and Value-Added Services.

(U) Work Performed By: The MITRE Corporation, McLean, VA; Booz-Allen & Hamilton, Inc., Bethesda, MD; The Institute

for Defense Analysis, Alex, VA; Small business not yet identified; and DISA.

(U) Related Activities: This project relates to other projects in Program Element #0302019K. There is no duplication of effort within the Agency.

(U) Other Appropriation Funds: None.

(U) International Cooperative Agreements: Not applicable.

(U) Project T63 - Theater C3 Technical Integration. This project provides engineering support directly to the warfighting and supporting CINCs to overcome deficiencies and to provide C3 capabilities that allows accomplishment of their missions. In addition, it provides a mechanism to inject CIM, CCIS and DIS concepts, architectures, standards, etc., into the theater commands, thus contributing to the achievement of the Global C3I Infrastructure. USPACOM and USLANTCOM depend upon this project to correct existing C3 deficiencies which have significant operational impacts. This project provides the sole source of technical guidance to CINC C4I system development to ensure that CINC programs incorporate and are consistent with DISA goal architectures.

(U) Prior Accomplishments:

- Initated solution engineering effort for USPACOM Joint Task Force (JTF) C3 systems.
- Developed candidates for rapid prototyping in support of the USPACOM JTF effort.
- Developed system/functional characteristics for Joint Communications Network Planning and Management System.
- Established test-fix-test program to address problems in Defense Switch Network (DSN)/tactical switch interfaces.
- Provided interim CINC planning guidance on Strategic /Tactical interfaces and problem areas.

(U) FY 1993 Plans:

- Continue solution engineering for USPACOM JTF C3 systems.
- Initiate support to rapid prototype USPACOM solutions.
- Investigate feasibility of developing a prototype interim capability for Joint Network Management (JNM).
- Recommend course of action for strategic/tactical interoperability interface problems requiring immediate corrective action.

(U) FY 1994 Plans:

- Continue engineering support to USPACOM solutions.
- Initiate Cost and Operational Effectiveness Assessments (COEA) for long-term USPACOM solutions.
- Develop transition strategy from interim to objective system for MNS-JNM Program.
- Coordinate DISA and Service activities to resolve strategic /tactical interoperability shortfalls.

- o Initiate definitive long-term system characteristics to prevent reccurrence of strategic/tactical problems.

(U) Work Performed By: Booz-Allen & Hamilton, Inc., Bethesda, MD; The MITRE Corporation, McLean, VA and DISA.

(U) Related Activities: This project relates to other projects in Program Element #0302019K. There is no duplication of effort within the Agency or DoD.

(U) Other Appropriation Funds: None.

(U) International Cooperative Agreements: Not applicable.

(U) Project A19 - Office of the Associate Director: This project provides research into emerging technologies and methodologies for Command and Control (C2) to identify those long range technologies that will impact the DISA mission over the next decade, and to insert those technologies and demonstrations into the information functions of DISA.

(U) Prior Accomplishments:

- o Maintained a Center of Excellence Research Fellowship at George Mason University (GMU), staying abreast of C3 technology.
- o Assisted DISA/NCS in developing technology integration strategies for transition of DCS to DIS.
- o Assessed various technologies in the development of DISN.

(U) FY 1993 Plans:

- o Monitor and assess technologies impacting the DoD C2 process and develop technology assessment reports.
- o Continue a Center of Excellence Research Fellowship at GMU, keeping abreast of C3 system technology.
- o Continue to look for technology transfer opportunities and implement.

(U) FY 1994 Plans:

- o Continue a Center of Excellence Research Fellowship at GMU, keeping abreast of C3 system technology.
- o Assist research efforts for Advanced Technology Test Beds.
- o Assess technological advances for implementation across the DISA mission areas.

(U) Work Performed BY: MITRE, McLean, VA; DISA, Arlington, VA; GMU, McLean, VA.

(U) Related Activities: Not Applicable.

(U) Other Appropriation Funds: None

(U) International Cooperative Agreements: Not Applicable.

(U) PROJECT D06 - FORSCOM SUPPORT: The objective of this project is to integrate, develop, and refine current DISA C3 planning for CINCFOR, and propose recommendations and/or initiatives to improve command-wide C3 and Counter Drug Architecture for CINCFOR. This project provides funds for planning incremental steps neces-

sary for CINCFOR to evolve from current mission set to broader mission requirements. Dynamic changes underway within DoD drive the requirement for CINCFOR to refocus its priorities.

(U) Prior Accomplishments:

- o Conducted an initial cataloging effort of all available C3 information sources related to FORSCOM architecture development.
- o Developed Integrated C3 architecture from all previously developed FORSCOM C3 architectures and C3 system planning documents. Incorporated additional information required by the command to accommodate evolving requirements for civil support/counter drug support.

(U) FY 1993 Plan:

- o Define FORSCOM C4 impacts resulting from implementing the JCS Unified/Specified Command study.
- o Develop an Implementation Plan based on recommendation made in the Integrated C4 Architecture.
- o Conduct a Selected Analysis of items prioritized by FORSCOM, that are contained in the Implementation Plan.

(U) FY 1994 Plan:

- o Integrate reserve component C3 information systems and services with CINCs' C3 network.
- o Develop low cost alternatives to alleviate C3 system deficiencies.
- o Integrate Counter Drug unique system architectures with CINCFOR C3 system architectures to proliferate inter-operability of system services, to alleviate system redundancy, and reduce overall system costs.

(U) Work Performed by: Logicon Eagle Technology, Inc., Winter Park, FL; DISA

(U) Related Activities: Efforts in this project are dependent upon other CINC planning initiatives such as FORSCOM Operations Center (FOC) upgrade project, CINC Mobile Command Center Project, Emergency Relocation Site (ERS) project but most importantly, CINCFOR's Command, Control, Communications, Computers, and Intelligence Systems Master Plan (C4ISMP) program, and others. There is no duplication of effort.

(U) Other Appropriation Funds: None.

(U) International Cooperative Agreements: Not applicable.

(U) Project T64 - Special Projects. All aspects of this project are classified and require special access. Therefore, information on this project is not contained in this document but can be obtained upon request. This combines projects previously known as Strategic C3 Architecture and Thrift Account.

FY 1994 BUDGET ESTIMATE DESCRIPTIVE SUMMARY

Program Element: 0303131K Budget Activity: 03
PE Title: MEECN Date: April 1993

A. (U) Resources ($ in 000)

Project Number & Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
S25 Strategic Connectivity Test and Evaluation	836	881	(In FY94 project merged into Proj T70)		
S26 Strategic Connectivity Engineering	2,823	2,314	(In FY94 project merged into Proj T70)		
T70 Strategic C3 Support	0	0	3,285	Contg	Contg
Totals	3,659	3,195	3,285		

B. (U) BRIEF DESCRIPTION OF ELEMENT: This Program Element focuses on ensuring the implementation of National policy requiring nuclear Command, Control and Communications (C3) systems; support positive control of nuclear forces; and provides connectivity between National Command Authorities (NCA) and strategic and other appropriate forces to permit flexible execution and retaliatory planning before, during, and after an enemy nuclear attack. DISA performs this task as Nuclear C3 (NC3) Systems Engineer. The diverse conglomerate of communications assets supporting warning sensors, command centers and nuclear forces is dramatically changing. All plans/procedures must be changed to remain effective. This program specifically ensures that a balanced, integrated capability is maintained. This program provides direct long range and specialized support to ASD(C3I) and Joint Staff (JS) for determining which programs should be supported/ canceled, as well as support fail safe and risk reduction.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN FY 1994:

(U) Project T70 - Strategic C3 Support. This project tests command and control needed to employ US nuclear forces in an operational context simulating a range of threats. It tests our ability to generate/disseminate warning messages/Emergency Action Messages (EAMs), hold decision conferences, report back from forces and sensors on status of targets, force elements, and C3 platforms during all phases of a nuclear war. It provides direct feedback to JS/J3, J6 and operational commands on adequacy of communication plans and ability of systems/operators to implement plans in an operational setting. It provides NC3 support to the NCA, JS, and Unified and Specified Commanders-in-Chief (CINCs) to ensure positive control of strategic/non-strategic nuclear forces. Near-term nuclear force capabilities are enhanced by continuously testing in an operational setting and using results to improve subsequent communications plans. Mid-term capabilities are enhanced by

developing master plans that ensure that C3 systems which are under development meet mission requirements and properly integrate with each other and current systems.

(U) Prior Accomplishments:

- o Continued support for Failsafe and Risk Reduction (FARR)
- o Completed revision plans/procedures/test program to reflect new NC3 structure.
- o Completed initial Hemp prioritization methodology/ assessments of critical NC3 nodes.

(U) FY 1993 Plans:

- o Continue Strategic NC3 Test and Evaluation (NC3T&E).
- o Test integration/database update capability of Nuclear Planning and Execution System (NPES) software.
- o Commence Non-Strategic Nuclear Forces (NSNF) C3 operations assessment of Direct-to-Forces.
- o Support High Power Transmitter Set (HPTS) testing.
- o Incorporate new MILSTAR conferencing parameters.

(U) FY 1994 Plans:

- o Continue strategic NC3T&E/NSNF C3 operations assessment.
- o Complete identification of criteria for measurements of system performance.
- o Validate HPTS operational performance.
- o Continue assessment/tracking MILSATCOM developments in MILSTAR, UFO, DSCS-R and other military/commercial satellites.

(U) Work Performed By: MITRE Corporation, McLean, VA; Electrospace Systems Inc., Arlington, VA; Naval Ocean System Center (NOSC), San Diego, CA; Sciences Applications International Corp., (SAIC), McLean, VA; Naval Space and Warfare Systems Command (SPAWAR), Washington, DC.; DISA.

(U) Related Activities: This project relates to Program Elements #0302016K and #0302019K. There is no duplication of effort within the Agency or DoD.

(U) Other Appropriation Funds: Operation and Maintenance: $1,156K (FY 1994).

(U) International Cooperative Agreements: Not Applicable.

FY 1994 BUDGET ESTIMATES DESCRIPTIVE SUMMARY

Program Element: 0208045K | Budget Activity: 04

PE Title: C3 Interoperability | Date: April 1993

1A. (U) Resources ($ in Thousands)

Project Number & Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
T10 Center for Systems Interoperability and Integration	3,300 (Project to be funded O&M beginning in FY 1993)				
T20 Center for Standards	16,529	3,619	3,849	Contg	Contg
T30 Center for Test and Evaluation	22,959	12,381	16,320	Contg	Contg
T40 Major Range and Test Facility Base (MRTFB)	5,311	8,173	7,919	Contg	Contg
TOTAL	48,099	24,173	28,088		

B. (U) Brief Description of Element: To ensure interoperability and integration of Command, Control, Communications and Intelligence (C3I) systems through development and maintenance of a joint global architecture, interface and system standards, interface definitions, operational procedures and a test and certfication program for C3 systems; and to function as an Operational Test Agency (OTA) to test/certify the Defense Data Network (DDN), Defense Message System (DMS), and other strategic systems.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN FY 1994:

(U) Project T20 - Center For Standards. The Center serves as DoD Executive Agent for centralized management of Information Technology standards. The primary goal is to guide development of standards within DoD and encourage industry adoption of standards supporting DoD requirements. When commercially available standards exist, they will be adopted. The Center will manage development of DoD unique requirement efforts.

(U) Prior Accomplishments:

- o Finalized/approved Military Standard (MIL-STD) for High Frequency(HF) Electronic Counter Counter Measures (ECCM).
- o Published MIL-STD for Interoperability and Performance Standards for Digital Facsimile Equipment.
- o Completed MIL-STD for Integrated Services Digital Network (ISDN) Profile.
- o Completed coordination of MIL-STD for Interoperability Standard for Digital Message Transfer Device(DMTD) Systems; completed second draft of Video Teleconferencing MIL-STD.

(U) FY 1993 Plans:
- o Manage DoD development of information transfer standards.
- o Begin work on Version 2 of ISDN Profile.
- o Provide developmental support for Joint Operational Standards (JOS) and Joint Interoperability Standards (JIS), assuring interoperability of Electronic Key Management Systems (EKMS).
- o Test/publish MIL-STD-188-220, DMTD.
- o Complete Video Teleconferencing MIL-STD.
- o Complete Digital Facsimile Equipment MIL STD.
- o Develop Ultra High Frequency (UHF)/Super High Frequency (SHF) Satellite Standards.

(U) FY 1994 Plans:
- o Complete ISDN Profile Version 2.0.
- o Support merge of Secure Data Network System (SDNS) data bases for Central Facility operations.
- o Review/revise/develop/coordinate NATO Standard Agreements (STANAGs) on tactical area communications, switched system, multichannel transmission standards.
- o Develop Extremely High Frequency (EHF)/SHF SATCOM Standards.
- o Develop Advanced HF Automatic Link Establishment (ALE)/Packet Radio Standards.

(U) Work Performed By: Logicon, Inc., Winter Park, FL; The MITRE Corporation, McLean, VA; DISA.

(U) Related Activities: There is no duplication of effort within the Agency or DoD.

(U) Other Appropriation Funds: O&M: $5.2M (FY 1994).

(U) International Cooperative Agreements: Not applicable.

(U) Project T40 - MRTFB. This project provides resources to operate DISA Joint Interoperability Test Center (JITC) which is included in the DoD MRTFB. Indirect operation/maintenance expenses, facilities and logistics support are included in this project.

(U) Prior Accomplishments:
- o Established standards certification test and evaluation facilities for National Imagery Transmission Format (NITF), Government Open System Interconnection Profile (GOSIP) Version I.
- o Accredited by National Institute of Standards and Technology (NIST)/National Voluntary Laboratory Accreditation Program (NVLAP) as GOSIP Version I Conformance Laboratory and by NIST as GOSIP Version 1 Means-of-Test (MOT) Assessor.

- o Completed installation of Matrix Switch and Distributed Network Control System (DNCS).
- o Implemented second generation Message Loading Device.
- o Developed/implemented Test Procedure Generator (TPG) for Commanders-in-Chief (CINCs)/Services/Agencies (C/S/As).
- o Developed/promulgated necessary policy/procedure documents to activate JITC as an MRTFB.

(U) FY 1993 Plans:

- o Establish JITC as NIST/NVLAP accredited GOSIP Version 2 Conformance Laboratory and NIST accredited GOSIP Version 2 MOT Assessor.
- o Continue modernization efforts such as: development of C3I system stimulator; DNCS upgrades; delivery of MSE Packet Switches; improved circuit switch loading capability; development of Variable Message Format (VMF) and Army Tactical Digital Link-1 (ATDL-1) test tools.
- o Enhance Multi-Level Security (MLS) testing capability.
- o Integrate Central Data Base System (CDBS) 2000 Tactical Data Information Link (TADIL) standards into appropriate JITC certification test systems/testbeds.

(U) FY 1994 Plans:

- o Upgrade JITC Conformance Laboratory to GOSIP Version 3.
- o Continue modernization efforts such as: development of C3I system stimulator; DNCS upgrades; procurement of Joint Tactical Information Distribution System (JTIDS) terminals for the Joint Portable TADIL Tester (JPTT); and develop TADIL C test tool.
- o Continue development of software/hardware upgrades to test tools as JPTT and MicroMAS.

(U) Work Performed By: BDM, Albuquerque, NM; LOGICON, Winter Park, FL; INTEROP, Sierra Vista, AZ; DISA.

(U) Related Activities: There is no duplication of effort within the Agency or DoD.

(U) Other Appropriation Funds: Not applicable.

(U) International Cooperative Agreement: Not applicable.

FY 1994 BUDGET ESTIMATES DESCRIPTIVE SUMMARY

Program Element: 0208045K
PE Title: C3 Interoperability
Project Number: T30
Budget Activity: 04
Date: April 1993

A. (U) Resources ($ in Thousands)

Project Title Popular Name	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
T30 Center for Test and Evaluation	22,959	12,381	16,320	Contg	Contg

B. (U) Brief Description of Mission Requirement and System Capabilities: This Center plans, conducts, evaluates, and reports the results of Tests and Evaluations (T&E) for DoD Command and Control Information Systems (C2IS) during proof-of-concepts phase, during system development/deployment phases, and over the entire system life cycle. This Center provides testing, evaluation, and analytical support in every phase of the JIEO systems engineering process, supporting a multitude of other DoD and non-DoD customers. The T&E mission includes DoD information systems, protocols, interoperability, information exchange systems, certification testing of C2 systems software, standards conformance, Corporate Information Management (CIM), standards validation testing, operational and developmental T&E, and selected engineering prototype testing.

C. (U) Program Accomplishments and Plans:

(U) Prior Year Accomplishments:

- o Conducted total of 104 Information Systems interoperability tests.
- o Completed multiple voice switch tests including USSOUTHCOM switch interoperability and USCENTCOM voice and data switch interoperability tests.
- o Established test plans and standards certification facilities for Secure Fax and High Frequency (HF) Automatic Link Establishment MIL-STDS-188 series.
- o Completed Defense Data Network (DDN) baseline assessment test report and Defense Message System (DMS) Tactical Evaluation Master Plan (TEMP).
- o Performed assessment of end-to-end testing of Worldwide Military Command and Control System ADP Modernization Program (WAM) on Joint Operations Planning and Execution System (JOPES).
- o Completed transition of Joint Interoperability Evaluation Systems (JIES) to JITC. Completed in-depth study of existing JIES hardware and software, and initiated structured approach to recover from earlier development efforts.
- o Relocated Joint Interface Test System (JITS) from Fort Monmouth to Fort Huachuca.

- o Provided support to Commanders-in-Chief (CINCs) on C3I interoperability issues during Ocean Venture 92 and Cobra Gold 92.

(U) FY 1993 Plan:

- o Continue joint development and operational interoperability certification testing of 16 Tactical Digital Information Link (TADIL) systems and 6 Message Text Format (MTF) systems.
- o Continue to identify joint and/or combined technical, procedural, operational and conformance interfaces requiring C2IS interoperability certification from CINCs/Services/Agencies (C/S/As).
- o Perform following technical tests: Defense Switch Network (DSN) to tactical baseline assessment; DSN to tactical switch test; tactical switch interoperability test.
- o Achieve JIES Initial Operating Capability (IOC), Breakpoint 1.
- o Continue software development of JIES in TADIL J area.
- o As DISA Operational Test Agency (OTA): complete DDN Independent Evaluation Report (IER); complete DDN Operational Test Plan (OTP) Test Report and IER for Phase I; prepare OTP for Defense Integrated Services Network (DISN)-Near Term; begin evaluation of Defense Message Conversion System (MCS).
- o Provide support to warfighting CINCs to resolve C3I system interoperability problems in joint and combined exercises.

(U) FY 1994 Plan:

- o Continue to identify joint/combined technical, procedural, operational and conformance interfaces requiring C2IS interoperability certification from C/S/As.
- o Provide support to warfighting CINCs requesting assistance in resolving C3I system interoperability problems in joint and combined exercises.
- o Continue joint development and operational interoperability certification testing for TADIL and MTF systems.
- o As DISA OTA, complete DISN-Near Term operational T&E and independent assessment plan for first change-of-phase assessment of DMS.
- o Upgrade JIES system to full TADIL A, B, and J monitoring capability and achieve JIES IOC for Breakpoint 2.
- o Validate interoperability of C2IS used in joint and/or combined military operations by planning/conducting/reporting technical and conformance interfaces tests.

(U) Program Plan to Completion:

- o This is a continuing program.

FY 1994 BUDGET ESTIMATES DESCRIPTIVE SUMMARY

Program Element: 0208045K
PE Title: C3 Interoperability
Project Number: T30
Budget Activity: 04
Date: April 1993

D. (U) Work Performed By: BDM-Engineering Services Company, Albuquerque, NM; LOGICON, Winter Park, FL; INTEROP, Sierra Vista, AZ; DISA.

E. (U) Comparison with FY 1993 Descriptive Summary: No change.

F. (U) Program Documentation: Not applicable.

G. (U) Related Activities: There is no duplication of effort within the Agency or DoD.

H. (U) Other Appropriation Funds: Not applicable.

I. (U) International Cooperative Agreements: Not applicable.

J. (U) Milestone Schedule:

o JIES TADIL A and B Monitoring IOC	QTR3/FY93
o JIES TADIL J Monitoring IOC	QTR3/FY94

FY 1994 BUDGET ESTIMATES DESCRIPTIVE SUMMARY

Program Element: #0901600K
Title: Contract Administration/Audit

Budget Activity: 04
Date: April 1993

A. (U) RESOURCES ($ in Thousands)

Project Number & Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
C01 Contract Administration/Audit	0	0	1,283	Con't	Con't
Total	0	0	1,283	Con't	Con't

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program element contains funding to reimburse the Defense Contract Management Command, an organization of the Defense Logistics Agency, and the Defense Contract Audit Agency for services rendered with respect to contract audit and management efforts performed for DISA.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN FY 1994:

(U) C01: Contract Administration/Audit: This project involves the provision of contract audit services and of contract administration services. Resources associated with this project will be used to reimburse the two service providers.

(U) FY 1992 Accomplishments: In FY 1992, funding for these services was part of the DLA and DCAA direct appropriations.

(U) FY 1993 Plans: In FY 1993, funding for these services is part of the DLA and DCAA direct appropriations.

(U) FY 1994 Plans: In FY 1994, funds will be provided to the DLA and the DCAA for contracting services rendered.

(U) Work Performed By:
The Defense Contract Management Command of the DLA and the Defense Contract Audit Agency.

(U) Related Activities: None.

(U) Other Appropriation Funds: Procurement: $1,368K (FY 1994)

(U) International Cooperative Agreements: Not applicable.

FY 1994 Budget Estimates Descriptive Summary

Program Element: 0303126K
PE Title: Long Haul Communications

Budget Activity: 05
Date: April 1993

A. (U) RESOURCES (Dollars in $000)

Project Number & Title	FY1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
D11 Drug Enforcement	1,250	(Submitted under separate cover)			
D12 DoD Communications Information Security Management	149	178	350	Continuing	Continuing
D16 Secure Video Teleconferencing System (SVTS)	0	583	699	Continuing	Continuing
D20 Defense Information System Network (DISN)	6,329	4,367	8,055	Continuing	Continuing
D30 DCS Network Management System (NMS)	1,115	1,910	2,532	Continuing	Continuing
D40 Defense Satellite Communications System (DSCS)	3,009	1,250	2,587	Continuing	Continuing
D50 Defense Switch Network (DSN)/CINC Support	256	152	807	Continuing	Continuing
D60 Defense Data Network (DDN)	264	359	847	Continuing	Continuing
D70 Terrestrial Transmission	0	1,509	1,184	Continuing	Continuing
D80 Defense Message System (DMS)	2,519	2,509	3,209	Continuing	Continuing
S50 DCS Architectural Standards Support	40	(transferred to P.E. 0208045K)			
W90 White House Situation Support Staff (WHSSS)	0	0	450	Continuing	Continuing
TOTAL:	14,931	12,817	20,720		

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program element funds system engineering, test, and evaluation for the Defense Communications System (DCS) which provides Defense-wide communications for the day-to-day operations of the DoD and serves as the core of DoD wartime communications for the National Command Authorities (NCA), the Joint Chiefs of Staff (JCS), the Commanders in Chief (CINC's), and other critical users. It also supports the evolution of the DCS from a separate telecommunication system to an integral part of the

Defense Information System Network (DISN). Rapidly advancing ADP and telecommunications technologies are providing increased capabilities at reduced costs. This PE provides for the network engineering vital to exploit these technologies to reduce the cost of the DCS and to provide valuable new information services to our users. This network engineering emphasizes the performance of engineering trade-off studies to evaluate commercial equipments and service offering to provide economy and higher productivity for the DCS. It also includes the development of engineering tools needed to perform these studies, the coordination with military and commercial standards organizations for incorporation of program unique features; and the development of functional specifications to be provided to the military departments to develop DCS subsystems when commercial offerings cannot be modified to meet the military requirements for survivability, security, and interoperability.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10,000K IN FY 1994:

(U) PROJECT D12 - DoD COMMUNICATIONS INFORMATION SECURITY MANAGEMENT: This project is an OSD directed effort to provide support for the development of the Defense Message System (DMS) Security Architecture, development of the Defense Data Network (DDN) Security Architecture and support for the Defense-Wide Information Systems Security Program. It will assess DCS network components which are vulnerable to operational failure or unauthorized disclosure of information through exploitation of system design flaws.

(U) FY 1992 Accomplishments:
- o Developed program plan and resource requirements to adequately support a DCS Vulnerability Assessment Program.
- o Began survey and prioritization of DCS components to be analyzed.

(U) FY 1993 Plans:
- o Refine and update resource requirements and program plan for DCS Vulnerability Assessment Program.
- o Set goals and objectives for DCS component analysis.

(U) FY 1994 Plans:
- o Establish test plans and procedures for testing and evaluation of components (e.g. gateways, routers) and coordinate with vendors fixing of problems discovered through the analysis of components.
- o Modify overall program plan as DISN evolves and priorities change.

(U) Work Performed by: MITRE Corporation, McLean, VA.
(U) Related Activities: This project supports the Defense-Wide Information Security Program. There is no duplication of effort.
(U) Other Appropriation Funds: None.
(U) International Cooperative Agreements: None.

FY 1994 Budget Estimates Descriptive Summary

Program Element: 0303126K
PE Title: Long Haul Communications
Budget Activity: 05
Date: April 1993

(U) PROJECT D16 - SECURE VIDEO TELECONFERENCING SYSTEM (SVTS): This project, tasked by Presidential Directive NSDD-314, provides a cost-effective highly secure teleconferencing system that is responsive to the urgent operational requirements of the Executive Departments involved in the development and implementation of national security policy. This system is designed primarily for use by executives in the Executive Departments to manage national and international crises, and for highly sensitive daily conferences.

(U) FY 1992 Accomplishments:

- The FY 1992 accomplishments are documented under Program Element #0302016K, Project S45.

(U) FY 1993 Plans:

- Design, develop, prototype and implement the next group of top priority SVTS user-defined enhancements, according to the priorities set by the users.
- Validate the next group of top priority user-defined enhancements. Priorities will be set by the SVTS user group.

(U) FY 1994 Plans:

- Design and prototype enhanced capabilities for the mobile node, and implement the most urgent of those capabilities.
- Design and prototype enhancements to optimize usage of the available bandwidth of the communications links.
- Redesign and prototype selected SVTS subsystems to improve and optimize system reliability, availability, and maintainability.

(U) Work Performed by: Harris Corporation, Melbourne, FL through FY93. Contract will be recompeted in FY93, with new contract awarded in FY94.
(U) Related Activities: There is no duplication of effort.
(U) Other Appropriation Funds: O&M: $1039K (FY94). Procurement: $252K (FY94).
(U) International Cooperative Agreements: None.

(U) PROJECT D20 - DEFENSE INFORMATION SYSTEM NETWORK (DISN): The goal of this project is to design and implement an interoperable, flexible, efficient and affordable network to provide the full spectrum of communications and information transfer requirements for the future of DoD. Initial DISN efforts will concentrate on consolidation of various service/agency networking initiatives such as AFNET, NAVNET and DLANET with DISA's pilot internet initiative. Follow-on efforts will use emerging integrated voice and data and cell-relay switching technology to combine voice, data, video and imagery services over an integrated digital network.

(U) FY 1992 Accomplishments:

- Updated/modified the DISN network engineering plan.

FY 1994 Budget Estimates Descriptive Summary

Program Element: 0303126K
PE Title: Long Haul Communications
Budget Activity: 05
Date: April 1993

- o Collected, analyzed and validated service/agency requirements.
- o Developed and enhanced computer based models for consolidating service/agency T1 networks into a T3 backbone network.
- o Conducted engineering design, technology assessment and implementation studies for various hardware alternatives.
- o Developed criteria for protocol selection and hardware.
- o Conducted Integrated Services Digital Network (ISDN) technical integration and cost studies.
- o Developed functional specifications for the DISN network.
- o Provided technical support to the Internet Engineering Testbed.
- o Provided technical support for the Protocol Laboratory Program.
- o Establish a DISN multiplexer test facility at JITC and initiated testing of Integrated Digital Network Exchange (IDNX) equipment.
- o Acquired networking multiplexer design software.
- o Complete video teleconferencing standardization, testing, and certification.

(U) FY 1993 Plans:

- o Update/modify the DISN network engineering plan.
- o Continue enhancement of computer based models for network design.
- o Provide DISN acquisition engineering support.
- o Provide technical support for the Internet Engineering Testbed.
- o Provide technical support for the Protocol Laboratory program.
- o Provide technical support to enhance and deploy the Internet policy-based routing protocol into Internet.
- o Perform analysis, design, prototyping and test evaluation of a limited number of solutions to unique DoD requirements for Internet Network Management using standard International Standards Organization (ISO) protocols.
- o Perform engineering analysis for transmission system implementation.
- o Develop algorithms/tools for DISN performance evaluation.

(U) FY 1994 Plans:

- o Develop DISN network design to include worldwide requirements.
- o Perform engineering for DISN network.
- o Develop plan for DISN evolution.
- o Develop specification for user quality service in the router networks.
- o Design end-to-end router precedence and control on a world-wide basis.
- o Develop physical security guidance and procedures for DISN nodes.
- o Provide technical support to the evaluation of the bidders proposals for DISN contracts.
- o Assess DISN network standards and technology.
- o Enhance DISN network design model.
- o Analyze DISN Architecture.

FY 1994 Budget Estimates Descriptive Summary

Program Element: 0303126K
PE Title: Long Haul Communications

Budget Activity: 05
Date: April 1993

- o Influence the incorporation of DISN military requirements into national and international standards.
- o Enhance network design and performance analysis models for integrated design.
- o Perform interoperability, test and evaluation (T&E) of new equipment/systems.
- o Perform DISN interoperability T&E with Allied and Foreign PTT systems.
- o Develop prototype and evaluate Non-Developmental Item (NDI) equipment for DISN, Defense Message System (DMS) and Defense Simulation Internet (DSI) entry gateways.
- o Formulate technical concepts, develop and direct implementation of a new trouble ticket system.
- o Engineer solutions to system problems identified in the DISN Investigative Report and Problem Report Tracking System.
- o Perform feasibility analyses for DIS ISDN Fly-Away Node.
- o Extend Machine Intelligent Technical Controller (MITEC) capabilities to include DISN/AFNET multiplex equipment.
- o Extend Technical Control Automation Protocol (TCAP)/MITEC capabilities to include multi-site DISN/AFNET multiplex equipment operation and expert system diagnosis.
- o Extend Transmission Alarm Interpreter (TAI) rules, knowledge bases and methodologies to support multi-site (multi-segment) alarm interpretations in support of centralized operations by MILDEPs.

(U) Work Performed by: University of Virginia, Charlottesville VA; MITRE Corporation, McLean VA; George Mason University, Fairfax VA; BBN Corp., Cambridge MA; AT&T, Raleigh NC; Virginia State University, Petersburg VA.
(U) Related Activities: Services/agencies are working on networking strategies of the future for individual requirements. DISA is taking the lead to ensure interoperability over a single integrated network with no duplication of effort.
(U) Other Appropriation Funds: O&M $885K.
(U) International Cooperative Agreements: None.

(U) PROJECT D30 - DCS NETWORK MANAGEMENT SYSTEM (NMS): The objective of this project is to provide a survivable network management control capability within the DCS to enable near real-time monitoring and control of the DCS infrastructure, cost effective utilization of leased bandwidth, and expedient service provisioning to DCS users during peacetime, escalation, contingency, wartime or other national emergency.
(U) FY 1992 Accomplishments:

- o Provided analysis of database issues relating to the integration of subnets (AFNET, NAVNET, DLANET, Pilot Internet) into the current DCS.

FY 1994 Budget Estimates Descriptive Summary

Program Element: 0303126K
PE Title: Long Haul Communications
Budget Activity: 05
Date: April 1993

- Devised an engineering plan to bundle circuit requirements for the diverse networks for greater efficiency and reduced cost.
- Engineered enhancements for DSN Integrated Management Support System - Europe (DIMSS-EUR) and for DIMSS-Pacific IOC.
- Prepared engineering Network Management (NM) inputs for DISN.
- Defined interface of Universal Modem for integrated control.
- Engineered Deployable Area Communications Operations Center (ACOC).
- Security analysis of Network Management Operations Center (NMOC).

(U) FY 1993 Plans:

- Provide engineering support for the DCS NMOC Integration.
- System engineering for DIMSS enhancements for Europe and Pacific.
- Develop system design for DISN Level III NM Centers.
- Develop proof of concept for secure gateway for NMOC Integrated Network Management System (INMS).
- Develop enhanced control concepts for integrated SATCOM and DIS network management.

(U) FY 1994 Plans:

- Begin upgrade of the Integrated Network Management System (INMS) in Allied Combined Operations Center, Pacific.
- Exploit new technologies to enhance DSCS reconfiguration flexibility.
- Perform engineering for control capabilities required for deployment of Universal Modem and Interim System Planning Computer.
- Provide engineering support for the development of DISN operations center network management facilities.
- Provide the systems engineering required to transfer the technology of the DSN Integrated Management Support System (DIMSS) expert system and trainer technology to provide similar network management and training capability for the IOC of the DISN.
- Develop a concept plan to perform end user to end user network management for DISN.
- Complete the design for consolidated control of Service/Agency subnets.
- Provide engineering support for the interim network management system in CONUS.
- Design the capability to measure detailed DISN traffic data for DISN redesign.
- Prepare specification and technical input to SOW for DISN network management system, including end user to end user network management.

(U) Work Performed by: American Telephone and Telegraph, Bell Labs, Whippany, NJ; American Management Systems Inc., Arlington, VA; Sprint International Communications Corp, Herndon, VA; Stanford Research

FY 1994 Budget Estimates Descriptive Summary

Program Element: 0303126K
PE Title: Long Haul Communications
Budget Activity: 05
Date: April 1993

Incorporated, Menlo Park, CA.
(U) Related Activities: Rome Laboratories (USAF) is working an effort on an Expert System for Integrated DCS System Control funded under Program Element #0303126F (Long Haul Communications). There is no duplication of effort. Rome Labs (USAF) is developing a tactical ISDN switch under Program Element #0303126F. This work will compliment the work on the ISDN Fly-Away Node. There is no duplication of effort.
(U) Other Appropriation Funds: None.
(U) International Cooperative Agreements: None.

(U) PROJECT D40 - DEFENSE SATELLITE COMMUNICATIONS SYSTEM (DSCS):
Accomplishes the engineering for the development and enhancement of subsystem and components of DSCS to provide vital communications service to U.S. and allied forces as an integral part of the DISN. DSCS satisfies JCS validated Global Command and Control System (GCCS) priority requirements, and provides flexible robust communications to crises/contingency activities.
(U) FY 1992 Accomplishments:
- o Provided system engineering for DSCS enhancements & classified users.
- o Continued engineering analysis and technical planning in support of DSCS III launches and prepared system concept definition for DSCS satellites number 15 and beyond.
- o Continued to perform Electronic Counter Counter Measures (ECCM) and Frequency Division Multiple Access (FDMA) network engineering.
- o Provided system engineering for development of Super High Frequency (SHF) Demand Assignment Multiple Access (DAMA) Standard and for implementation of SHF waveform standard.
- o Completed engineering analysis for earth terminal modernization.
- o Provided Jam Resistant Secure Communications (JRSC) engineering analysis, integration planning and support to users.
- o Completed transition engineering and technical planning in support of Distributed MILSATCOM Conferencing (DMC).

(U) FY 1993 Plans:
- o Provide engineering for DSCS enhancements and classified users.
- o Provide engineering support for development of modified DSCS III satellites.
- o Provide engineering in support of Universal Modem System (UMS).
- o Update ECCM and FDMA network engineering initiate smart mux integration.
- o Initiate a Demand Assignment Bandwidth System (DABS) for use by DISN nonfull-time subscribers.
- o Continue system engineering for DAMA Standard and for Architecture Roadmap Decision Opportunity Number 2 (DO2).

FY 1994 Budget Estimates Descriptive Summary

Program Element: 0303126K
PE Title: Long Haul Communications
Budget Activity: 05
Date: April 1993

(U) FY 1994 Plans:

- o Provide system engineering for DSCS enhancements and classified users.
- o Continue to update ECCM and FDMA network engineering.
- o Initiate technical analysis for integrating commercial technology into U.S. terminal upgrade programs and DSCS control and network management reduce O&M costs.
- o Provide engineering of network designs and technical direction for survivable secure communications networks.
- o Complete the test and evaluation of control segment.
- o Develop interface between DSCS and DISN.
- o Provide engineering analysis of space segment improvements to enable use of smaller terminals to support rapid deployment of forces.
- o Provide system engineering for MILDEPs' small terminal programs.
- o Provide engineering support for SHF Replenishment Cost and Operational Effectiveness Analysis (COEA).
- o Continue system engineering support for DO2.

(U) Work Performed by: SAIC, Tysons Corner, VA; STEL, Inc., Reston, VA; Harris Corp., Alexandria, VA; Pragmatics, Inc., McLean, VA; Telemarc Inc., Fairfax, VA.
(U) Related Activities: Related efforts are contained in Program Element #0303142A (SATCOM Ground Environment) and Program Element #0303110F (DSCS Space Segment). There is no duplication of effort.
(U) Other Appropriation Funds: O&M: $2694K (FY94).
(U) International Cooperative Agreements: None.

(U) PROJECT D50 - DEFENSE SWITCHED NETWORK (DSN): The purpose of this project is to perform networking and system engineering tasks for the worldwide DoD voice communications network. This project includes the DoD red Switch Network (RSN); the Central Area (CA), and Southwest Asia Telecommunications System (SATS), including strategic/tactical interfaces; and the strategic planning for the Defense Simulation Internet (DSI). The tasks in this project focus on developing advanced capabilities such as Common Channel Signalling (CCS), Integrated Services Digital Network (ISDN), system interfaces, secure voice and secure voice conferencing. The DSI will be a high capacity network testbed created to support the full spectrum of warfighting simulation, and will be used to expand commercial networking technology integration.
(U) FY 1992 Accomplishments:

- o Developed network designs and specifications for the DSN, DoD Red Switch Network, and the CA.
- o Identified and resolved transitional and operational network problems.

FY 1994 Budget Estimates Descriptive Summary

Program Element: 0303126K
PE Title: Long Haul Communications
Budget Activity: 05
Date: April 1993

(U) FY 1993 Plans:
- o Develop and implement an interface for DSN and Mobil Subscriber Equipment (MSE) interconnectivity in the CA.
- o Design and implement DSN pilot switched 56kbps network to support video and secondary imagery dissemination.
- o Design and implement DSN-PAC pilot ISDN Network.
- o Provide engineering for DSN Redesigns.
- o Provide engineering for ISDN demonstration network.
- o Design and begin implementation of Defense Red Switch Network as per OASD Memo "Defense Wide Secure Voice Program."
- o Update DSN engineering documentation.

(U) FY 1994 Plans:
- o Enhance the DoD ISDN Demonstration Network.
- o Provide engineering for DSN switch test plan and procedures.
- o Provide engineering in support of Certification of DSN Switches.
- o Develop tactical & PBX interfaces to KN-S-4100 switch.
- o Conduct Common Channel Signaling #7 (CCS7) Interoperability Tests.
- o Initiate integration of DSI technology into DISN.

(U) Work Performed by: AT&T, Raleigh, NC; AT&T, Greensboro, NC; MITRE Corp, McLean VA; Logicon Inc, Reston, VA.
(U) Related Activities: National Security Agency (NSA) is initiating a program for the development of an ISDN compatible secure terminal under Program Element #0303401G (Communications Security).
(U) Other Appropriation Funds: O&M: $2426K (FY94).
(U) International Cooperative Agreements: None.

(U) PROJECT D60 - DEFENSE DATA NETWORK (DDN): The DDN project improves the performance and services of the end-to-end secure, survivable and enduring data communications systems to meet DoD data transfer requirements for formal message service and computer-to-computer data transfer. Validated operational user requirements and overall architectural goals shape the planning and evolution of this system.

(U) FY 1992 Accomplishments:
- o Identified requirements for evolving existing data services.
- o Planned the transition to Integrated DCS.
- o Planned and engineered improvements to existing data services.
- o Planned and engineered transition to new DDN components.

(U) FY 1993 Plans:
- o Conduct engineering in support of transition to an Integrated DCS.
- o Specify, design, prototype, integrate and test solutions to unique DoD

requirements using the baseline GOSIP suite of protocols.
- o Provide technical support for introducing solutions to unique DoD requirements into the standards bodies and the Internet community.
- o Provide system engineering support on issues relating to DoD-to-GOSIP protocol transition.

(U) FY 1994 Plans:
- o Provide engineering in support of the transition from DDN to DISN.
- o Provide engineering to implement designs to combine MILNET/DISNET 1 and DISNET 2/DISNET 3.
- o Model enhancements in support of DDN designs.

(U) Work Performed by: BBN Corp., Cambridge, MA; GSI Inc., Sterling, VA; MITRE Corporation, McLean, VA, University of Virginia, Charlottesville, VA.
(U) Related Activities: All DoD S/A have DDN components. Work under this project is related to efforts under Program Element #0303126F (Long-Haul Communications) (USAF), Program Element #0305167G (Consolidated Computer Security Program (CCSP)), and Program Element #0303401G (Communications Security) (NSA). These are cooperative rather than duplicative efforts.
(U) Other Appropriation Funds: O&M: $1135K (FY 94).
(U) International Cooperative Agreements: None.

(U) PROJECT D70 - TERRESTRIAL TRANSMISSION (TT): This project provides system engineering support to the development of survivable, cost effective responsive and secure core telecommunications capability to DIS users. Provides improved interoperability with tactical, common carrier, joint service and allied communication networks, and improved endurability and responsiveness during wartime and crisis conditions. Provides engineering support to design, develop, and analyze the transmission systems of the Defense Information Systems Network (DISN).
(U) FY 1992 Accomplishments:
- o Provided minimal level support with in-house staffing.

(U) FY 1993 Plans:
- o T&E interoperability of various transmission systems and tactical networks with DISN.
- o Initiate demonstration of base/station level transmission network management subsystem concepts for DIS Level III network management applications.
- o Provide system/knowledge engineering to extend Machine Intelligent Technical Control (MITEC) capabilities to include DISN smart multiplex equipment.
- o Complete development of computer-based design packages for VHF/UHF link and network systems.

FY 1994 Budget Estimates Descriptive Summary

Program Element: 0303126K
PE Title: Long Haul Communications
Budget Activity: 05
Date: April 1993

- o Produce and evaluate link design tools for fiber optic and Synchronous Optical Network (SONET) transmission systems.
- o Provide engineering support for development of standards for DISN node design.

(U) FY 1994 Plans:

- o Upgrade HF links with automatic link establishment, anti-spoofing, networking capability, and DDN connectivity.

(U) Work Performed by: MIT Lincoln Laboratories, Lexington, MA.
(U) Related Activities: Rome Laboratories (USAF) is the lead organization for MITEC within the Air Force.
(U) Other Appropriation Funds: None
(U) International Cooperative Agreements: Not Applicable.

(U) PROJECT D80 - DEFENSE MESSAGE SYSTEM (DMS): The purpose of this project is to provide systems engineering support to determine DMS requirements, assess the feasibility of using Commercial Off-the-Shelf (COTS) technology and services, and designing enhancements and extensions to commercial products where necessary to meet DMS requirements. Secure messaging, transitional components, and systems engineering are major areas of the project, focusing on military requirements.

(U) FY 1992 Accomplishments:

- o Revised COTS technology assessment/R&D planning baseline.
- o Performed implementation strategy analyses and engineering.
- o Developed Mail List Agent proof of concept model.
- o Defined X.500 directory requirements.
- o Developed Allied Communication Procedure (ACP) 123 common message format and procedures.
- o Analyzed and defined tactical requirements for DMS.
- o Analyzed requirements for gateways needed by DMS.

(U) FY 1993 Plans:

- o Support refinement and validation of DMS Required Operational Messaging Characteristics.
- o Revise DMS Functional and Security Evaluation Documentation.
- o Support refinement and validation of ACP 123 document.
- o Refine definition of X.400, X.500 and Service Management components.
- o Update DMS Target Architecture and Implementation Strategy (TAIS) Phase 1 and 2 Appendices.
- o Refine and complete DMS Concept of Operations.
- o Refine and complete DMS Service management Concept of Operations and requirements definition.
- o Support development and implementation of Proof of Concept

(POC) DMS components (including X.400, X.500, Service Management, and PMSP).
- o Support development of Initial Operational Capability (IOC) DMS components (including X.400, X.500, Service Management, and PMSP).
- o Support transition planning and associated implementations.
- o Support continued tactical requirements definition.
- o Continue analysis of gateways required by DMS.
- o Complete development of AUTODIN simulation capability to support AUTODIN Switching Center closures.
- o Continue to promote DMS requirements into various standards fora.
- o Implement initial operational capability of on-line automated project management/project tracking tools.

(U) FY 1994 Plans:
- o Perform simulations of AUTODIN for AUTODIN Switching Center (ASC) closure planning.
- o Provide engineering for promoting DMS requirements into various standards fora.
- o Provide engineering for promoting ACP-123 through international arena.
- o Develop specifications for Phase 2 components (e.g. Message Transfer Agents (MTA), Organizational User Agents (OUA), etc.).
- o Provide directory services engineering, culminating in a SOW.
- o Develop specifications for Phase 2 Mail List Agent (MLA) using lessons learned from Phase 1 MLA.
- o Provide DMS Open Systems Interconnect (OSI) transition/interface engineering.

(U) Work Performed by: AT&T, Greensboro N.C.; MITRE Corporation, Reston, VA; PSCI, Ottawa, Canada; Rome Laboratory, USAF; SPARTA, McLean VA;TIS, Olney, MD.
(U) Related Activities: DISN, Defense Information Systems Security Program (DISSP), Multi-Level Security (MLS) Program, Service Baselevel Modernization Program, Service Tactical Messaging Transition Programs, Allied Message System Transition Programs, NSA's Secure Data Network System (SDNS) and Message Security Protocol (MSP) programs. Work performed is complimentary. There is no duplication of effort.
(U) Other Appropriation Funds: O&M: $242K (FY94).
(U) International Cooperative Agreements: Allied Communication Publication (ACP) 123 is an effort that documents the various OSI X.400-based messaging services that the DoD and Allies will agree to use for military message interoperability.

FY 1994 Budget Estimates Descriptive Summary

Program Element: 0303126K
PE Title: Long Haul Communications
Budget Activity: 05
Date: April 1993

(U) PROJECT W90 - WHITE HOUSE SITUATION SUPPORT STAFF (WHSSS): This project ensures that full level crisis management capabilities are provided to the President, Vice President, the National Security Advisor and his staff. This effort emphasizes information exchange and display and procedures. This project is part of the National Security Information and Situation Management System (NSI&SMS) effort.

(U) FY 1992 Accomplishments:
- The FY 1992 accomplishments are documented under Program Element #0302016K, Project W90.

(U) FY 1993 Plans:
- The FY 1993 plans are documented under Program Element #0302016K, Project W90.

(U) FY 1994 Plans:
- Completion of study on optical storage and retrieval research efforts.
- Compare current method versus proposed method and determine which system would most benefit our immediate and future needs.

(U) Work Performed by: Contractors (TBD); DISA, White House Situation Support Staff.

(U) Related Activities: The White House Situation Support Staff Project directly supports the improvement of the White House communications, as they relate to the National Security Council. There is no duplication of effort.

(U) Other Appropriation Funds: O&M: $2080K (FY94). Procurement: $3630K (FY94).

(U) International Cooperative Agreements: None.

FY 1994 BUDGET ESTIMATES DESCRIPTIVE SUMMARY

Program Element: 0303127K
PE Title: National Communications System (NCS)

Budget Activity: 05
Date: April 1993

A. (U) RESOURCES ($ IN 000)

Project Number & Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
N03 Commercial SATCOM Interconnectivity (CSI)	426	640	895	Continue	Continue
N11 NS/EP Telecommunications Interoperability and Standards	604	640	929	Continue	Continue
N19 EMP Mitigation	811	104	0	0	$19,383
N22 Network Security	500	444	489	Continue	Continue
N24 Advanced Intelligent Network	1,113	1,327	1,371	Continue	Continue
N25 Interoperability	0	0	155	Continue	Continue
TOTAL	3,454	3,155	3,839		

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program element supports Executive Order 12472 of 3 April 1984 which assigns the NCS the mission of assisting the President, the National Security Council, the Office of Science and Technology Policy, and the Office of Management and Budget, in exercising their wartime and non-wartime telecommunications functions and responsibilities, and coordinating the planning for, and provisioning of, National Security and Emergency Preparedness telecommunications for the federal government under all circumstances including crisis and emergency, attack, recovery, and reconstitution. To attain this objective, there are several National Security Decision Directives which provide additional guidance to the NCS which require that initiatives be developed that will improve the survivability and restorability of the commercial telecommunications systems that support national security requirements, enhance the survivability and endurability of U.S. commercial satellites, and provide communications support for Government agencies which have responsibilities for continuation of government functions during all phases of conflict.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN FY 1994:

FY 1994 BUDGET ESTIMATES DESCRIPTIVE SUMMARY

Program Element: 0303127K
PE Title: National Communications System (NCS)

Budget Activity: 05
Date: April 1993

(U) Project Number and Title: N03 (Commercial SATCOM Interconnectivity (CSI)) - This project is required to develop emergency plans and procedures to coordinate the networking of selected commercial satellite facilities to support National Security and Emergency Preparedness (NS/EP) telecommunications. This project also supports the development of National Security Telecommunications Advisory Committee (NSTAC) initiatives and test and evaluation of new commercial satellite capabilities. Close coordination between the National Communications System and industry is critical for acquiring knowledge and synchronizing architecture recommendations with industry while still in the planning period.

(U) FY 1992 Accomplishments:
- o Developed Advanced Communications Technology Satellite work plans, tested procedures and experiments.
- o Refined CSI Architecture and estimated mid-term costs.
- o Continued MSAT-X experiments.

(U) FY 1993 Plans:
- o Perform end-to-end transportable tests and concepts.
- o Develop mid-term architecture implementation/transition plans.
- o Conduct ACTS experiments.
- o Survey new technologies for NS/EP applications.
- o Evaluate mobile SATCOM capabilities.
- o Develop future architecture concepts for NS/EP support.

(U) FY 1994 Plans:
- o Evaluate ACTS experiments.
- o Conduct MSAT-X test and research alternative architectural design concepts to satisfy NS/EP requirements.

(U) Work Performed By: Science Applications International Corporation, McLean VA; NASA, JPL, Pasadena CA; Harris Corporation, Melbourne FL; Lewis Lab, Cleveland OH.

(U) Related Activities: Not Applicable.

(U) Other Appropriation Funds: Operations and Maintenance: $4,569K (FY 1992); $5,636K (FY 1993); $5,709K (FY 1994).

(U) International Cooperative Agreements: Not Applicable.

FY 1994 BUDGET ESTIMATES DESCRIPTIVE SUMMARY

Program Element: 0303127K
PE Title: National Communications System (NCS)

Budget Activity: 05
Date: April 1993

(U) Project Number and Title: N11 (National Security and Emergency Preparedness (NS/EP) Telecommunications Interoperability and Standards) - This project analyzes new telecommunication technologies and their effects on interoperability of Government communications and conducts related technical evaluations and standards development. It also supports the Federal Telecommunication Standards Program.

(U) FY 1992 Accomplishments:
- o Developed technical analyses relating to NS/EP interoperability requirements in areas of Integrated Services Digital Networks (ISDNs), broadband transmission, and automated network management.

(U) FY 1993 Plans:
- o Continue efforts to develop technical analyses relating to NS/EP requirements in areas of broadband ISDNs, optical switching, and network management across network boundaries, and end-to-end information systems.

(U) FY 1994 Plans:
- o Obtain approval for store and forward facsimile system standards.
- o Provide technical contribution to standards committees to accomodate low bit rate digital service over cellular/ wireless systems.
- o Complete HF radio automatic message store-and-forward and HF radio automatic networking to multimedia standards.
- o Provide Government positions to industry standards committees on:
  - o color facsimile and facsimile store and forward,
  - o personal and cellular communications,
  - o cogestion in wideband asychronous transfer mode networks.

(U) Work Performed By: Department of Commerce, Boulder, Colorado; National Security Agency, Fort George G. Meade, Maryland; Delta Information Systems, Horsham, Pennsylvania; Bellcore, Holmdel, New Jersey; George Mason University, Fairfax, Virginia; Naval Research Laboratory, Washington, DC.

(U) Related Activities: Not Applicable.

(U) Other Appropriation Funds: Operations and Maintenance: $3,643K (FY 1992); $3,595K (FY 1993); $2,320K (FY 1994).

FY 1994 BUDGET ESTIMATES DESCRIPTIVE SUMMARY

Program Element: 0303127K
PE Title: National Communications System (NCS)

Budget Activity: 05
Date: April 1993

(U) International Cooperative Agreements: Not Applicable.

(U) Project Number and Title: N19 (Electromagnetic Pulse (EMP) and Nuclear Effects Mitigation). This project evaluates the vulnerability of NS/EP critical telecommunication equipment to nuclear-generated electromagnetic pulses (EMP), to other electromagnetic interference including lightning and electromagnetic emanations, and to fallout and background radiation. This project is being terminated because the major components of modern digital networks have been tested, including AT&T 4ESS™ and 5ESS™ and Northern Telecomm (NT) DMS100™ switches and AT&T and NT fiber optic repeaters and terminals. The last major component, the digital access cross connect switches (DACS), is scheduled to be tested during the FY 1991-1992 time period.

(U) FY 1992 Accomplishments:

- o Completed EMP testing of the AT&T FD 565 optic repeater and terminal.
- o Completed modelling of radiation effects in Metalic Oxide Field Effect Transistor.
- o Developed methods for analyzing network management strategies to mitigate network disruption caused by EMP effects.

(U) FY 1993 Plans:

- o Complete analysis of tests of digital access cross connect switches.
- o Complete development of analysis methods for effects of EMP on network performance.

(U) Work Performed By: A.T.&T. Technologies, Holmdel, New Jersey; Naval Research Laboratory, Washington, D.C.; Harry Diamond Laboratories (U.S. Army), Woodbridge, Virginia; Patuxent River Naval Station, Patuxent, Maryland.

(U) Related Activities: Not Applicable.

(U) Other Appropriation Funds: Operations and Maintenance: $948K (FY 1992); $88K (FY 1993).

(U) International Cooperative Agreements: Not Applicable.

(U) Project Number and Title: N22 (Network Security) - This project

FY 1994 BUDGET ESTIMATES DESCRIPTIVE SUMMARY

Program Element: 0303127K
PE Title: National Communications System (NCS)
Budget Activity: 05
Date: April 1993

is directed by the Assistant Secretary of Defense - C3I, in his role as Chairman of the Policy Coordinating Committee for National Security Telecommunications and Information Systems, to mitigate the hacker threat posed to National Security and Emergency Preparedness (NS/EP) telecommunications carried via the public switched network (PSN). The research gained from this project will be used to develop a consistent framework of guidelines that will be useful to government and industry in assuring that critical software, supporting and/or controlling telecommunications switches, can be trusted to perform as required in support of the PSN.

(U) FY 1992 Accomplishments:
- o Developed software tool to perform analyses to uncover hidden security vulnerabilities.
- o Researched vulnerabilities associated with relocation of system to a fully conformant open system environment.
- o Developed a general security document for telecommunications organizations.

(U) FY 1993 Plans:
- o Develop information authentication at the PSN gateway.
- o Perform analysis of algorithms for software tampering.
- o Develop new access methodologies.
- o Develop software to detect modifications to user activities.

(U) FY 1994 Plans:
- o Begin phase II Network Security initiatives to research intelligent gateway issues.

(U) Work Performed By: The National Institute of Standards and Technology (NIST), Gaithersburg, MD.

(U) Related Activities: Not Applicable.

(U) Other Appropriation Funds: Operations and Maintenance: $1,342K (FY 1992); $1,500K (FY 1993); $1,500K (FY 1994).

(U) International Cooperative Agreements: Not Applicable.

(U) Project Number and Title: N24 (Advanced Intelligent Network) - This project is required to employ newly developed processing capabilities to tailor the extensive telecommunication resources of the existing PSN, which includes the Local Exchange Carrier (LEC) and Interexchange Carrier (IC)

networks, thus enhancing connectivity and services of essential government users during periods of emergency. AIN is an evolving capability within the PSN and its architecture consists of signalling systems switches, computer processing, centralized databases and transmission media. This research will result in customized network services that can be flexibly, rapidly and cost effectively configured by customer upon demand.

(U) FY 1992 Accomplishments:
- o Developed AIN program plan to ensure NS/EP needs are reflected in the evolving AIN technology.
- o Performed capability assessment for NS/EP applications.
- o Developed NS/EP functional needs for AIN capabilities.
- o Participated with industry to develop new AIN standards.

(U) FY 1993 Plans:
- o Research and analyze the evolving AIN network architectures to ensure the NS/EP needs influence the evolving AIN Standards technology in its early stage of development.
- o Research to determine the time phased AIN penetration in the PSN.
- o Develop AIN capabilities that will be available in each geographic region.
- o Perform analysis to determine the reliability and the survivability of AIN services based on various scenarios of peacetime and wartime emergencies.
- o Develop an approach for interconnection of LEC and IC signaling networks to enhance AIN services.

(U) FY 1994 Plans:
- o Conduct studies to determine the reliability and survivability of the configuration of AIN capability previously selected and the networks supporting them, researching points of vulnerability.

(U) Work Performed By: Mitre Corporation, McLean, VA.; Booz-Allen & Hamilton, Bethesda, MD., Bellcore, Livingston, N.J.

(U) Related Activities: Not Applicable.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

FY 1994 BUDGET ESTIMATES DESCRIPTIVE SUMMARY

Program Element: 0303127K
PE Title: National Communications System (NCS)

Budget Activity: 05
Date: April 1993

(U) Project Number and Title: N25 (Interoperability) - This project is established to ensure interoperability among emerging government communication systems, including information systems, by providing the required analyses to the NCS Member Organizations and other government agencies through the development of initial specification and correlation of standards for specific types of communication and information systems; the design of initial automated methods for application of standards to systems; the refinement and evaluation of program objectives in evolving technology environment.

(U) FY 1992 Accomplishments: N/A
(U) FY 1993 Plans: N/A
(U) FY 1994 Plans:

- o Develop technology and government standards to promote interoperability with emphasis on:
  - o high resolution facsimile systems
  - o low bit rate digital services
  - o HF radio standards
  - o personal and cellular communications
  - o congestion in wideband asychronous transfer modenet works

(U) Work Performed By: Mitre Corporation, McLean, VA; Booz, Allen & Hamilton, Bethesda, MD; National Telecommunications and Information Administration/Institute for Telecommunications Sciences (NTIA/ITS), Boulder, CO.

(U) Related Activities: Not Applicable.

(U) Other Appropriation Funds: Operations and Maintenance: $1,000K (FY 1993); $800K (FY 1994).

(U) International Cooperative Agreements: Not Applicable.

DEFENSE INFORMATION SYSTEMS AGENCY
MRTFB INSTALLATION FINANCIAL SUMMARY
Joint Interoperability Test Center
(Dollars in $000)

Funding Source	FY 1992	FY 1993	FY 1994
Institutional (PE 0208045K)			
In-House Effort	1,549	2,623	2,595
Contractor Effort	3,156	4,721	4,552
Improvement & Modernization (I&M)	606	829	772
Total	5,311	8,173	7,919
Direct (User Funding)			
Parent Service	19,584	16,108	16,320
Other DoD	6,456	7,835	8,430
Non-DoD	77	2,180	3,050
Total	26,117	26,123	27,800
Total Institutional & Direct (I&D)	31,428	34,296	35,719
% Direct to Total I&D (less I&M)	84.7%	78.1%	79.5%
Other Funds			
Procurement	0	0	0
(I&M)	0	0	0
(All Other)	0	0	0
RPMA	0	31	0
MILCON	0	0	0
Military Personnel	3,707	3,821	3,958
Telecommunications	0	0	0
Real Property Maintenance	0	0	0
Hospital	0	0	0
Miscellaneous	0	0	0
Total Other Funds	3,707	3,852	3,958
TOTAL INSTALLATION (TOA)	35,135	38,148	39,677

Exhibit MRTFB-1
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DEPARTMENT OF DEFENSE
JITC ELEMENT OF EXPENSE LISTING
(DOLLARS IN THOUSANDS)

INSTITUTIONAL

ELEMENT OF EXPENSE	FY 1992	FY 1993	FY 1994
Military Pay (Non-Add)	905	1,399	1,449
Civilian Pay	1,113	1,757	1,840
Travel	119	194	174
Transportation	4	6	6
Utilities/Rental	0	0	0
Communications	99	161	145
Purchased Equipment Maintenance	0	0	0
Purchased Equipment Other	0	0	0
Printing and Reproduction	0	0	0
Contract Services	3,156	4,721	4,552
Supplies	255	415	374
Equipment	75	122	110
Other Expenses	490	797	718
TOTAL	5,311	8,173	7,919

Exhibit MRTFB-2A(1)
Page 1 of 1

DEPARTMENT OF DEFENSE
JITC ELEMENT OF EXPENSE LISTING
(DOLLARS IN THOUSANDS)

DIRECT (USER FUNDING)

ELEMENT OF EXPENSE	FY 1992	FY 1993	FY 1994
Military Pay (Non-Add)	2,802	2,422	2,509
Civilian Pay	4,009	4,801	4,970
Travel	1,375	1,707	1,918
Transportation	30	26	31
Utilities/Rental	0	0	0
Communications	395	309	389
Purchased Equipment Maintenance	17	16	18
Purchased Equipment Other	0	0	0
Printing and Reproduction	0	0	0
Contract Services	16,957	16,603	17,140
Supplies	1,024	826	1,035
Equipment	348	302	369
Other Expenses	1,962	1,533	1,930
TOTAL	26,117	26,123	27,800

EXHIBIT MRTFB-2a(2)
Page 1 of 1

DEFENSE INFORMATION SYSTEMS AGENCY
Joint Interoperability Test Center
(Dollars in Thousands)

RDT&E INSTALLATION SCHEDULE OF INCREASES & DECREASES

PE: 0208045K
Project: Institutional
Activity: 03

FY 1992 Actual	FY 1993	FY 1994
5,311	8,173	7,919

1. FY92 actual to FY93 President's Budget

   - The increase of $2.63 million is the result of annualizing Institutional costs in FY 1993. FY 1992 JITC Institutional costs include only the time frame from 1 Feb 92 through 30 Sep 92. JITC did not become a member of the MRTFB until a Feb 92.

2. FY93 President's Budget to FY93 Appropriation

   - The reduction $0.408 million is the result of FY93 undistributed Congressional reductions.

3. FY93 Appropriation to FY94 program

   - The reduction of $0.254 million reflects reductions in other miscellaneous expenses.

EXHIBIT MRTFB-2B

DEFENSE INFORMATION SYSTEMS AGENCY
MANPOWER BY WORKYEARS
Joint Interoperability Test Center

	FY 1992				FY 1993				FY 1994			
Category	Instit	Direct	Other	Total	Instit	Direct	Other	Total	Instit	Direct	Other	Total
Military	26	44	0	70	26	44	0	70	26	44	0	70
Civilian	24	60	0	84	27	57	0	84	28	56	0	84
Contractor	47	253	0	300	76	244	0	320	63	274	0	338
TOTAL	73	358	0	431	129	345	0	474	117	375	0	492

Narrative: The Joint Interoperability Test Center (JITC) was designated an MRTFB effective 1 Feb 92. FY 1992 manyears presented as Institutional represent manpower for the period 1 Feb 92 through 30 Sep 92. Direct column represents all FY 1992 non-Institutional manpower effort.

DEFENSE INFORMATION SYSTEMS AGENCY
JITC Source of Direct Funds

(Dollars in Thousands)

Program	PE	FY 1992	FY 1993	FY 1994
1. PARENT SERVICE:				
a. RDT&E				
JIEO:		16,837.0	12,508.0	14,920.0
ANDVT/MILSTAR SW Test	0208045K	15.4	0.0	0.0
STU-III/Red Switch	0208045K	95.6	0.0	0.0
UGC-144 Certifictn	0208045K	8.4	0.0	0.0
Minterm/KY-99 Int Test	0208045K	60.2	0.0	0.0
ANDVT/OTAR via HF	0208045K	29.7	0.0	0.0
AN/TYC-39(v)6 w/AUTODIN	0208045K	19.6	0.0	0.0
Data Transf Dev 1st Art	0208045K	19.6	0.0	0.0
UHF Satellite Test	0208045K	58.8	0.0	0.0
AN/TTC-42 to #5 ESS	0208045K	19.2	0.0	0.0
AN/MSC-63A Interop Test	0208045K	443.8	0.0	0.0
Major Circuit Switch	0208045K	598.0	590.0	121.0
AN/TSC-122 Oper Demo	0208045K	52.8	0.0	0.0
Digital Mess Trans Dev	0208045K	39.2	0.0	0.0
Sec Tact Data Net Demo	0208045K	44.8	0.0	0.0
String Testing	0208045K	1,360.5	925.0	854.0
Intel Systems Certifcn	0208045K	0.0	285.0	421.0
AN/USC-42(V) Mini Dama	0208045K	0.0	197.0	0.0
Electronic Warfare Testing	0208045K	306.0	280.0	358.0
Adv Tact Air Cmd Central	0208045K	0.0	0.0	0.0
Pacific HF Radio Sys	0208045K	0.0	0.0	158.0
JASORS Testing	0208045K	0.0	0.0	86.0
AN/TYC-39A w/AUTODIN	0208045K	0.0	272.0	121.0
Other Tactical Interop Tst	0208045K	881.0	924.0	1,180.0
Subtotal, Tactical Commun Test		4,052.5	3,473.0	3,299.0
All Source Analys Sys	0208045K	23.3	0.0	0.0
Navy Air Log IS (NALIS)	0208045K	10.6	0.0	0.0
Senior Scout	0208045K	66.5	0.0	0.0
SIS(SJ)/Patriot Recert	0208045K	63.0	0.0	0.0
TACM AN/TYQ-23(V)1	0208045K	7.6	0.0	0.0
MATCALS Cert Test	0208045K	59.0	0.0	0.0
Royal Thailand AF Def Sys	0208045K	10.9	0.0	0.0
JIES SW Development	0208045K	2,198.0	0.0	3,669.0
SIS (RJU) Requal Test	0208045K	6.3	0.0	0.0
TACS/TSQ-73 Requal Test	0208045K	18.8	0.0	0.0
E-3 TADIL A Test	0208045K	95.6	0.0	0.0
JAMES Requalif Test	0208045K	47.5	67.0	0.0
JAMPS Requalif Test	0208045K	34.0	58.0	0.0
MTF Editor	0208045K	64.5	85.0	0.0
ICCE RADIL Test	0208045K	0.0	113.0	150.0
Maneuver Control Sys	0208045K	0.0	120.0	118.0
Airborne C3 Syst Test	0208045K	0.0	56.0	185.0
Caribbean Basin Radar	0208045K	0.0	0.0	253.0

DEFENSE INFORMATION SYSTEMS AGENCY
JITC Source of Direct Funds

(Dollars in Thousands)

Program	PE	FY 1992	FY 1993	FY 1994
E-3 AWACS (30/35)	0208045K	0.0	79.0	235.0
Contingency TACs APS	0208045K	0.0	0.0	0.0
Rivet Joint	0208045K	0.0	0.0	187.0
Patriot/TADIL Tests	0208045K	0.0	0.0	0.0
Other TADIL/MTF Tests	0208045K	1,188.8	934.8	727.0
Subtotal Procedural Test		3,894.5	1,512.8	5,524.0
AN/TTC-39A w/ETS	0208045K	108.8	0.0	0.0
DSN/Tactical Interface Demo	0208045K	896.0	462.0	0.0
GOSIP Laboratory	0208045K	921.5	250.0	110.0
DDN STF	0208045K	178.9	87.0	0.0
USSOCOM Imagery Devices	0208045K	20.4	0.0	0.0
FDDI Laboratory Devel	0208045K	104.4	95.0	0.0
IDNX/AT&T Interop Tst	0208045K	75.0	46.0	0.0
NITF MTF/MTF TACO	0208045K	938.4	446.0	347.0
DSCS to NATO Satellite	0208045K	0.0	50.0	320.0
HIDAR MEECN Mode Interop	0208045K	0.0	65.0	259.0
Secure Data Net Sys	0208045K	0.0	55.0	375.0
SCP Interop/Perform Tst	0208045K	0.0	0.0	0.0
Surviv Comm Integra Sys Tst	0208045K	0.0	0.0	0.0
Other Strategic Tests	0208045K	656.7	1,330.0	1,440.0
Subtotal Strategic Test		3,900.0	2,886.0	2,851.0
DDN Operational Eval	0208045K	901.2	750.0	580.0
DMS Operational Eval	0208045K	264.8	225.0	240.0
WAM Operational Eval	0208045K	268.5	350.0	275.0
DISN Operational Eval	0208045K	0.0	85.0	150.0
Subtotal OTA		1,434.5	1,410.0	1,245.0
Other Misc Test Spt	0208045K	1,638.5	1,304.2	738.0
CINC Exercise Spt	0208045K	614.0	762.0	772.0
Dist Testbed Develop	0208045K	1,303.0	1,160.0	491.0
Subtotal, Miscellaneous		3,555.5	3,226.2	2,001.0
DNSO:				
HF ALE Test Spt	0303126K	99.8	225.0	0.0
DSSO:				
WAM OT Test Conduct	0303154K	2,149.6	1,800.0	0.0
SUBTOTAL, RDT&E:		19,086.4	14,533.0	14,920.0

DEFENSE INFORMATION SYSTEMS AGENCY
JITC Source of Direct Funds

(Dollars in Thousands)

Program	PE	FY 1992	FY 1993	FY 1994
b. OPERATION & MAINTENANCE				
DNSO:				
ANDVT OTAR HF Test	0303126K	3.3	0.0	0.0
SUBTOTAL, O&M:		3.3	0.0	0.0
c. PROCUREMENT		0.0	0.0	0.0
d. DEFENSE BUDGET OPERATING FUND - DSA				
DNSO:				
DMS OTA Support		30.1	0.0	0.0
DDN Operational Evaluation		454.2	485.0	510.0
DCS Xmsn Syst Test		0.0	225.0	0.0
Blacker Testing		10.0	15.0	0.0
DISN OT&E Support		0.0	850.0	890.0
SUBTOTAL, DBOF-DSA		494.3	1,575.0	1,400.0
TOTAL, DISA		19,584.0	16,108.0	16,320.0
2. OTHER DEPARTMENT OF DEFENSE:				
a. ARMY				
OT Support to RCAS	Army	2,769.4	2,600.0	1,250.0
Communic Interface Sys	Army	51.0	60.0	0.0
UAV Support	Army	13.0	0.0	0.0
NITF Certification Spt	Army	60.0	50.0	50.0
VSAT	Army	19.0	0.0	0.0
SBIS OT&E Support	Army	0.0	225.0	1,400.0
JPTT TADIL SW/HW	Army	63.0	0.0	0.0
Tactical Imaging Sys	Army	150.9	0.0	0.0
Other Test Support	Army	225.0	750.0	875.0
SUBTOTAL, Army		3,351.3	3,685.0	3,575.0
b. NAVY				
FOCS 1st Art Test Spt	USMC	50.0	100.0	0.0
NITF Certifications	Navy	20.0	25.0	30.0
Other Navy/USMC Spt	Navy	0.0	50.0	75.0
SUBTOTAL, Navy		70.0	175.0	105.0

DEFENSE INFORMATION SYSTEMS AGENCY
JITC Source of Direct Funds

(Dollars in Thousands)

Program	PE	FY 1992	FY 1993	FY 1994
c. AIR FORCE				
Special Program		47.1	0.0	0.0
Comfy Storm		89.0	0.0	0.0
NITF/Paragon Support		1,355.0	1,050.0	575.0
T-1 Fiber Optic		19.0	0.0	0.0
Red Switch Support		59.2	300.0	0.0
Othe Test Support		0.0	200.0	350.0
SUBTOTAL, Air Force		1,569.3	1,550.0	925.0
d. MISCELLANEOUS DOD				
EKMS Support	NSA	215.7	550.0	1,100.0
NITF Certification	DIA	0.0	50.0	0.0
MTF TACO	DIA	0.0	350.0	400.0
CIM Support	ASD(C3I)	1,100.0	1,225.0	1,950.0
CN/CMS Support	ASD(C3I)	150.0	250.0	375.0
SUBTOTAL, Misc DoD		1,465.7	2,425.0	3,825.0
TOTAL, OTHER DOD		6,456.3	7,835.0	8,430.0
3. NON-DEPARTMENT OF DEFENSE:				
a. OTHER GOVT AGENCIES				
GOSIP Accred Lab	NIST	10.0	200.0	200.0
SUBTOTAL, OTHER GOVT AGENCIES		10.0	200.0	200.0
b. PRIVATE INDUSTRY				
NITF Certification	ECI	5.0	0.0	0.0
NITF Certification	TASC	13.3	0.0	0.0
GOSIP Test Support	Novell	3.3	0.0	0.0
GOSIP Test Support	NCC	2.0	0.0	0.0
GOSIP Test Support	CDC	0.8	0.0	0.0
GOSIP Test Support	IBM	5.9	0.0	0.0
GOSIP Test Support	CDA	1.4	0.0	0.0
GOSIP Test Support	DEC	0.3	0.0	0.0
GOSIP Test Support	Bull/HN	6.2	0.0	0.0
GOSIP Test Support	NCR	2.6	0.0	0.0
GOSIP Test Support	Alcatel	2.5	0.0	0.0
NITF Certification	Various	12.0	1,188.0	1,710.0
GOSIP Testing	Various	11.3	792.0	1,140.0
SUBTOTAL, PRIVATE INDUSTRY		66.6	1,980.0	2,850.0
TOTAL, NON-DOD		76.6	2,180.0	3,050.0
GRAND TOTAL, DIRECT USER FUNDS		26,117.0	26,123.0	27,800.0

DEFENSE INFORMATION SYSTEMS AGENCY
Joint Interoperability Test Center
Improvement and Modernization

(Dollars in Thousands)

Investment Project > $300K	FY 1992	FY 1993	FY 1994
Institutionally Funded (PE 0208045K): Development of replacement Traffic Loading Device (TLD)	0	0	345
Direct User Funded (PE 0208045K): Development of Joint Interoperablity Evaluation System (JIES)	2,575	0	3,669
Proposed CTEIP/REP Funded Projects: Acquisition of Remote Test Facilities (RTFs)	0	3,160	2,390

DEPARTMENT OF DEFENSE
DEFENSE INFORMATION SYSTEMS AGENCY
JITC Improvement and Modernization Analysis

Project Title: Joint Interoperability Evaluation System (JIES)

Description: This program develops a distributed test bed which will be used by the JITC to conduct Tactical Digital Information Link (TADIL) testing. This testing has been mandated by the Joint Staff and ASDC3I. The JIES consists of a Central Test Facility located at the JITC and several Remote Test Facilities dispersed throughout CONUS at various Service/Agency test sites.

Requirements/Payoffs: The JIES provides a modern tool used to verify that the existing and future Tactical Data Systems comply with TADIL A/B/J message standards and will interoperate in joint operations. The existing capability is antiquated: it will not support TADIL J testing, it is expensive to maintain, and it is inefficient to operate. Thus, the specific payoffs of JIES are:

- Provides capability to meet ASDC3I/Joint Staff tasking
- Verifies Service/Agency TDS's interoperate
- Shortens test cycle by reducing fielding delays of TDS's caused by testing and by reducing cost of testing
- Facilitates/enhances test conduct and analysis of results

Schedule: The JIES development was originally contracted out by JTC3A. However, the JTC3A elected to terminate the development contractor for convenience and subsequently tasked JITC to complete the JIES. Consequently, many of the early programmatic milestones were accomplished prior to the transition of the program to the JITC. The current effort is an incremental delivery approach which spans 4 years and consists of five major deliveries (called Breakpoints).

Studies:	Complete.
Specifications:	Complete.
Contract Award:	Existing Support Contract to be used
Development:	QTR3FY92 thru QTR2FY95 (Incremental)
Installation:	QTR2FY93 thru QTR2FY95 (Incremental)
Operational Capability:	Breakpoint 1 - QTR3FY93 (IOC)
	Breakpoint 2 - QTR3FY94 (IOC)
	Breakpoint 3 - QTR1FY95 (IOC)
	Breakpoint 4 - QTR2FY95 (IOC)
	Breakpoint 5 - QTR3FY95 (FOC)

Funding Profile: In late FY 1991, former Director, JTC3A terminated the original JIES fixed-price developmental contract with Martin-Marietta Corporation and transferred JIES software development responsibility to the JITC. The funding profile presented herein represents only those costs associated with the JITC JIES development effort.

	Dollars in Millions				
	FY 1991	FY 1992	FY 1993	FY 1994	FY 1995
RDT&E Funded	$1.422	$2.575	$ 0	$3.669	$3.406
RDT&E Unfunded	$0.003	0	4.010	0	0

DEPARTMENT OF DEFENSE
DEFENSE INFORMATION SYSTEMS AGENCY
JITC Improvement and Modernization Analysis

Project Title: Remote Test Facilities (RTFs)

Description: Procurement of Remote Test Facilities (RTFs) which allow the various Services and Agencies (S/A) to interface to the JIES distributed testing network. An RTF is composed of a nominal four racks of equipment housing the various multiplexers, crypto, LAN, voice and protocol equipments to allow the system under test to be stimulated during an Air Defense Joint Operational Maintenance Test (OMT). There are 15 new tactical systems required through 1997. Locations are across the CONUS and include Iceland and Panama.

Requirements/Payoff: The interoperability testing of these air defense platforms occurs from each of the tactical data systems (TDS) software development facility, connected to the other players of the Joint interface; for example, an Air Force F-15 talking to a Navy F-14 and an AEGIS, with the Marine TAOC, Army HAWK and a SIS River Joint monitoring the transmissions. Without the RTF, the TDS will not be able to be tested for Tactical Digital Information Link (TADIL) J.

Schedule: The TDSs are scheduled for various testing dates from FY 1993 to Fy 1997. The RTF hardware is fully Commercial-Of-The-Shelf (COTS). JITC has used a nominal 10 months lead time to obtain funds, engineer, build and install each RTF. Existing JITC Omnibus support contracts will be used to support RTF requirement.

Studies:	Complete.
Specifications:	Complete.
Contract Award:	Existing JITC Omnibus Contract
IOC:	QTR1FY93 (Incremental)
FOC:	QTR3FY97

Funding Profile:

	Dollars in Millions						
	FY 1991	FY 1992	FY 1993	FY 1994	FY 1995	FY 1996	FY 1997
RDT&E Funded	$0.000	$0.000	$0.000	$0.000	$0.000	$0.000	$0.000
RDT&E Unfunded	$0.000	$0.000	$3.160	$2.390	$2.260	$0.790	$0.540

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FY 1994 BUDGET ESTIMATES

DESCRIPTIVE SUMMARIES

DEFENSE LOGISTICS AGENCY

APRIL 1993

Program Element: 0605798S
PE Title: DoD Support Activities
Budget Activity 6
Date: April 1993

A. (U) RESOURCES ($ in Thousands)

Project No. & Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	Total Program
0001 Joint Service Training Systems Development	4,744	4,365	4,220	Continuing
0002 Defense Training Resource Analysis	3,750	3,430	3,316	Continuing
0003 Management Support and Evaluation Directorate (MS&ED)	4,127	3,741	3,643	Continuing
0004 R&D In Support of DoD Enlistment Testing and Processing	1,579	1,419	1,382	Continuing
Total	14,200	12,955	12,561	Continuing

B. (U) BRIEF DESCRIPTION OF ELEMENT: The program element provides funding for DoD Support Activities as listed above.

C. (U) JUSTIFICATION FOR PROJECTS: See attached detail by project.

D. (U) WORK PERFORMED BY: In-house, universities and contractors.

E. (U) RELATED ACTIVITIES: None.

F. (U) OTHER APPROPRIATIONS FUNDS: None.

Program Element: 0605798S
PE Title: DoD Support Activities

Budget Activity: 6
Date: April 1993

A. (U) RESOURCES ($ in Thousands)

Project Number & Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	Total Program
0001 Joint Service Training Systems Development				
	4,744	4,365	4,220	Continuing

B. (U) BRIEF DESCRIPTION OF ELEMENT: The Joint Service programs were established by the Secretary of Defense to improve training and readiness of the Active and Reserve Components. This PE expedites the prototype development of new training technologies and Joint Service training data systems improve training effectiveness and enhances the performance of the military forces. It also saves DoD funds through the sharing of training information as well as the transfer of emerging and innovative technologies among the Services and private sector.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN FY 1994

(U) 0001 Joint Service Training Systems Development: This project rapidly prototypes, tests and evaluates those high payoff training technologies which can demonstrate increased effectiveness for multi-Service implementation. Emphasis is given to technologies and simulations that save DoD resources or can help reduce the environmental impact of training exercises.

(U) Prior Accomplishments:

- Evaluated and fielded an automated data system that integrates logistic support analysis data with instructional system development process.
- Developed and implemented software standards for interactive video and instructional programs to maximize their portability among the military services.
- Development and demonstrated the effectiveness of standard interface module that networks dissimilar wargames and simulations for the OJCS, CINCs, and Services.

Program Element: 0605798S (continued)

(U) Prior Accomplishments:

- o Developed and field-tested a portable aid for explosive ordnance disposal specialists.

(U) FY 1993 Plans:

- o Develop a prototype automated job performance aid for evaluating the results of joint service field exercises.
- o Develop standard software interfaces to maximize courseware portability across different types of operating systems.
- o Consolidate unique Service prototype systems for automating the Instructional Systems Development process into a common set of software modules than can be used by all Services.
- o Complete development of an interactive team trainer which uses simulated live-fire exercises in ambush and hostage (anti-terrorist) situations.

(U) FY 1994 Plans:

- o Test and transition an automated job performance aid for evaluating the results of joint service field exercises.
- o Initiate development of a prototype electronic classroom that can demonstrate the benefits and cost savings of distance learning technologies.
- o Evaluate the effectiveness and potential cost savings of an interactive team trainer for small arms fire.
- o Test and transition a portable and deployable universal laser-based engagement system for indirect fire control training and Special Operations/Low Intensity Conflict training.

(U) WORK PERFORMED BY: In-house, DoD laboratories universities and contractors.

(U) RELATED ACTIVITIES: N/A

(U) OTHER APPROPRIATION FUNDS: N/A

(U) INTERNATIONAL COOPERATIVE AGREEMENTS: N/A

Program Element: 0605798S
PE Title: DoD Support Activities

Budget Activity: 6
Date: April 1993

A. (U) RESOURCES ($ in Thousands)

Project Number & Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	Total Program
0002 Defense Training Resource Analysis				
	3,750	3,430	3,316	Continuing

B. (U) BRIEF DESCRIPTION OF ELEMENT: This project supports the Defense Institute for Training Resource Analysis (DITRA). Projects analyze the contributions to readiness of various training techniques and programs and use the results to expedite new training concepts and procedures that increase unit effectiveness or decrease costs. Emphasis is also given to the development of analytical tools and systematic methodologies to improve training resource allocations.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN FY 1994

(U) 0002 Defense Training Resource Analysis:
This project includes the development of analytical tools and systematic methodologies to improve training resource allocations. This project supports DoD training managers (OSD, Joint Staff, Unified Commands, and the Military Services) to promote more efficient and effective use of training resources, increase the effectiveness of military training, and enhance the performance of the military forces.

(U) Prior Accomplishments:

- Developed a multi-Service system to track and process data on technological applications of training equipment to avoid unnecessary duplication in future equipment development.
- Completed a prototype system for all military departments that integrates training information to better manage the force drawdown. The systems also helps transition personnel with military training and occupations to private sector career fields.
- Complete and transition the integrated system for the Reserve component training alternatives.

(U) FY 1993 Plans:

- Initiate the development of a computer-based forecasting and cost estimation analysis tool pertaining to military training at Service schools and training centers.
- Analyze the training of National Guard units at the National Training Center as it relates to performance criteria for ground force units.

Program Element: 0605798S (continued)

(U) FY 1994 Plans:

- o Develop a systematic methodology for tracking dedicated collective/unit training resources.
- o Evaluate training capability to respond to future mobilization and/or reconstitution requirements.
- o Develop analytical tools and methods to expedite the implementation of more cost effective training concepts to enhance the performance of individuals and the capability of military units.

(U) WORK PERFORMED BY: In-house, DoD laboratories universities and contractors.

(U) RELATED ACTIVITIES: N/A

(U) OTHER APPROPRIATION FUNDS: N/A

(U) INTERNATIONAL COOPERATIVE AGREEMENTS: N/A

Program Element: 0605798S | Budget Activity: 6
PE Title: DoD Support Activities | Date: April 1993

A. (U) RESOURCES: ($ in Thousands)

Project Number & Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	Total Program
0003 Management Support and Evaluation Directorate (MS&ED) - previously DoD Technology Analysis Office				
	4,127	3,741	3,643	Continuing

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program element provides engineering, scientific and analytical support to the Office of the Director of Defense, Research and Engineering (ODDR&E) in their review and oversight of the Science and Technology (S&T) program and the ODDR&E responsibilities in the Defense Acquisition Process. MS&ED provides support in the development of the S&T Thrusts and conduct assessments and analysis of the S&T program to ensure maximum utilization of Research and Development funds to accomplish the overall objectives of the S&T program.

C. (U) JUSTIFICATION FOR PROJECT LESS THAN $10.0 MILLION IN FY 1994:

(U) 0003 - Management Support & Evaluation Directorate (MS&ED): The primary mission of MS&ED is to assist the ODDR&E in the S&T Program and the Defense Acquisition Process. This program element is actively involved in the formulation of the Defense S&T Strategy, its implementation and programmatic and financial analyses of all aspects of the S&T program. Funds are required for personnel compensation, equipment maintenance and upgrade, supplies, travel, utilities, communications and facilities.

(U) Prior Accomplishments:

- Reviewed and analyzed the S&T program.
- Provided Technical and analytical support to the development of S&T thrusts.
- Provided Management and technical support for the Balanced Technology Initiative.
- Formulated the Defense Technology Strategy.
- Supported University research programs such as the University Research Initiative as well as related science and engineering education activities of the military services.

Program Element: 0605798S (Continued)

(U) Prior Accomplishments:

- o Support efforts to transfer technology from DoD Laboratories to the private sector.
- o Coordination of policy implementation in the DoD Laboratories.

(U) FY 93 Plans:

- o Review and analysis of the S&T program.
- o Technical and analytical support to the development of S&T thrusts.
- o Management and technical support for the Balanced Technology Initiative.
- o Formulation of the Defense Technology Strategy.
- o Support University research programs such as the University Research Initiative as well as related science and engineering education activities of the military services.
- o Support efforts to transfer technology from DoD Laboratories to the private sector.
- o Coordination of policy implementation in the DoD Laboratories.

(U) FY 1994 Plans: This is a continuing program built upon prior year results and accomplishments listed in the areas above.

(U) WORK PERFORMED BY: Work is performed in-house.

(U) RELATED ACTIVITIES: N/A

(U) OTHER APPROPRIATION FUNDS: N/A

(U) INTERNATIONAL COOPERATIVE AGREEMENTS: N/A

Program Element: 0605798S
PE Title: DoD Support Activities

Budget Activity: 6
Date: April 1993

A. (U) RESOURCES ($ in Thousands)

Project Number & Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	Total Program
0004 R&D In Support of DoD Enlistment Testing and Processing				
	1,579	1,419	1,382	Continuing

B. (U) BRIEF DESCRIPTION OF ELEMENT: The DoD uses the Armed Services Vocational Aptitude Battery (ASVAB) to determine eligibility of military applicants and to report recruit quality data to Congress. Each service also uses ASVAB test forms developed in this program as part of their in-service testing programs. This allows DoD to make measurement improvements as well as decrease the likelihood of test compromise. On October 1, 1989, ASD(FM&P) decided to transfer development, calibration and quality control functions from the Air Force to the Defense Manpower Data Center (DMDC). Ongoing RDT&E efforts include development and evaluation of procedures to (1) reduce or eliminate threats to the validity of ASVAB test scores generated. (2) improve the efficiency of the test development, calibration, and validation process, and (3) improve selection and classification decisions made by each Service through more effective use of test score information.

In addition, periodic assessments are required to provide DoD manpower planners and Congress with information on aptitude trends in the population from which recruits are drawn.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN 10.0 MILLION IN FY 1994

(U) 0004 R&D in Support DoD Enlistment Testing and Processing: The primary mission is to develop, calibrate, and perform quality control for the ASVAB. New forms of the ASVAB will be developed. Validation of the ASVAB against civilian jobs will be in progress.

Program Element: 0605798S (Continued)

(U) Prior Year Accomplishments:

- o DoD Enlistment Testing Program
  - oo Developed new conversion tables to account for answer sheet changes associated with new MEPCOM Optical Mark Readers.
  - oo Developed, edited, screened, and tried out AFQT items for the next round of ASVAB test forms.
  - oo Developed a comprehensive ASVAB Test Development Procedures Manual.
  - oo Developed preliminary conversion tables for ASVAB Forms 20-22 and prepared for initial Operational Test and Evaluation of these forms.
  - oo Conducted review of ASVAB leading to change recommendations by 3/93
- o DoD Student Testing Program
  - oo Completed editing, printing, and distribution of all new materials for the ASVAB 18/19 Career Exploration Program which was implemented 7/92.
  - oo Developed and implemented training for MEPCOM, recruiting, and school personnel on uses and advantages of the new program.
  - oo Completed validation of ASVAB for civilian careers.
  - oo Developed plans and items for a DoD Interest Inventory to replace the Self-Directed Search in the Student Testing Program
- o DoD Enlistment Testing Program
  - oo Complete the ASVAB review and produce recommendations for changes to test content and administration procedures.
  - oo Items reflecting new content will be developed and edited for use in the next round of test forms.

Program Element: 0605798S (Continued)

(U) FY 93 Plans:

- oo Final conversion tables will be produced for ASVAB Forms 20-22.
- oo Final conversion tables will be implemented for operational use.
- oo An investigation of procedures for linking the scales used in reporting recruit quality to Congress to the National Assessment scales used by DEd for reporting students abilities will be completed.

- o DoD Student Testing Program
  - oo Complete the development and tryout of items for the DoD interest inventory.
  - oo An evaluation of the ASVAB 18/19 Career Exploration will be designed and initiated.

(U) FY 1994 Plans:

- o DoD Enlistment Testing Program
  - oo Implement changes resulting from the ASVAB review including test content revisions and preparation for alternative modes of administration.
  - oo Complete research on the content of the technical Subtests.
  - oo Items developed in the last two years will be screened and assembled into preliminary versions of the next round of test forms.
  - oo Plans for a new norming study will be completed.
  - oo Improvements in test development and equating methodologies will continue to be identified and implemented.

- o DoD Student Testing Program
  - oo Complete the evaluation of the new ASBAB 18/19 materials and develop recommendations for further enhancements.
  - oo Continue to develop the DoD Interest Inventory and tryout of new forms.

(U) Worked Performed By: DMDC, DoD Components: Booz-Allen & Hamilton, Inc., American Institutes for Research, HumRRO, and BDM.

(U) Related Activities: N/A

(U) Other Appropriation Funds: N/A

(U) International Cooperative Agreements: N/A

Program Element: 0901600S
PE Title: Contract Administration/Audit

Budget Activity 6
Date: April 1993

A. (U) RESOURCES ($ in Thousands)

Project No. & Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	Total Program
0005 Contract Administration and Audit	0	0	235	Continuing

B. (U) BRIEF DESCRIPTION OF ELEMENT: The FY 1994 budget reflects estimates for contract audit and management services that will be incurred as a result of contract awards made in this appropriation. Funding will be used to support the Defense Contract Audit Agency (DCAA) and Defense Contract Management Command (DCMC) services performed in this program element.

This budget differs from last year in order to reflect a Congressional and Departmental initiative to move toward mission budgeting for an improved method of justifying resources. The visibility of total costs related to contract awards and administrative requirements is improved because support service funding for related contracts is included.

C. (U) JUSTIFICATION FOR PROJECT: This program element supports a Congressional and Departmental initiative to improve justifying resources. It includes funding to support contract audit and management services provided by the Defense Contract Audit Agency (DCAA) and Defense Contract Management Command (DCMC).

D. (U) WORK PERFORMED BY: Defense Contract Audit Agency and Defense Contract Management Command.

E. (U) RELATED ACTIVITIES: None.

F. (U) OTHER APPROPRIATIONS FUNDS: None.

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THE JOINT STAFF

April 1993

FY 1994
Budget Estimate

RDT & E
Defensewide

FY 1994 BUDGET ESTIMATE RDT&E PROGRAMS

Program Element	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
0201135J CINC C2 Initiatives(U)	0	1,786	1,193
0303154J WWMCCS ADP Modernization	0	3,900	7,000
0603734J Island Sun(U) (Descriptive Summary Not Included)	58,776	22,550	15,822
0901600J Contract Administration/Audit	0	0	436
Total	58,776	26,236	24,451

Exhibit R-1

RESEARCH AND DEVELOPMENT ACTIVITIES· JOINT STAFF
DEPARTMENT OF DEFEN
(IN THOUSANDS OF DOLLARS)

CONDUCT OF R&D BY ACTIVITY	LINE CODE		FY 1992	FY 1993	FY 1994
BASIC RESEARCH	101	TOA	0	0	0
		OBLIG.	0	0	0
		OUTLAYS	0	0	0
APPLIED RESEARCH (DEVELOPMENT)	102	TOA	58,776	26,236	24,451
		OBLIG.	53,175	52,446	26,357
		OUTLAYS	53,134	41,902	30,313
TOTAL RESEARCH	103	TOA	0	0	0
		OBLIG.	0	0	0
		OUTLAYS	0	0	0
TOTAL RDT&E		TOA	58,776	26,236	24,451
		OBLIG.	53,175	52,446	26,357
		OUTLAYS	53,134	41,902	30,313
FACILITIES INCLUDED IN R&D		TOA	0	0	0
		OBLIG.	0	0	0
		OUTLAYS	0	0	0
MILPERS R&D (OTHER APPNS)		TOA	0	0	0
		OBLIG.	0	0	0
		OUTLAYS	0	0	0
SPECIAL FOREIGN CURR.		TOA	0	0	0
		OBLIG.	0	0	0
		OUTLAYS	0	0	0
CONDUCT OF R&D PERFORMED BY COLLEGES/UNIVERSITIES	201	TOA	0	0	0
		OBLIG.	0	0	0
		OUTLAYS	0	0	0
FACILITIES INCLUDED IN MILCON		TOA	0	0	0
		OBLIG.	0	0	0
		OUTLAYS	0	0	0
R&D FACILITIES		TOA	0	0	0
		OBLIG.	0	0	0
		OUTLAYS	0	0	0

FY 1994 BUDGET ESTIMATE RDT&E DESCRIPTIVE SUMMARY

Program Element: 0201135J
PE Title: CINC Command and Control (C2) Initiatives Program
Budget Activity 04
Date: April 1993

A. (U) RESOURCES (Dollars in $000)

Project Number & Title	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	TO Complete	TOTAL Program
CINC Command and Control (C2) Initiatives Program					
	0	1,786	1,193	Cont.	Cont.

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program element provides the Commanders in Chief (CINCs) the capability to implement timely, low cost near-term improvements to enhance their command and control systems in response to unforeseen circumstances arising from current situations. Funding responsibility for this program was transferred from DCA to the Joint Staff beginning in FY 1993 to improve management and control.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10 MILLION IN BOTH FY 1994: These funds support small highly focused efforts to improve CINC command and control ability/reliability.

(U) FY 92 Accomplishments (DCA Funded):
- -- Mapping, Charting, and Geodesy command data base management system.
- -- SOF Intelligence van prototype.
- -- Secure video distribution design/development for command center.
- -- Survivability analysis of TW/AA communications network.
- -- Small contingency airlift simulator.

(U) FY 93 Planned Program:
- -- Provide continued low-cost, near-term enhancement to C2 systems of the CINCs in response to unforeseen operational requirements.

(U) FY 1994 Planned Program:
- -- Provide continued low-cost, near-term enhancement to C2 systems of the CINCs in response to unforeseen operational requirements.

(U) Program Plan to Completion:

(U) WORK PERFORMED BY: Numerous contractors and agencies worldwide.

This document is not releasable to non-DoD personnel without prior approval of the Joint Staff Comptroller.

FY 1994 BUDGET ESTIMATE RDT&E DESCRIPTIVE SUMMARY

Program Element: 0201135J
PE Title: CINC Command and Control (C2) Initiatives Program

Budget Activity 04
Date: April 1993

(U) RELATED ACTIVITIES: None.

(U) OTHER APPROPRIATION FUNDS: Procurement; Major Equipment.

(U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable.

FY 1994 BUDGET ESTIMATE RDT&E DESCRIPTIVE SUMMARY

Program Element: # 0303154J
PE Title: WWMCCS ADP Modernization

Project Number: ___
Budget Activity: 03
Date: April 1993

A. (U) RESOURCES (Dollars in $000)

Project Title: Global Command and Control System

Popular Name	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	TO Complete	TOTAL Program
Global Command and Control System	0	3,900	7,000	TBD	TBD

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEMS CAPABILITIES: The WAM follow-on program development was assigned to the Joint Staff which will execute the program under the name Global Command and Control System. The Global Command and Control System (GCCS) is a comprehensive, worldwide system of systems which will provide the National Command Authority (NCA), Chairman of the Joint Chiefs of Staff, combatant commanders (CINCs), Services, Defense Agencies, Joint Task Force commanders and component commanders, and others with information processing and dissemination capabilities necessary to conduct command and control (C2).

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. FY 1992 Accomplishments:
   --Not Applicable.
2. FY 1993 Planned Program:
   --Define concepts and architecture and begin integration and testing of Global Command and Control System.
3. FY 1994 Planned Program:
   --Begin system integration in anticipation of fielding.
4. Program Plan to Completion:
   -- To be determined.

D. (U) WORK PERFORMED BY: Defense Information Systems Agency, Defense Advanced Research Project Agency and Commercial Sources.

E. (U) COMPARISON WITH FY 1993 AMENDED BUDGET DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) ENGINEERING CHANGES: Not Applicable.
2. (U) SCHEDULE CHANGES: Not Applicable.
3. (U) Cost Changes: Not applicable.

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AMENDED FY 1994 BUDGET ESTIMATE RDT&E DESCRIPTIVE SUMMARY

Program Element: # 0303154J
PE Title: WAM

Project Number: ____
Budget Activity: 03

F. (U) PROGRAM DOCUMENTATION: Not applicable.

G. (U) RELATED ACTIVITIES: This project relates to WIS and WWMCCS appropriations and program elements.

H. (U) OTHER APPROPRIATION FUNDS: Operation and Maintenance and Procurement.

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable.

J. (U) MILESTONE SCHEDULE: To be determined.

FY 1994 BUDGET ESTIMATE RDT&E DESCRIPTIVE SUMMARY

Program Element: 09011600J
PE title: Contract Administration/Audit

Budget Activity: 09
Date: April 1993

a. (U) RESOURCES (DOLLARS IN $000)

Project Number & Title	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	TO Complete	TOTAL Program
Contract Administration/Audit	0	0	436	Cont.	Cont.

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: The FY1994 budget reflects the portion of the Department's estimate as a result of contract awards made in this appropriation. This represents a change from the way the budget was presented last year and reflects a Congressional and Dpartmental initiative to move toward mission budgeting which calls for an improved method of budgeting and justifying resources. The visibility of total costs related to contract awards and administrative requirements is improved in this presentation because support service funding for related contracts is included in this appropriation.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS: These funds will be used to finance contract services that are performed in support of programs budgeted in this appropriation.

D. (U) WORK PERFORMED BY: Defense Contract Audit Agency, Defense Contract Management Command.

E. (U) COMPARISON WITH PREVIOUS DESCRIPTIVE SUMMARY: N/A.

F. (U) PROGRAM DOCUMENTATION: N/A.

G. (U) RELATED ACTIVITIES: N/A

H. (U) OTHER APPROPRIATION FUNDS: Procurement.

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: N/A.

J. (U) MILESTONE SCHEDULE: N/A.

DESCRIPTIVE SUMMARIES FOR PROGRAM ELEMENTS OF THE UNITED STATES SPECIAL OPERATIONS COMMAND FISCAL YEAR 1994

APRIL 1993

RDT&E, DEFENSEWIDE

UNITED STATES SPECIAL OPERATIONS COMMAND
RESEARCH, DEVELOPMENT, TEST AND EVALUATION,
DEFENSEWIDE

INTRODUCTION

USSOCOM is a unified command with worldwide responsibilities to train, maintain, and provide Special Operations Forces in support of the contingency plans developed by the five regionally oriented unified commands (USEUCOM, USCENTCOM, USPACOM, USLANTCOM, and USSOUTHCOM). When directed by the President, USCINCSOC will assume command of a special operation anywhere in the world. USSOCOM's Army forces include special forces (Green Berets), Rangers, short to medium range infiltration/exfiltration aircraft, civil affairs specialists, and psychological operations specialists. Navy forces consist of SEAL (Sea, Air, Land) Delivery Vehicle teams and special boat units. The Air Force special operation units provide medium to long range air infiltration/exfiltration aircraft, specially equipped gunships, and aerial refuel capability. USSOCOM is the only operational command within DOD directly responsible for determining its own force structure requirement, determining the related materiel requirements, developing and procuring SOF unique equipment, and training and deploying its own units.

U.S SPECIAL OPERATIONS COMMAND
RESEARCH, DEVELOPMENT, TEST AND EVALUATION,
DEFENSEWIDE

**CROSS REFERENCE FROM FY 1993
PROGRAM ELEMENT/PROJECT NUMBER TO FY 1994**

Between FY 1993 and FY 1994, two Program Elements have been added and one has been closed. Several projects were combined or grouped under new project names and there are three new RDT&E projects. These changes are summarized below.

PROGRAM ELEMENT	REMARKS
PE # 1160279BB	PE established in Budget Activity #1 for Small Business Innovative Research (SBIR) per the SBIR Program Reauthorization Act of 1992. Project S050, SBIR, was established during the FY 1993 execution year.
PE # 1160402BB	Project P205, Studies Support for Special Operations / Low Intensity Conflict, transitioned from PE # 0605815D to this PE and Budget Activity #2.
PE # 1160404BB	Projects D474, SF300, and the C3I development and support sub-projects of project S0416 are combined into project S700, "Special Operations Communications Advanced Development". Projects D489, SF400, and the munitions sub-projects of S0416 are combined into project S800, "Special Operations Munitions Advanced Development". Projects D477, D478, and D479 are combined into project S900, "Special Operations Miscellaneous Equipment Advanced Development". S300 and the weapons sub-projects of S0416 are combined into project S375, "Special Operations Weapons Systems Advanced Development". Project SF100 has been renamed "Special Operations Aviation Systems Advanced Development". The sub-project called Navy RDT&E in S0417 has been renamed and transferred to PE # 1160407BB, project S275, "Special Operations Medical Technology Research and Development". Two new project starts are S650, "Quiet Knight Development and Integration," S675, "Sustainment Engineering Support."
PE # 1160407BB	The sub-project called Navy RDT&E in PE # 1160404BB, project S0417 has been renamed and transferred to this PE in order to consolidate medical technology R&D into one PE.

CROSS REFERENCE FROM FY 1993
PROGRAM ELEMENT/PROJECT NUMBER TO FY 1994 (Continued)

PE # 0901600BB	This new PE contains, in project S990, USSOCOM share of Defense Agency contract audit administration costs as directed by Defense Management Report Decision(DMRD) 990.
PE # 1160409BB	This PE has no funding in the budget years. Prior year element funds were distributed to project S200 in PE # 1160402 ($300K FY92, $400K FY93) and project S400 in PE # 116040SBB ($5780K FY92, $770K FY93).

U.S. SPECIAL OPERATIONS COMMAND
RESEARCH, DEVELOPMENT, TEST AND EVALUATION,
DEFENSEWIDE

Fiscal Year 1994 Budget Estimates

SUMMARY OF FY 1994 PROJECTS BY PROGRAM ELEMENT

(U) RESOURCES: ($ in Thousands)

Program Element: #1160279BB — Budget Activity: #1
PE Title: Small Business Innovative Research (SBIR)

PROJECT NUMBER	TITLE	FY 1992 ACTUAL	FY 1993 ESTIMATE	FY 1994 ESTIMATE	TO COMPLETE	TOTAL PROGRAM
S050	SBIR	0	1,749	2,281	Cont.	Cont.
Total		0	1,749	2,281		

Program Element: #1160401BB — Budget Activity: #2
PE Title: Special Operations Technology Development

PROJECT NUMBER	TITLE	FY 1992 ACTUAL	FY 1993 ESTIMATE	FY 1994 ESTIMATE	TO COMPLETE	TOTAL PROGRAM
S100	SO TECH BASE DEV	3,550	3,730	17,794	Cont.	Cont.

Program Element: #1160402BB — Budget Activity: #2
PE Title: Special Operations Advanced Technology Development

PROJECT NUMBER	TITLE	FY 1992 ACTUAL	FY 1993 ESTIMATE	FY 1994 ESTIMATE	TO COMPLETE	TOTAL PROGRAM
P204	EOD-LIC	5,000	4,641	2,426	Cont.	Cont.
P205	SO/LIC STUDIES	0	0	1,455	Cont.	Cont.
S200	SOST	10,850*	8,268*	5,774	Cont.	Cont.

* PE #1160409BB (Other Force Programs; Project S400A) contains $300 in FY92 and $400 in FY93 for the SOST Program. Total funding for SOST program is $11,150 in FY92 and $8,668 in FY93.

Program Element: #1160404BB — Budget Activity: #4
PE Title: Special Operations Tactical Systems Development

PROJECT NUMBER	TITLE	FY 1992 ACTUAL	FY 1993 ESTIMATE	FY 1994 ESTIMATE	TO COMPLETE	TOTAL PROGRAM
DE14	JASORS	12,590	18,482	33,166	Cont.	Cont.
D476	PSYOPS	1,424	3,905	289	Cont.	Cont.
D615	SOF AV	23,785	2,617	19,181	0	64,070
SF100	AVIA DEV	1,053	3,100	0	Cont.	Cont.
SF200	CV-22	15,000	0	0	TBD	TBD

SUMMARY OF FY 1994 PROJECTS BY PROGRAM ELEMENT (Continued)

PROJECT NUMBER	TITLE	FY 1992 ACTUAL	FY 1993 ESTIMATE	FY 1994 ESTIMATE	TO COMPLETE	TOTAL PROGRAM
S0417	S SUP SYS	21,198	6,597	36,345	Cont.	Cont.
(Sub-project: Navy C3 and Electronics" transferred to S700, $625 in FY92 and $626 in FY93. Sub-project "Navy RDT&E" transferred to S275, $685 in FY92 and $646 in FY93.)						
S1684	SWC CRAFT	25,192	2,961	10,897	Cont.	Cont.
3129	MC-130H	3,324	0	0	0	6,675
3284	SOF ADS	8,806	6,691	20,943	TBD	TBD
3326	AC-130U	26,655	22,706	32,821	0	93,097
3642	SOF ATS	36,961	19,307	24,697	TBD	TBD
S350	SOFPARS	10,007	9,845	5,813	TBD	TBD
S375	WEPS SYS	468	2,072	2,066	Cont.	Cont.
(FY92/93 funds include funding from former projects S300 and S0416)						
S650	QUIET KNT	0	0	969	Cont.	Cont.
S675	SUST ENG	0	0	9,615	Cont.	Cont.
S700	COMMS	3,369	4,527	7,911	Cont.	Cont.
(FY92/93 funds include funding from former projects D474, SF300, and the C3I development and support subprojects of S0417)						
S800	MUNITIONS	16,247	14,150	14,788	Cont.	Cont.
(FY92/93 funds include funding from former projects D489, SF400, and the munitions subprojects of S0416)						
S900	MISC EQUIP	1,245	1,313	1,804	Cont.	Cont.
(FY92/93 funds include funding from former projects D477, D478, D479)						

Program Element: #1160405BB — Budget Activity: #4

PE Title: Special Operations Intelligence Systems Development

PROJECT NUMBER	TITLE	FY 1992 ACTUAL	FY 1993 ESTIMATE	FY 1994 ESTIMATE	TO COMPLETE	TOTAL PROGRAM
S400	SOF INTEL R&D	10,057*	27,254*	6,686	Cont.	Cont.

* PE # 1160409BB (Other Force Programs; Project 400A) contains $5,780 in FY92 and $770 in FY93 for SOF Intel R&D. Total funding for SOF Intel R&D is $15,837 in FY92 and $28,024 in FY93.

SUMMARY OF FY 1994 PROJECTS BY PROGRAM ELEMENT (Continued)

Program Element: #1160407BB — Budget Activity: #2
PE Title: SOF Medical Technology Development

PROJECT NUMBER	TITLE	FY 1992 ACTUAL	FY 1993 ESTIMATE	FY 1994 ESTIMATE	TO COMPLETE	TOTAL PROGRAM
S275	SO MED TECH R&D	984*	1,187*	1,310	Cont.	Cont.

* Funds include transfer of $685 FY92 and $646 FY93 from PE # 1160404BB, Project S0417, sub-project "Navy RDT&E" to this project.

Program Element: #1160408BB — Budget Activity: #4
PE Title: SOF Operational Enhancements*

PROJECT NUMBER	TITLE	FY 1992 ACTUAL	FY 1993 ESTIMATE	FY 1994 ESTIMATE	TO COMPLETE	TOTAL PROGRAM
S500A	OPN'L ENH	55,990	69,456	72,167	Cont.	Cont.

* Will be submitted under separate cover.

Program Element: #0901600BB — Budget Activity: #4
PE Title: Contract Audit Administration Costs

PROJECT NUMBER	TITLE	FY 1992 ACTUAL	FY 1993 ESTIMATE	FY 1994 ESTIMATE	TO COMPLETE	TOTAL PROGRAM
S990	Audit Admin	0	0	4,656	Cont.	Cont.

Program Element: #1160409BB — Budget Activity: #5
PE Title: Other Force Programs

PROJECT NUMBER	TITLE	FY 1992 ACTUAL	FY 1993 ESTIMATE	FY 1994 ESTIMATE	TO COMPLETE	TOTAL PROGRAM
S400A	OTH FP	6,080	1,170	0	0	0

U.S. SPECIAL OPERATIONS COMMAND
RESEARCH, DEVELOPMENT, TEST AND EVALUATION,
DEFENSEWIDE

SUMMARY OF FY 1994 PROJECTS BY PROJECT NUMBER

PROJ NR	PROJECT TITLE	PROGRAM ELEMENT	PROGRAM TITLE
DE14	JASORS	1160404BB	SO TACT SYS DEVELOPMENT
D476	PSYOPS Advanced Development	1160404BB	SO TACT SYS DEVELOPMENT
D615	SOF Aviation	1160404BB	SO TACT SYS DEVELOPMENT
P204	EOD-LIC	1160402BB	SO ADVANCED TECH DEVELOPMENT
P205	SO/LIC STUDIES	1160402BB	SO ADVANCED TECH DEVELOPMENT
S0417	SEAL Support Systems	1160404BB	SO TACT SYS DEVELOPMENT
S050	SBIR	1160279BB	SMALL BUSINESS INNOVATIVE RESEARCH
S100	SO Technology Development	1160401BB	SO TECHNOLOGY DEVELOPMENT
S1684	Special Warfare Combatant Craft	1160404BB	SO TACT SYS DEVELOPMENT
S200	Special Operations Special Technology	1160402BB	SO ADVANCED TECH DEVELOPMENT
S275	SO Medical Technology Research	1160407BB	SO MED TECH RESEARCH & DEVELOPMENT
S350	SOFPARS	1160404BB	SO TACT SYS DEVELOPMENT
S375	SO Weapons Systems Advanced Development	1160404BB	SO TACT SYS DEVELOPMENT
S400	SO Intelligence R&D	1160405BB	SO INTELLIGENCE SYSTEMS DEVELOPMENT
S400A	Other Force Programs	1160409BB	OTHER FORCE PROGRAMS
S650	Quiet Knight Development/ Integration	1160404BB	SO TACT SYS DEVELOPMENT
S675	Sustainment Engineering Support	1160404BB	SO TACT SYS DEVELOPMENT
S700	SO Communications Adv Dev	1160404BB	SO TACT SYS DEVELOPMENT
S800	SO Munitions Adv Dev	1160404BB	SO TACT SYS DEVELOPMENT
S900	SO Miscellaneous Equipment Adv Dev	1160404BB	SO TACT SYS DEVELOPMENT
S990	Audit Administration	0901600BB	CONTRACT AUDIT ADMIN COSTS

U.S. SPECIAL OPERATIONS COMMAND
RESEARCH, DEVELOPMENT, TEST AND EVALUATION,
DEFENSEWIDE

SUMMARY OF FY 1994 PROJECTS BY PROJECT NUMBER (Continued)

PROJ NR	PROJECT TITLE	PROGRAM ELEMENT	PROGRAM TITLE
SF100	Aviation Systems Adv Dev	1160404BB	SO TACT SYS DEVELOPMENT
SF200	CV-22	1160404BB	SO TACT SYS DEVELOPMENT
3129	MC-130H	1160404BB	SO TACT SYS DEVELOPMENT
3284	SOF Aircraft Defensive Systems (SOF ADS)	1160404BB	SO TACT SYS DEVELOPMENT
3326	AC-130U	1160404BB	SO TACT SYS DEVELOPMENT
3642	SOF Aircrew Training Sys	1160404BB	SO TACT SYS DEVELOPMENT

U.S. SPECIAL OPERATIONS COMMAND
RESEARCH, DEVELOPMENT, TEST AND EVALUATION,
DEFENSEWIDE

SUMMARY OF FY 1994 PROJECTS BY PROJECT TITLE

PROJECT TITLE	PROJ NR	PROGRAM ELEMENT	PROGRAM TITLE
AC-130U	3326	1160404BB	SO TACT SYS DEVELOPMENT
Audit Administration	S990	0901600BB	CONTRACT AUDIT ADMINISTRATION
Aviation Systems Adv Dev	SF100	1160404BB	SO TACT SYS DEVELOPMENT
CV-22	SF200	1160404BB	SO TACT SYS DEVELOPMENT
EOD-LIC	P204	1160402BB	SO ADVANCED TECH DEVELOPMENT
JASORS	DE14	1160404BB	SO TACT SYS DEVELOPMENT
MC-130H	3129	1160404BB	SO TACT SYS DEVELOPMENT
Other Force Programs	S400A	1160409BB	OTHER FORCE PROGRAMS
PSYOPS Advanced Development	D476	1160404BB	SO TACT SYS DEVELOPMENT
Quiet Knight Development Integration	S650	1160404BB	SO TACT SYS DEVELOPMENT
SEAL Support Systems	S0417	1160404BB	SO TACT SYS DEVELOPMENT
Small Business Innovative Research	S050	1160279BB	SMALL BUSINESS INNOVATIVE RES
SO Communications Adv Dev	S700	1160404BB	SO TACT SYS DEVELOPMENT
SO Intelligence R&D	S400	1160405BB	SO INTELLIGENCE SYSTEMS DEVELOPMENT
SOF Aircraft Defensive Systems	3284	1160404BB	SO TACT SYS DEVELOPMENT
SOF Aircrew Training Sys	3642	1160404BB	SO TACT SYS DEVELOPMENT
SOF Aviation	D615	1160404BB	SO TACT SYS DEVELOPMENT
SOFPARS	S350	1160404BB	SO TACT SYS DEVELOPMENT
SO/LIC Studies	P205	1160402BB	SO ADVANCED TECH DEVELOPMENT
SO Medical Technology Research	S275	1160407BB	SO MED TECH RESEARCH/DEVELOPMENT
SO Miscellaneous Equipment Advanced Development	S900	1160404BB	SO TACT SYS DEVELOPMENT

U.S. SPECIAL OPERATIONS COMMAND
RESEARCH, DEVELOPMENT, TEST AND EVALUATION,
DEFENSEWIDE

SUMMARY OF FY 1994 PROJECTS BY PROJECT TITLE (Continued)

PROJECT TITLE	PROJ NR	PROGRAM ELEMENT	PROGRAM TITLE
SO Munitions Adv Dev	S800	1160404BB	SO TACT SYS DEVELOPMENT
SO Technology Development	S100	1160401BB	SO TECHNOLOGY DEVELOPMENT
SO Weapons Systems Adv Dev	S375	1160401BB	SO TECHNOLOGY DEVELOPMENT
Special Operations Special Technology	S200	1160402BB	SO ADVANCED TECH DEVELOPMENT
Special Warfare Combatant Craft	S1684	1160404BB	SO TACT SYS DEVELOPMENT
Sustainment Engineering Support	S675	1160404BB	SO TACT SYS DEVELOPMENT

FISCAL YEAR 1994 BUDGET ESTIMATES
RDT&E DESCRIPTIVE SUMMARY

Program Element: #1160279BB
PE Title: Small Business Innovative Research (SBIR)
Budget Activity: #1
Date: March 1993

A. (U) RESOURCES: ($ in Thousands)

PROJECT NR & TITLE	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
S050 Small Business Innovative Research (SBIR)					
	0	1,749	2,281	Cont.	Cont.
Total	0	1,749	2,281		

B. (U) BRIEF DESCRIPTION OF PROJECT: The Small Business Innovative Research (SBIR) program is a highly competitive three phase award system which provides qualified small business concerns with opportunity to propose high quality innovative ideas that meet specific research and development needs of USSOCOM. SBIR is a result of the Small Business Development Act of 1992. It was enacted by Congress in Public Law 97-219 reenacted by Public Law 99-443 and reauthorized by the SBIR Program Reauthorization Act of 1992. Starting in FY 1994, the SBIR program will be refocused towards dual use and defense reinvestment efforts.

FISCAL YEAR 1994 BUDGET ESTIMATES
RDT&E DESCRIPTIVE SUMMARY

Program Element: #1160279BB
PE Title: Small Business Innovative Research (SBIR)
Budget Activity: #1
Date: April 1993

A. (U) RESOURCES: ($ in Thousands)

PROJECT NR & TITLE	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
S050 Small Business Innovative Research (SBIR)					
	0	1,749	2,281	Cont.	Cont.

B. (U) BRIEF DESCRIPTION OF PROJECT: The Small Business Innovative Research (SBIR) program is a highly competitive three phase award system which provides qualified small business concerns with opportunity to propose high quality innovative ideas that meet specific research and development needs of USSOCOM. SBIR is a result of the Small Business Development Act of 1992. It was enacted by Congress in Public Law 97-219, reenacted by Public Law 99-443, and reauthorized by the SBIR Program Reauthorization Act of 1992. Starting in FY 1994, the SBIR program will be refocused towards dual use and defense reinvestment efforts.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN FY 1994:

(U) Project S050 - Small Business Innovative Research (SBIR): Phase I projects evaluate the scientific technical merit and feasibility of an idea. Awards are up to $100,000 with a maximum of a six month period for performance. Phase II projects expand the results of and further pursue the developments of Phase I. Awards are up to $750,000 with a maximum two year period of performance. Phase III is for commercialization of the results of Phase II and requires the use of private or non-SBIR federal funding. DoD publishes government agency proposal projects twice a year for a common DoD Request for Proposal. USSOCOM then awards its proposed SBIR projects.

(U) FY 1992 Accomplishments: Not Applicable. Project starts in FY 1993.

(U) FY 1993 Planned Program:

- (U) Award Phase I contracts to initiate SBIR projects among the following objectives:

  - o (U) Design and demonstrate a family of equipment to be used by Navy SEALs to find and neutralize underwater mines in very shallow water.

  - o (U) Design and develop kits for the Multi-Mission Advanced Tactical Terminal (MATT) to enable reception of the Tactical Information Broadcast Service (TIBS) and the Tactical Reconnaissance Intelligence Exchange System (TRIXS).

  - o (U) Design and demonstrate a reusable, mechanically rechargeable battery, using aluminum/air chemistry,

FISCAL YEAR 1994 BUDGET ESTIMATES
RDT&E DESCRIPTIVE SUMMARY

Program Element: #1160279BB
PE Title: Small Business Innovative Research (SBIR)
Budget Activity: #1
Date: April 1993

for potential use by SOF personnel in remote ground activities.

- (U) Award Phase II contracts for projects that successfully complete Phase I. The emphasis of the FY 1994 program will be toward dual use and defense reinvestment efforts.

(U) FY 1994 Planned Program:

- (U) Continue FY93 projects.
- (U) Award contracts for new Phase I/II as identified by the DoD SBIR process.

(U) Program to Completion:

- (U) This is a continuing program.

(U) Work Performed by: To be determined.

(U) Related Activities: To be determined.

(U) Other Appropriated Funds: To be determined.

(U) International Cooperative Agreements: None.

FISCAL YEAR 1994 BUDGET ESTIMATES
RDT&E DESCRIPTIVE SUMMARY

Program Element: #1160401BB
PE Title: Special Operations Technology Development

Budget Activity: #2
Date: April 1993

A. (U) RESOURCES: ($ in Thousands)

PROJECT NR & TITLE	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
S100 Special Operations Technology Base Development					
	3,550	3,730	17,794	Cont.	Cont.
Total	3,550	3,730	17,794		

B. (U) DESCRIPTION: This program provides studies and laboratory prototypes for USSOCOM to link non-system basic and exploratory research and development to future SOF specific system full-scale development and procurement. This project supports special operations forces, psychological and civil affairs forces involvement in foreign internal defense, and counterterrorism worldwide. It also supports special operations forces conduct of special reconnaissance and direct action operations in low, mid, and high intensity conflict.

(U) The objective of the SOF tech base program is to provide a balanced effort of studies and tech base funding across the 6.2 and 6.3A categories in order to exploit technological developments of other organizations through aggressive resource leveraging. This resource leveraging (applying small incremental amounts of USSOCOM funding on top of significantly larger research investments by other DoD, government, and commercial organizations) will allow USCINCSOC to influence the direction of technology development or the schedule against which it is being pursued to acquire emerging technology for SOF.

FISCAL YEAR 1994 BUDGET ESTIMATES
RDT&E DESCRIPTIVE SUMMARY

Program Element: #1160401BB
PE Title: SO Technology Development

Budget Activity: #2
Date: April 1993

A. (U) RESOURCES: ($ in Thousands)

PROJECT NR & TITLE	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
S100 Special Operations Technology Base Development					
	3,505	3,730	17,794	Cont.	Cont.

B. (U) BRIEF DESCRIPTION OF PROJECT: This program provides studies and laboratory prototypes for USSOCOM to link non-system basic research and development to future SOF specific system full scale development and procurement. This program supports special operations, psychological and civil affairs forces involvement in foreign internal defense, counter-terrorism, and other special operations activities worldwide. It also supports special operations forces conduct of special reconnaissance and direct action operations in low, mid, and high intensity conflict.

(U) The objective of the SOF tech base program is to provide a balanced effort of studies and tech base funding across the 6.2 and 6.3A categories in order to exploit technological developments of other organizations through aggressive resource leveraging. This resource leveraging (applying small incremental amounts of USSOCOM funding on top of significantly larger research investments by other DoD, government, and commercial organizations) will allow USCINCSOC to influence the direction of technology development or the schedule against which it is being pursued to acquire emerging technology for SOF.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN FY 1994:

(U) Project S100 - Special Operations Technology Base Development: This program provides an investment strategy for USSOCOM to link non-system basic and exploratory research and development to future SOF specific system full-scale development and procurement.

(U) FY 1992 Accomplishments:

- (U) Supported concept exploration and technology demonstrations of component priority projects as follows:
  - (U) Quiet Knight Technology: Phase II continued into FY92 to develop concepts and prototype technologies to reduce electronic signature of SOF aircraft. Program includes concept validation of active interaction with digital terrain elevation database and low radar output for low level navigation. Also, includes validation of active in-flight route replanning.
  - (U) Individual Operational Ration: Initiated development of computer-based methodology to apply individual physiological and mission data to optimize

FISCAL YEAR 1994 BUDGET ESTIMATES
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Program Element: #1160401BB
PE Title: SO Technology Development

Budget Activity: #2
Date: April 1993

use of existing ration components by SOF soldiers. Builds on Army rations and physiological work.

- (U) Supported the USSOCOM Technology Exploitation Program for the following new initiative:

  - o (U) Speech Processor: Classified project for concept exploration and proof-of-concept demonstration of a psychological operations and communications deception technique.

- (U) Conducted concept exploration of SOF-applicable technology for the following projects:

  - o (U) Manportable Non-line-of-sight Weapons System: Initiated concept development of Army lab initiatives for weapons which provide surgical accuracy without line of sight targeting.

  - o (U) Concepts for New SOF Power Sources: Extended original Army power source study for individual soldier and light force operations. Supported concept exploration and prototyping program initiated in late FY92 and to extend into FY93.

  - o (U) Advanced Sniper Weapon Fire Control System: Initiated effort to design and prototype inertially stabilized reticle and computer/sensor package for application to advanced sniper weapon.

- (U) Leveraged Service and DARPA lab efforts to meet SOF technology objectives in the following projects:

  - o (U) SOF Enhanced Moldable Explosive Charge (SEMEC): Started development and demonstration of an improved trinitroazetidine (TNAZ) based moldable explosive charge for SOF. Enhancements include providing at least 15% more power, by weight and volume, than currently available moldable explosives while providing the same or lower sensitivity.

  - o (U) Battle Dress System (BDS): Initiated development of integrated, modularized head-to-foot battle uniform which may also serve as a test bed/prototype for the Army's Soldier Enhancement Program. Development is in conjunction with Individual Signature Reduction project and leverages against Army Human Engineering Laboratory (HEL) and other investments.

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- o (U) Lower Extremity Assistance for Parachutist (LEAP): Initiated development of prototype lower extremity exoskeletal support for parachutists carrying heavy loads or landing on rough terrain and hard surfaces. Based on prior Army development. Operational prototype data will feed advanced work by DARPA, Army and the Marine Corps.

- (U) FY92 deferred/canceled projects:

  - o (U) Planned project to research Improved Energy Source for Underwater Vehicles was deferred to FY93. Delay was primarily because of unavailability of project personnel to develop and process necessary international approvals. However, the delay will also permit assessment of additional related R&D work before project initiation.

  - o (U) Planned project to research High Powered Microwave SOF weapon application was canceled. Anticipated significant Service co-funding was not made available. The project could not be executed without co-funding.

(U) FY 1993 Planned Program:

- (U) Continue development of Quiet Knight Technology, Speech Processor, Manportable Non-line-of-sight Weapons System, Concepts for New SOF Power Sources, Advanced Sniper Weapon Fire Control system, SOF Enhanced Moldable Explosive Charge, Battle Dress System (extended to include adaptive individual camouflage), Lower Extremity Assistance for Parachutist, and Individual Operational Rations.

- (U) Initiate research and development for the Diver Magnetic Mine Detector and Underwater Electromagnetic Designator.

- (U) Extend research to new concept explorations, additional service leveraging opportunities, and the technology exploitation program.

(U) FY 1994 Planned Program:

- (U) Continue work on FY93 projects to completion.

- (U) Extend strategic research investment in appropriate candidate areas such as the following:

  - o (U) New Technologies: directed energy (microwave, lasers, particle beam); non-lethal weapons; psycho-physiological studies; stealth technologies.

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PE Title: SO Technology Development

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- (U) Concept Explorations: stand-off weapons; incendiaries and munitions; adhesives; human sensory enhancing equipment, day/night sights and fire control systems; multi-spectral, man portable vision devices and sensors; sensor fusion; artificial intelligence/expert systems; low observables.

- (U) Accelerate/Channel Service Efforts: power sources; mine detection; air/land/sea remotely piloted vehicles; soldier support systems; low observable technologies.

(U) Program to Completion: This is a continuing program.

(U) Work Performed By: U.S. Army Human Engineering Laboratory, U.S. Army Belvoir RD&E Center, Naval Sea Systems Command, U.S. Army Natick RD&E Center, U.S. Army Missile Command, U.S. Army Armament RD&E Center, Warner Robins Air Logistics Center, U.S Army Ballistics Research Laboratory, U.S. Air Force Wright Laboratories, Los Alamos National Laboratory, Idaho National Engineering Laboratory, and U.S. Army Harry Diamond Laboratory.

(U) Related Activities: There is no unnecessary duplication of effort within the Department of Defense. Numerous projects capitalize on the technological developments of other organizations through resource leveraging so that Special Operations unique requirements are addressed.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: None.

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Program Element: #1160402BB
PE Title: Special Operations Advanced Technology Dev

Budget Activity: #2
Date: April 1993

A. (U) RESOURCES: ($ in Thousands)

PROJECT NR & TITLE	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
P204 Explosive Ordnance Disposal for Low Intensity Conflict (EOD-LIC)	5,000	4,641	2,426	Cont.	Cont.
P205 Studies Support for Special Operations/Low Intensity Conflict	0	0	1,455	Cont.	Cont.
S200 Special Operations Special Technology (SOST)	10,850*	8,268*	5,774	Cont.	Cont.
Total	15,850	12,909	9,655		

* PE # 1160409BB (Other Force Programs; Project S400A) contains $300 in FY92 and $400 in FY93 for SOST. Total funding is $11,150 in FY92 and $8,668 in FY93.

B. (U) DESCRIPTION: This program is a rapid prototyping effort to provide technology and equipment to military operators who are confronted with explosive and hazardous material threats (EOD-LIC) and to accelerate the acquisition of SOF-peculiar equipment (SOST). It also provides specialized research and analytical support for OASD(SO/LIC). Technology goals are generated annually by ASD(SO/LIC) and USSOCOM with input from components and regional commanders-in-chief (CINCs).

FISCAL YEAR 1994 BUDGET ESTIMATES
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Program Element: #1160402BB
PE Title: SO Advanced Technology Development

Budget Activity: #2
Date: April 1993

A. (U) RESOURCES: ($ in Thousands)

PROJECT NR & TITLE	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
P204 Explosive Ordinance Disposal for Low Intensity Conflict (EOD-LIC)	5,000	4,641	2,426	Cont.	Cont.

B. (U) BRIEF DESCRIPTION OF PROJECT: This program is a rapid prototyping effort to provide technology and equipment to military operators who are confronted with explosive and hazardous material threats.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN FY 1994:

(U) Project P204 - Explosive Ordnance Disposal for Low Intensity Conflict (EOD-LIC): The project objective is to provide the military user effective prototype equipment, with real operational utility, within 12-24 months after requirement definition. The project supports foreign internal defense, counter-terrorism activities worldwide, military assistance and training activities in the Middle East, Pacific, South America, and other LIC situations as they develop. Tasks focus on detection, countermeasures, and neutralization of explosive and hazardous material threats. Requirements submitted by the Joint Service EOD community, Special Operations, Marine Corps, and other LIC-oriented military users were prioritized by the EOD/LIC Coordination Group at OSD.

(U) FY 1992 Accomplishments:

- (U) Completed and transitioned the following sub-projects: Digital Picture Transmitter, Device Disrupter/Dearmer, Differential Global Positioning System (DGPS), Interactive Video Training, and Diver Held Sonar.
- (U) Continued development of: Mini-flail, Microwave Mine Detector, and Forward Looking Sonar.
- (U) Initiated new tasks to develop:
  - -- (U) Autonomous Search Vehicle. Development of a small autonomous vehicle capable of remotely surveying a surf zone or harbor for mine-like targets on the sea floor.
  - -- (U) Advanced Radiographic System. Demonstration of a compact, lightweight, man-portable, high resolution radiography system, including computer image processing, that provides real time internal views of conventional munitions fuzing and improvised devices.
  - -- (U) Automated Ferrous Locator. Development of a small, man-portable ferrous ordnance locator that

combines three technologies: detection of ferrous magnetic signatures in soil, computerized data storage, and positional coordinate locator.

-- (U) Low Watt Wireless Communications. Demonstration of a wireless communication system with extremely low electromagnetic emissions to support EOD operational units performing render safe procedures.

-- (U) Remote Firing Device. Demonstration of a small, remotely detonating system which allows rapid command detonation of explosive material over long distances by EOD personnel.

-- (U) EOD Boat Signature Reduction. Demonstration of a low acoustic and magnetic signature configuration of a small EOD boat which will minimize the dangers associated with influence fuzed sea mines.

-- (U) Circuitry Analysis/Verification. Development of a hand-held diagnostic tool to assist EOD personnel in detecting electronic circuitry used in various fuzing and improvised explosive devices.

-- (U) Diver Head-Up-Display. Development of a miniaturized liquid crystal display and associated electronics for the head-up display of multiple input information displayed either sequentially or on command by Navy divers.

-- (U) Infrared Goggles. Demonstration of a new generation night vision goggle for use by EOD teams during operations involving booby-trap clearance/avoidance and explosive device entry, to make visible slight temperature differences emitted from a wide variety of sources.

-- (U) Mine/Countermine Database. Development of a comprehensive database of landmines for Army Special Forces which is fully compatible with the EOD/LIC Interactive Video Training System.

(U) FY 1993 Planned Program:

- (U) Complete and transition the following tasks: Mini-flail, Microwave Mine Locator, Forward Looking Sonar, Improvised Explosive Device Sterilizer, High Frequency Transit Case, Chemical Detector, Acoustic Underwater Firing Device, EOD Mid-East Training, Fiber-optic Communications, Laser C-4 Initiation System, Advanced Radiographic System, Millimeter Wave Radar Probe, Low Watt Wireless Communications, Remote Firing Device, and EOD Boat Signature Reduction.

- (U) Continue development of: Underwater Navigation System, Standoff Detection, Low Watt Wireless Communications, Underwater Laser Imaging System, Autonomous Search Vehicle, Automated Ferrous Locator, Circuit Analysis/Verification,

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PE Title: SO Advanced Technology Development

Budget Activity: #2
Date: April 1993

Diver Head-up Display, Infrared Goggles, and Mine/Countermine Database.

- (U) Initiate new tasks: Currently, all FY 1993 funding is earmarked to complete or continue tasks which are underway. No new starts are planned.

(U) FY 1994 Planned Program:

- (U) Complete and transition the following tasks: Underwater Navigation System, Standoff Detection, Underwater Laser Imaging System, Autonomous Search Vehicle, Automated Ferrous Locator, Circuit Analysis/Verification, Diver Head-up Display, Infrared Goggles, and Mine/Countermine Database.

- (U) Initiate new tasks: This is a rapid prototyping program which supports world-wide contingencies to meet the requirements of Joint Service EOD and Special Operations communities. Projects are nominated by the various communities in response to specific criteria established by the OSD Coordination Group. Currently, sub-projects planned for FY 1994 are as follows:

  -- (U) Mine Reconnaissance Underwater Vehicle - Development of a small unmanned underwater vehicle (UUV) which integrates several technologies into an autonomous shallow-water mine hunting vehicle.
  -- (U) Portable High Resolution Sonar - Develop a sonar to locate mines in very shallow water from an inflatable Special Warfare boat.

(U) Program to Completion: This is a continuing program.

(U) Work Performed By: Projects are performed by a variety of organizations, including academic, commercial analytical organizations, and DOD and other R&D activities (These organizations include the U.S. Army Belvoir RD&E Center, Fort Belvoir, VA; Columbia Research Corporation, Panama City, FL; Harris Corporation, Rochester, NY; Naval EOD Technology Center, Indian Head, MD; EG&G Special Technologies Laboratory, Santa Barbara, CA; and EG&G/INEL, Idaho Falls, ID; Essex Corporation, McLean, VA; Marconi Underwater Systems Limited, Somerset, England; Indian Head Division, Naval Surface Warfare Center, Indian Head, MD; Honeywell ELAC, Kiel, Germany; Coastal Systems Station, Panama City, FL; SPARTA Laser Systems Laboratory, San Diego, CA; Electronic Warfare Associates, Inc., Vienna, VA; and Sandia National Laboratories, Albuquerque, NM).

(U) Related Activities: Program provides a coordinated response to DOD component requirements for rapid prototyping of EOD-LIC equipment. Individual DOD Components establish follow-on programs for full-scale development (if required), procurement, and fielding.

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PE Title: SO Advanced Technology Development

Budget Activity: #2
Date: April 1993

OSD EOD/LIC Coordination Group maintains oversight of the tasks which are executed through the Office of Special Technology (OST). There is no unnecessary duplication of effort in the Department of Defense.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperation Agreements: Not Applicable.

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Program Element: #1160402BB
PE Title: SO Advanced Technology Development

Budget Activity: #2
Date: April 1993

A. (U) RESOURCES: ($ in Thousands)

PROJECT NR & TITLE	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
P205 Studies Support for Special Operations/Low-Intensity Conflict	-0-*	-0-*	1,455	Cont.	Cont.

* FY92 ($1,897) and FY93 ($1,500) project funded in PE 0605815D.

B. (U) BRIEF DESCRIPTION OF PROJECT: This project provides specialized research and analytical support for the Assistant Secretary of Defense for Special Operations and Low-Intensity Conflict, ASD(SO/LIC). Projects address a broad spectrum of technical, acquisition, and policy issues relating to SO, LIC, counter- and anti- terrorism, peacekeeping, psychological operations, counterinsurgency, unconventional warfare, and contingency operations. The project supports and is integrated into overall DoD efforts to develop options for dealing effectively with a wide range of military responsibilities in the military environment other than war.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN FY 1994:

(U) Project P205 - Studies Support for Special Operations/Low-Intensity Conflict: This project provides a vehicle to initiate studies required to support acquisition documentation and philosophical policy issues regarding roles and missions of SOF in the changing world environment.

(U) FY 1992 Accomplishments:

- (U) Projects included the following studies: potential SOF roles in countering the proliferation of weapons of mass destruction; intelligence requirements for low-intensity conflict; forces costing models for Major Force Program 11; the narco-insurgent connection in the Andean Ridge (cosponsored with USSOUTHCOM); moral and legal constraints on low-intensity conflict; low-intensity management initiatives; and lessons learned from U.S. involvement in the Salvadoran Civil War (cosponsored with OASD(ISA)).

(U) FY 1993 Planned Program:

- (U) Projects under consideration include: terrorism futures; military effectiveness in low-intensity conflict; SOF resources blueprint; contingency and wartime manning for theater special operations commands; special weapons proliferation; and a number of other projects designed to increase the utility of SOF and the military tools for coping with LIC in a rapidly changing security environment.

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PE Title: SO Advanced Technology Development

Budget Activity: #2
Date: April 1993

(U) FY 1994 Planned Program:

- (U) Continue to develop policy and planning alternatives, analyze force structure and resource allocations, and refine countermeasures options with regard to low-intensity conflict and the role of SOF in the new global environment. Projects will be geared to efforts to develop a coherent, cost-effective approach to integrate policy, strategy, and force structure to support the national military strategy during a period of declining resources and changing threats. Examples include: terrorism strategy validation; staff augmentation and readiness training for theater special operations commands; issues regarding the use of SOF in countering the proliferation of weapons of mass destruction; and studies supporting the concept exploration and definition and execution of acquisition programs.

(U) Program to Completion: This is a continuing program.

(U) Work Performed By: Projects will be performed by a variety of organizations, including academe, commercial analytical organizations, and Federally Funded Research and Development Centers.

(U) Related Activities: Program is coordinated with other DoD organizations to eliminate potential duplications with past, ongoing, or proposed studies.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

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Program Element: #1160402BB
PE Title: SO Advanced Technology Development (SOST)
Budget Activity: #2
Date: April 1993

A. (U) RESOURCES: ($ in Thousands)

PROJECT NR & TITLE	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
S200 Special Operations Special Technology (SOST)					
	10,850*	8,268*	5,774	Cont.	Cont.

* PE #1160409BB (Other Force Programs; Project S400A) contains $300 in FY92 and $400 in FY93 for SOST. Total funding is $11,150 in FY92 and $8,668 in FY93.

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: Special Operations Special Technology (SOST) is a 6.3A type rapid prototyping program which mates emerging advanced technologies with SOF-peculiar mission requirements. Successful SOST projects are prepared for transition into the normal acquisition process, if further development is desired. SOST participation ends once the prototypes are evaluated and a transition package is prepared. A typical SOST transition package includes the prototype(s), evaluation results, draft Operational Requirements Document (ORD), and a proposed acquisition plan. It focuses on meeting technology goals that:

(U) 1. Are a result of unique joint service, special mission, or area specific needs for which a few of a kind prototypes must be developed on a rapid response basis.

(U) 2. Are of sufficient time sensitivity to accelerate the prototyping effort of a normal acquisition program in any phase. This prototype acceleration typically reduces the acquisition cycle by three years.

(U) 3. Are SOF-peculiar advanced technology demonstrations.

C. (U) PROJECT ACCOMPLISHMENTS AND PLANS:

(U) FY 1992 Accomplishments:

- (U) AIRBORNE COMMUNICATIONS COMPUTER (ACC). Awarded contract to develop computer system for use in SOF airframes to update communications equipment, provide navigation assistance, and programming Electronic Countermeasures (ECM) at remote sites.

- (U) DEPLOYABLE MEDIA PRODUCTION CENTER (DMPC). Awarded contract to develop, fabricate and test deployable PSYOP video and leaflet production system.

- (U) ASSAULT ZONE SURVEY EQUIPMENT (AZS). Awarded contract to develop, fabricate and test a system for rapid mapping and charting areas to be used as landing zones in helicopter or

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airborne assaults (formerly Global Positioning System Survey Equipment).

- (U) INTRAFORMATIONAL POSITIONING SYSTEM (IFPS). Awarded contract for piloted simulation of rendezvous software.

- (U) MEDICAL DIAGNOSTIC TOOL (MDT). Developed and tested a medical diagnosis and reference tool. System allows SOF user to carry medical reference library in a small package. Conducted concept evaluation test of prototype Medical Diagnostic Tool.

- (U) MULTI-FREQUENCY ANTENNA (MFA). Developed specification and awarded competitive contract to reduce number of antenna on SOF watercraft for reduced interference and improved safety. Antenna system will cover High Frequency (HF), Very High Frequency (VHF), and Ultra High Frequency (UHF) commercial and military marine bands.

- (U) PASSIVE INFRA-RED (IR) SUPPRESSION SYSTEM. Continued development of Ponchos and Blanket IR camouflage based on Teledyne-Brown material.

- (U) SHIP SYSTEM. This is a classified project. Began fabrication of prototype system.

- (U) STABILIZED WEAPONS MOUNT (SWM). Awarded contract for stabilized weapons mount for SOF small arms (.50 caliber and smaller, including M-60, 40mm, and small automatic weapons) installed on SOF watercraft or land vehicles.

- (U) SEAL DELIVERY VEHICLE (SDV) SIGNALLING DEVICE. Awarded competitive contract to develop a sound signalling device for safety recalls of SDV during training exercises.

- (U) MOBILE BROADCAST EXTENDERS RADIO SYSTEM (MBRS) (formerly UAV PSYOP Payload). Awarded prototype development contract. Technical approach to UAV PSYOP Payload has changed from strictly a UAV mounted system to a multi-platform system for greater deployment flexibility.

- (U) VERY SHALLOW WATER MINE COUNTERMEASURES (VSW MCM). Evaluation of VSW MCM sensor prototype options resulted in selection of a laser imaging approach. This effort is being developed under P204. No further SOST effort is necessary.

- (U) WATERPROOF GLOBAL POSITIONING SYSTEM (GPS) RECEIVER. Awarded competitive contract for handheld unit with selective availability and anti-spoof. Fabricated and tested accessories to allow diver to determine position underwater.

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PE Title: SO Advanced Technology Development (SOST)
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- (U) Demonstrated a submersible, multi-fuel engine for use with SOF inflatable boats.

- (U) WATERPROOF RADIO. Awarded contract to complete development of waterproof radio for use by combat swimmers. Radio is capable of being carried to depths of 66ft in operational configuration and operates immediately upon surfacing.

- (U) THERMAL IMAGING DEVICE (TID). Fabricated and demonstrated a prototype high resolution thermal imaging device that improves the accuracy of long range laser designation missions.

- (U) SWIMMER NAVIGATION BOARD (SNB). Continued development of a system to improve accuracy of dead-reckoning underwater navigation.

- (U) Tested and transitioned the Passive Navigation System (PNS), Special Operations Vision Enhancement Equipment, Ranger Anti-Armor Anti-Personnel Weapon Fire Control Unit (RAAWS-FCU), Personnel Evacuation Device (PED), Thermal Electric Generator (TEG), Impulse Through-Wall Locator, and submersible, multi-fuel engine for use with SOF inflatable boats.

- (U) Awarded contract for Language Identification and Voice Identification Device (LIVID) prototype. See S400 for project description.

- (U) Awarded contract for Imagery Receiver Intelligence System (IRIS) prototype. See S400 for project description.

(U) FY 1993 Planned Program:

- (U) Maintain leading edge in SOF critical technologies based on evolving USCINCSOC priorities.

- (U) Complete development and transition of TID, Waterproof GPS, SWM, SS, SDV Signalling Device (SSD), AZS, RMDT, and SNB.

- (U) DROP-IN COMMUNICATIONS PACKAGE (DCP). Develop and fabricate a communications package for SOF-peculiar applications and mobility platforms. Packages will include increased power, remote control, and improved radios (HF, VHF, and UHF).

- (U) SPECIAL OPERATIONS FORCES DEMOLITION KIT (SDK). Develop and evaluate a suite of support equipment to be used with existing explosives. Equipment will combine, initiate,

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Program Element: #1160402BB
PE Title: SO Advanced Technology Development (SOST)
Budget Activity: #2
Date: April 1993

attach, and control military explosives for various applications.

- (U) TRANSPORT CRADLE (TC). Fabricate transport cradles for high speed boats. Cradles are to be used for air transport of the boat.

- (U) IMPROVED CRAFT IDENTIFICATION FRIEND OR FOE (CIF). Develop and test system to prevent friendly fire incidents involving SOF craft.

- (U) Continue development and transition of IRIS and LIVID.

- (U) Improved SOF SIGINT Manpack System (ISSMS). Initiate development and evaluation of an improved manpackable, lightweight communications collection and direction finding system.

- (U) Initiate development of Advanced Command, Control, and Intelligence Communications (AC2IC). Description is classified.

- (U) Integrate emerging advanced technologies with SOF mission requirements through Broad Agency Announcement. Areas of interest for concept evaluation prototyping include: mobility platforms; SOF resupply systems; survival and personal equipment (body armor, food, medical equipment, load carrying systems, laser protection, desert/arctic uniforms, camouflage, etc.); power sources; enhanced explosive charges and munitions; shallow water/terrestrial mine detection and neutralization equipment and systems; tactical deception equipment; speech translators; Command, Control, Communications, and Intelligence (C3I); long range stand-off weapon systems; human sensory enhancing equipment; day/night sights and fire control systems; multi-spectral, man-portable vision devices and sensors; advanced learning/training systems; mission rehearsal systems; and psychological operations and civil affairs related systems.

- (U) Begin pre-prototype requirements review, prepare statements of work, and preliminary designs for new systems.

(U) FY 1994 Planned Program:

- (U) Continue development and transition of SDK, CIF, and DCP.

- (U) Enhance operational capabilities in target acquisition and fire control for SOF small arms and munitions through Advanced Technology Demonstrations (ATD).

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- (U) Develop advanced technologies for use by SOF in the detection and identification of threat weapons systems, and to improve reconnaissance and intelligence gathering capabilities in all environmental, visibility, and terrain conditions.

- (U) Develop ATDs to demonstrate use of emerging stealth and anti-detection technologies for application to SOF.

- (U) Develop ATDs to evaluate novel technologies to improve mobility of SOF over water, land, and air. Technology will be evaluated for ability to increase speed, and lower probability of detection, enhance load carrying and operability across a wide spectrum of environmental, visibility, and terrain conditions.

- (U) Push innovations in technology to improve SOF weapons and weapons platforms. Weapons shall have increased range, improved accuracy, reduced probability of detection, controllable lethality, and enhanced performance against hardened targets.

- (U) Demonstrate advanced low probability of detection and low probability of intercept communications concepts.

- (U) Advance new technologies in navigation, survey and direction finding that can be used in all conditions of visibility, both overt and clandestine, and in all terrain conditions.

- (U) Push technology to improve training and mission rehearsal capability for SOF forces. These training systems include language training, virtual reality rehearsal/simulation of military operations, and equipment operation training.

- (U) Design ATDs to demonstrate applicability of emerging technology to Psychological Operations.

- (U) Develop and demonstrate advanced low-observable technologies for use in SOF systems.

- (U) Advance new technology with applications to Civil Affairs. Specific areas of interest include language translation, water-purification, and medical services.

- (U) Develop new battery technology and advanced power generation and power sources for application to SOF missions.

- (U) TECHNOLOGY EXPLOITATION (TE). Exploit emerging technology to meet critical SOF requirements and encourage

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industry and government lab participation in identifying enhancements to SOF in critical areas. Needs in these areas have been advertised to industry and government R&D agencies via Broad Agency Announcement (BAA) and R&D conferences.

(U) Program to Completion: This is a continuing program.

D. (U) WORK PERFORMED BY: Service and National Laboratories, Defense and other Government Agencies including Army Armaments, Chemical, Human Engineering, Natick and Night Vision R&D Center, Air Force Electronic Systems, Rome and Wright R&D Centers, Naval Coastal Ocean and Weapons System Centers, and the Joint Electronic Warfare Center. Contractors include: Battelle, Columbus, OH and Northwest Lab, Richland WA; IBM; McDonnell Douglas; Harris, Melborne, FL; Hilton Systems, Crystal City, VA; Lockheed, Marietta, GA; MITRE, Bedford, MA; Motorola; Noise Cancellation Technologies, Columbia, MD; RACAL Communications, Rockville, MD; Scaled Composites, Mojave, CA; Special Technologies Laboratories, Goleta Valley, CA; Keiger, Hilton Head, SC; S-Tron, Foster City, CA; Kodak, Rochester, NY; TRW, Los Angeles, CA; General Dynamics, Pomona, CA; and Electronic Warfare Associates, Vienna, VA.

E. (U) COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY: This program consists of numerous rapid acquisition projects. Requirements by fiscal year are periodically updated to USCINCSOC priorities, reassessment of technological feasibility, or transition of projects into formal system acquisition programs.

1. (U) Technical Changes: Not Applicable.

2. (U) Schedule Changes: Not Applicable.

3. (U) Cost Changes: Not Applicable.

F. (U) PROGRAM DOCUMENTATION: USSOCOM Directive 70-1 prescribes program plan. USSOCOM validates program requirements and publishes an annual Prioritized Projects List. Program management resides at the Special Operations Research and Development Center (SORDAC). Most projects are executed by contractors with technical support and oversight by Service and other Government agency R&D Centers.

G. (U) RELATED ACTIVITIES: USSOCOM Technology Base program.

H. (U) OTHER APPROPRIATION FUNDS: Not Applicable.

I. (U) INTERNATIONAL COOPERATIVE AGREEMENT: Not Applicable.

J. (U) MILESTONE SCHEDULE: Not Applicable. This program consists of numerous rapid prototyping projects, none of which exceed the threshold.

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RDT&E DESCRIPTIVE SUMMARY

Program Element: #1160404BB
PE Title: Special Operations Tactical Systems Dev

Budget Activity: #4
Date: April 1993

A. (U) RESOURCES: ($ in Thousands)

PROJECT NR & TITLE	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
DE14 JASORS	12,590	18,482	33,166	Cont.	Cont.
D476 PSYOPS	1,424	3,905	289	Cont.	Cont.
D615 SOF AVIATION	23,785	2,617	19,181	0	64,070
SF100 AV SYS	1,053	3,100	0	Cont.	Cont.
SF200 CV-22	15,000	0	0	0	15,000
S0417 SEAL SPT SYS	21,198	6,597	36,345	Cont.	Cont.
S1684 SWC CRAFT	25,192	2,961	10,897	Cont.	Cont.
3129 MC-130H	3,324	0	0	0	6,675
3284 SOFADS	8,806	6,691	20,943	TBD	TBD
3326 AC-130U	26,655	22,706	32,821	0	93,097
3642 SOFATS	36,961	19,307	24,697	TBD	TBD
S350 SOFPARS	10,007	9,845	5,813	TBD	TBD
S375 WPN SYS	468	2,072	2,066	Cont.	Cont.
S650 QUIET KNIGHT	0	0	969	TBD	TBD
S675 SUST ENGR SPT	0	0	9,615	Cont.	Cont.
S700 COMMS	3,369	4,527	7,911	Cont.	Cont.
S800 MUNITIONS	16,247	14,150	14,788	Cont.	Cont.
S900 MISC EQUIP	1,245	1,313	1,804	Cont.	N/A
Total	207,324	118,273	221,305		

B. (U) DESCRIPTION: This program provides for development and testing of selected items of specialized equipment to meet the unique requirements of Special Operations Forces (SOF). Specialized equipment will permit small, highly trained forces to conduct required operations across the entire spectrum of conflict. These operations are generally conducted in harsh environments, for unspecified periods, in locations requiring small unit autonomy. Special Operations Forces must infiltrate by land, sea, and air to conduct unconventional warfare, direct action, or deep reconnaissance operations in denied areas against insurgent units, terrorists, or highly sophisticated threat forces. The requirement to operate in denied areas controlled by a sophisticated threat mandates that SOF systems remain technologically superior to threat forces to ensure mission success.

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RDT&E DESCRIPTIVE SUMMARY

Program Element: #1160404BB
PE Title: SO Tactical Systems Development

Budget Activity: #4
Date: April 1993

A. (U) RESOURCES: ($ in Thousands)

PROJECT NR & TITLE	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
DE14 Joint Advanced Special Operations Radio System (JASORS)	12,590	18,482	33,166	Cont.	Cont.

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:
This program provides funds for the development of a Low Probability of Interception/Detection (LPI/D) communications system for use by Joint Special Operations Forces deployed in hostile and clandestine environments. JASORS consists of seven subsystems; a Manpack Radio (MPR), Digital Message Entry Device (DMED), Intrateam Radio (ITR), Integrable Base Station (IBS) components, Transit Base Station (TBS), Infiltration/Exfiltration Platform System (I/EPS), and Ancillary Items Group (AIG). Communications are required to support both strategic and tactical commanders at all levels. Program is designed to provide communications from the team level to its next higher command. Program is a joint requirement validated by USSOCOM with the Army as Executive Agent.

C. (U) PROJECT ACCOMPLISHMENTS AND PLANS:

(U) FY 1992 Accomplishments:

- (U) Concept Exploration and Definition (CE&D) phase of program continued. Built prototype hardware modules. Continued software design, code, and test. Conducted technical simulations and tests to support system design.
- (U) Updated Systems Life Cycle Cost Estimate.
- (U) Completed Operational Requirements Document (ORD).
- (U) Negotiated Joint Integrated Logistics Support agreement with participating services.

(U) FY 1993 Planned Program:

- (U) Complete CE&D phase.
- (U) Complete software design, code, and test of subsystems.
- (U) Complete conceptual Hardware/Software Integration and Test (HSIT).
- (U) Complete system integration and test.
- (U) Complete Electrical Parameter/Performance Tests (EP/PT).

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- (U) Begin Government Low Probability of Intercept/Detection (LPI/D) assessment.

- (U) Intra Team Radio (ITR) deferred to FY94.

(U) FY 1994 Planned Program:

- (U) Complete Government LPI/D assessment of waveforms.

- (U) Complete preparation to enter Phase I Demonstration/Validation and Phase II Engineering and Manufacturing Development. (MSI/II Decision planned.)

- (U) Conduct Phase I/II Development Activities.

- (U) Mature and finalize design based on results of assessments of LPI/D and subsystem test.

- (U) Miniaturize Concept Exploration and Definition (CE/D) hardware and build engineering models for testing of subsystems and for integration tests.

- (U) Finalize software design, code, test and debug of subsystems and continue systems integration.

- (U) Begin Reliability Development Growth Testing.

- (U) Restart ITR development. Complete systems engineering and software documentation. Begin subsystem test of engineering models.

- (U) Begin engineering design of Infiltration/Exfiltration Platforms (I/EPS) ECPs.

- (U) Transition subsystem T-DMED mature technologies to production.

(U) Program to Completion:

- (U) This is a continuing program.

D. (U) WORK PERFORMED BY: U.S. Army Communications Electronics Command as Army Executive Agent for USSOCOM. Contractors are Harris Corporation (Prime), Motorola, and SAIC.

E. (U) COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. Technical Changes:

- (U) Increased system engineering and system integration/test level of effort to reduce overall program risk. Some low

FISCAL YEAR 1994 BUDGET ESTIMATES
RDT&E DESCRIPTIVE SUMMARY

Program Element: #1160404BB
PE Title: SO Tactical Systems Development

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priority and/or moderate risk requirements delayed to later phases of the program.

- (U) Infiltration/Exfiltration Platform System (I/EPS) development planned as a series of ECPs to existing Joint Special Operations Forces (JSOF) platforms rather than a separate (generic) JASORS subsystem.

2. Schedule Changes:

- (U) Program schedule adjusted to conform to DODD 5000.1 and DODI 5000.2. Milestone I replaces Milestone I/II. Milestone II replaces Milestone IIIa. Designation of program phases changed to reflect DODI 5000.2. Program structure remains unchanged.

- (U) Development (RDT&E) extended approximately 1 year due to level of effort required for system engineering, software development, and system integration/test of Concept Exploration and Definition (CE/D) brassboard hardware.

3. Cost Changes:

- (U) Increased RDT&E in FY94-96 required due to unanticipated level of effort needed to system engineer Low Probability of Intercept/Detection (LPI/D) network protocols, develop new VLSI devices (COMSEC and signal processing chips), miniaturize the Intrateam Radio (ITR), and integrate the I/EPS into JSOF platforms.

F. (U) PROGRAM DOCUMENTATION:

- (U)	Concept	12/84
- (U)	Joint Required Operational Capability (Approved)	01/89
- (U)	Operational and Organizational Plan (Approved)	07/89
- (U)	System MANPRINT Management Plan (Latest Draft)	08/89
- (U)	System Threat Assessment Plan (Completed)	01/89
- (U)	Market Investigation (Completed)	09/89
- (U)	Life Cycle Cost Estimate (Current Version)	03/90
- (U)	Acquisition Strategy/Plan (Approved)	05/90
- (U)	Joint Test Evaluation Master Plan (Latest Draft)	12/91
- (U)	Configuration Management Plan (Current Version)	12/91
- (U)	Joint Integrated Logistics Support Plan (Latest Draft)	10/91

G. (U) RELATED ACTIVITIES: There is no unnecessary duplication of effort within the Department of Defense.

H. (U) OTHER APPROPRIATION FUNDS: Not Applicable.

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not Applicable.

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J. (U) MILESTONE SCHEDULE: (SEE NOTE)

Milestone 0	Mar 90
Concept Evaluation and Definition	Oct 90
Milestone I: Demonstration & Validation	Mar 94
Technical Testing	Mar 95
Milestone II: Low Rate Initial Production	Jun 96
First Unit Equipped (EMD Models)	Jun 96
Operational Assessment	Oct 96
Operational Test	Apr 98
Milestone III: Production	Aug 98
Initial Operational Capability	FY 1999

NOTE: Program schedule has been modified to conform to DODD 5000.1 and DODI 5000.2. Impact: None. Milestone designations have changed but schedule remains intact.

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A. (U) RESOURCES: ($ in Thousands)

PROJECT NR & TITLE	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
D476 Psychological Operations (PSYOP)	1,424	3,905	289	Cont.	Cont.

B. (U) BRIEF DESCRIPTION OF PROJECT: The intent of Psychological Operations is to perform surveillance, broadcast deceptive sounds, persuade selected target audiences to support U.S. national interests and to counter misinformation directed at U.S. forces. New equipment is required to replace 1950's/1960's era systems which are difficult to deploy by air, obsolete, unreliable, and non-supportable. New equipment will have more capability while being smaller in size and easier to deploy to meet mission requirements.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN FY 1994:

(U) Project D476 - Psychological Operations (PSYOP): This project provides for the development and testing of several items of non-lethal Psychological Operations Equipment. Included are Special Operations Media System A (SOMS A), Special Operations Media System B (SOMS B), Family of Loudspeakers (FOL), and Leaflet Balloon System (LBS) Programs.

(U) Special Operations Media System A (SOMS A): SOMS A consists of a Television Broadcast and Control System and a Radio Broadcast and Control System configured in two separate/interoperable S-280 shelters or equivalent; each subsystem will be C-141 deployable. SOMS A will be able to create, receive, and process material for real time dissemination and provide PSYOP production capability while in a deployed status. SOMS A will receive transmission via satellite/ microwave from the deployed SOMS B Mobile Television Broadcast and Electronic News Gathering System for production and dissemination to large audiences. SOMS A will also interoperate with the fixed-cite Media Production Center located at Ft. Bragg and the Air Force's COMMANDO SOLO. Planned program will begin in FY95 after experience and knowledge is gained through the acquisition of the smaller, tactical version, SOMS B which is planned for production in FY94.

(U) Special Operations Media System B (SOMS B): SOMS B is an effort currently underway to develop/integrate a configuration of radio and television equipment for tactical deployment. SOMS B consists of a Mobile Radio Broadcasting System and a Mobile Television Broadcast System (MTBS to include the Electronic News Gathering (ENG) System). These subsystems will be configured in two separate/interoperable S-250-type shelters mounted on HHMMWV's; each subsystem will be C-130 transportable. SOMS B MTBS/ENG will broadcast, record, and transmit/receive programming material via satellite communications with the fixed-cite Media Production Center at Ft. Bragg, North

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Carolina and the Air Force's COMMANDO SOLO. Satellite communications will be used to obtain rapid approval of PSYOP products for dissemination in response to quickly changing mission scenarios, to forward products produced and approved in CONUS to SOMS B for dissemination, and to provide real-time command and control capability. The future planned operational/strategic configuration, the Special Operations Media System A, will provide microwave transmission capability with the SOMS B which will increase broadcast ranges and increase stand-off distance in theater resulting in a decrease to the loss of life and U.S. assets.

(U) Family of Loudspeakers (FOL): The FOL will be deployed by PSYOP Loudspeaker Teams and Mobile Audio/Visual Teams to target areas in support of SOF and conventional forces. FOL will permit the conduct of loudspeaker missions over larger areas than present equipment capability and will provide a greater stand-off distance for U.S. forces/assets resulting in a reduction of loss to U.S. forces/assets. The FOL will consist of modular amplifiers and speakers that can be interconnected to form sets of loudspeakers that will provide high quality recorded audio, live dissemination, and acoustic deception capability. Amplifiers and speakers will be transported, operated, and mounted in ground vehicles, watercraft, rotary wing aircraft, and dismounted for ground operations (tripod/manpack). The basic system, or manpack, is comprised of a modular amplifier and modular speaker(s) weighing less than 30 lbs.

(U) Leaflet Balloon System (LBS): The LBS is currently existing in allied inventories. It is believed to be a non-developmental acquisition which will provide PSYOP the ability to disseminate large quantities of leaflets in denied areas. LBS is a non-lethal, low radar acquisition system which will not present a military threat that could provoke hostilities. LBS is a deniable method of leaflet dissemination to be utilized during the pre-hostility stages of the operational continuum. The LBS consists of two subsystems; dissemination and launch. The dissemination subsystem will consist of a balloon carrier/vehicle and a leaflet release device capable of preprogramming for altitude release point. The launch subsystem will provide for logistical and weather programming.

(U) FY 1992 Accomplishments:

- (U) Special Operations Media System B (SOMS B): Completed pre-Milestone 0 activities; obtained MS 0 approval; selected the Department of Energy to perform concept study and provide preliminary design for MS I/II Decision.

- (U) FOL: Performed Phase 0 activities and initiated documentation in support of MS I/II; completed draft Market Investigation Report, Operational Requirements Document, Life Cycle Cost Estimate, Acquisition Strategy Report; released Commerce Business Daily Request for Information.

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(U) FY 1993 Planned Program:

- (U) Special Operations Media System B (SOMS B): Perform Phase 0 Concept Exploration and Definition activities to develop concepts and evaluate feasibility of alternative concepts; prepare documentation for MS I/II Decision. Demonstrate/validate critical technologies; finalize system design; test and evaluate system; initiate documentation for MS III Decision.

- (U) Family of Loudspeakers (FOL): Prepare documentation for MS I/II Decision for low rate initial production; publish Request for Proposal for approved LRIP quantities.

- (U) Leaflet Balloon System (LBS): Validate Mission Need Statement and Operational Requirements Document; initiate documentation required for MS 0/II Decision.

(U) FY 1994 Planned Program:

- (U) SOMS B: Conduct Operational Test & Evaluation; finalize documentation for MS III Decision to enter into production.

- (U) FOL: Conduct Operational Test & Evaluation and prepare documentation for MS III Decision.

- (U) LBS: Conduct Market Survey to determine potential vendors; award LBS contract with options for LRIP authorized at MS 0/II; perform Test & Evaluation.

(U) Program to Completion:

- (U) SOMS B: Complete production units of SOMS B.

- (U) FOL: Award production contract; production scheduled for FY 95-99.

- (U) LBS: Prepare MS III documentation for production & deployment; exercise options for production units for FY 95-99.

(U) Work Performed By: In-house development organizations are U.S. Army Communications and Electronics Command, Ft. Monmouth NJ; U.S. Army Natick Research and Development Center, Natick, MA; U.S. Army Armament Research, Development, and Engineering Center, Dover, NJ; and U.S. Department of Energy, Idaho National Engineering Laboratory, Idaho Falls, ID.

(U) Related Activities: There is no unnecessary duplication of effort within the Department of Defense.

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(U) Other Appropriation Funds: ($ in Thousands)

OTHER APPR. FUNDS PRGM.	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
PSYOP EQUIPMENT (P,DA)					
	121	-0-	4,443	Cont.	Cont.

(U) International Cooperative Agreements: Not Applicable.

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PE Title: SO Tactical Systems Development

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Date: April 1993

A. (U) RESOURCES: ($ in Thousands)

PROJECT NR & TITLE	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
D615 SOF Aviation *	23,785	2,617	19,181	-0-	64,070

* Project Completed FY 1994

B. (U) BRIEF DESCRIPTION OF PROJECT: A requirement exists to provide aviation support to Special Operations Forces in world-wide contingency operations and low-intensity conflicts.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) Project D615 - SOF Aviation: A requirement exists to provide aviation support to Special Operation Forces in world-wide contingency operations and low intensity conflict. The specialized aircraft for these missions must be capable of rapid deployment and undetected penetration of hostile areas. These aircraft must be capable of operating at extended ranges under adverse weather conditions to infiltrate, provide logistics for, reinforce, and extract Special Operations Forces. The threat is characterized by an extensive and sophisticated ground based air defense and an upgraded air-to-air capability targeted against helicopters. Third World operations are apt to involve greater distances and more challenging geographical environmental conditions than the European theater. This project will develop the Special Operations Aircraft (modified UH-60L and medium lift CH-47D helicopters) that will be capable of successful operations in these increasingly hostile environments. Both the MH-60K and MH-47E will have extended range fuel systems including aerial refueling capability, an integrated cockpit/ mission management system (which considerably reduces pilot workload), forward looking infrared sensor (allowing safe night operations), terrain following/terrain avoidance radar (allowing low level flight through adverse weather), upgraded engines, world-wide communications and other equipment which will increase mission success probability.

(U) FY 1992 Accomplishments:

- (U) Provided contractor support for Follow-On Testing (FOT) (MH-60K & MH-47E).
- (U) Completed Radar Cross Section and Infrared Signature tests (MH-60K & MH-47E).
- (U) Completed Electromagnetic/Environmental (EME) testing and ASE testing (MH-60K).

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PE Title: SO Tactical Systems Development

Budget Activity: #4
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- (U) Completed Electromagnetic/Environmental (EME) testing and ASE testing (MH-47E).

- (U) Completed transportability tests (C-5 for MH-47E) (C-5 and C-141 for MH-60K).

- (U) Software/hardware update activities initiated.

(U) FY 1993 Planned Program:

- (U) Commence verification of Terrain Following/Terrain Avoiding (TF/TA) (MH-60K & MH-47E).

(U) FY 1994 Planned Program:

- (U) Complete verification of TF/TA and provide associated logistic support (MH-47E/MH-60K).

(U) Program to Completion: Program completion FY 1994.

(U) WORK PERFORMED BY: Major contractors are Boeing Helicopter Company, Philadelphia, PA; Sikorsky Aircraft Division, Stratford, CT; Bendix Guidance Systems Division, Teterboro, NJ; and Link Division, Binghamton, NY. Government developmental organizations are: Product Manager, Special Operations Aircraft, St. Louis, MO; U.S. Army Aviation and Troop Command, St. Louis, MO; U.S. Army Communications and Electronics Command, Fort Monmouth, NJ; Simulation, Training and Instrumentation Command, Orlando, FL; and Program Executive Office, Aviation, St. Louis, MO.

(U) RELATED ACTIVITIES: Related modification efforts are managed by the Technology Applications Program Office, St. Louis, MO. Duplication is avoided through direct coordination between the two organizations as well as through coordination oversight by the Army Component organizations.

(U) OTHER APPROPRIATION FUNDS: ($ in Thousands)

OTHER APPR. FUNDS PRGM.	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
MH-47/MH-60 MODIFICATIONS (P,DA)					
	320,714	10,582	7,603	TBD	TBD

(U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not Applicable.

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A. (U) RESOURCES: ($ in Thousands)

PROJECT NR & TITLE	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
SF100 Aviation Systems Advanced Development	1,053	3,100	-0-	Cont.	Cont.

B. (U) BRIEF DESCRIPTION OF PROJECT: This program investigates maturing technologies that have potential application for the development and procurement of specialized equipment to meet unique SOF aviation requirements. Timely application of new technology is critical and necessary to meet evolving requirements in such areas as threat detection and avoidance, infrared suppression and countermeasures, lethal and nonlethal defense, communications, navigation, target detection and identification, and studies for future SOF aircraft.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN FY 1994:

(U) FY 1992 Accomplishments:

- (U) Completed an evaluation of non-developmental item (NDI) infrared suppressor technology with the purpose of reducing aircraft engine infrared (IR) emissions on SOF aircraft to enhance jammer and decoy countermeasures to defend against IR surface-to-air and air-to-air missiles.

(U) FY 1993 Planned Program:

- (U) Conduct evaluation of defense technology with the purpose of providing the most effective electronic warfare (EW) systems. Evaluation includes emerging technologies in the infrared countermeasures and suppression, radio frequency countermeasures, and expendable decoy arenas.

(U) FY 1994 Planned Program: Not Applicable.

(U) Program to Completion: Not Applicable.

(U) WORK PERFORMED BY: ASC/RW Electronic Warfare Program Office, Wright-Patterson, AFB, OH; AFMC/XRJ Special Projects Division, Wright-Patterson AFB, OH; and WR-ALC/LN EW Management Directorate and WR-ALC/LU SOF Management Directorate, Robins AFB, GA.

(U) RELATED ACTIVITIES: There is no unnecessary duplication of effort within the Department of Defense.

(U) OTHER APPROPRIATION FUNDS: To Be Determined.

(U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not Applicable.

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Date: April 1993

A. (U) RESOURCES: ($ in Thousands)

PROJECT NR & TITLE	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
SF200 CV-22 SOF Osprey					
	15,000	-0-	-0-	TBD	TBD

B. (U) BRIEF DESCRIPTION OF PROJECT: The CV-22 promises to fill the present void in USSOCOM's capability to extract special operations forces (SOF) at long ranges. The Commander-in-Chief of U.S. Special Operations Command has described this void as a "severe" hinderance to execution of USSOCOM's mission. The CV-22 Program will deliver a specially configured variant of the tiltrotor aircraft capable of penetrating enemy territory using low-level terrain-following flight at night and in adverse weather. It will also complement the MC-130 Combat Talon aircraft in its infiltration and resupply roles. The relatively modest investment by USSOCOM in the joint service development of the multimission capable V-22 provides tremendous return for the Command.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN FY 1994:

(U) FY 1992 Accomplishments:

- (U) Continued design and development effort to expand capabilities of the terrain following radar programmed for the CV-22. Integrated ground beacon detection, weather avoidance, low speed terrain following and other capabilities.
- (U) Participated with the Navy in the initiation of the Engineering and Manufacturing Development (EMD) Phase of the V-22.
- (U) Initiated Configuration Definition Trade Study to position CV-22 Program for re-start in FY94.
- (U) Continued support for Air Force component of V-22 multi-service test team at Patuxent Naval Air Test Center.
- (U) Continued logistics planning activities for SOF variant through Navy Field Activities.

(U) FY 1993 Planned Program:

- (U) Continue design and development effort to expand capabilities of the terrain following radar programmed for the CV-22. Integrated ground beacon detection, weather avoidance, low speed terrain following and other capabilities.

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- (U) Continue participating with the Navy in the Engineering and Manufacturing Development (EMD) Phase of the V-22.

- (U) Continue support for Air Force component of V-22 multi-service test team at Patuxent Naval Air Test Center.

- (U) Continue logistics planning activities for SOF variant through Navy Field Activities.

(U) FY 1994 Planned Program: None.

(U) Program to Completion: Not applicable.

(U) Work Performed By: SOF directorate of the Aircraft Systems Program Office, Wright-Patterson AFB, OH; Naval Air Systems Command, Washington, DC; Bell Helicopter Textron, Fort Worth, TX; Boeing Helicopters, Ridley Township, PA; Texas Instruments, McKinney, TX; IBM Federal Systems Division, Owego, NY.

(U) Related Activities:

- (U) V-22 is a joint service program led by the Navy. The Navy funds airframe and engine development, while USSOCOM funds development, integration, and testing of systems unique to the SOF missions.

- (U) Since the terrain following radar will be common to the CV-22, MH-47E, and MH-60K aircraft, close program and engineering coordination between the respective program offices is necessary to integrate the various efforts.

- (U) There is no unnecessary duplication of effort within the Department of Defense.

(U) Other Appropriation Funds: To Be Determined.

(U) International Cooperative Agreements: Not applicable.

FISCAL YEAR 1994 BUDGET ESTIMATES
RDT&E DESCRIPTIVE SUMMARY

Program Element: #1160404BB
PE Title: SO Tactical Systems Development

Budget Activity: #4
Date: April 1993

A. (U) RESOURCES: ($ in Thousands)

PROJECT NR & TITLE	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
SO417 SEAL Support System	21,198*	6,597*	36,345	Cont.	Cont.
SUB-PROJECTS					
ASDS	3,040	4,683	22,131	TBD	TBD
MK 8 Mod 1 SDV	14,008**	-0-	9,811	-0-	24,066
Undersea Systems	4,150	1,914	4,403	Cont.	Cont.

* Sub-project "Navy C3 and Electronics" was renamed and transferred to S700 ($625K in FY92 and $626K in FY93). Sub-project "Navy RDT&E" was renamed and transferred to S275 ($685K in FY92 and $646K in FY93).

** $7,675 spent on MK 8 Mod 1 SDV SLEP. Balance spent on PARAMAX EX 8 Mod 1 contract close-out.

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: This program funds the development of SEAL support items used during the conduct of hydrographic/inland reconnaissance, beach obstacle clearance, underwater ship attack, and other direct action missions. Items included in this project are as follows:

(U) Advanced SEAL Delivery System (ASDS): The ASDS is a manned combatant submersible capable of delivering SEAL personnel and weapons in a high threat environment. The ASDS will provide the requisite range, endurance, payload, and other capabilities for operation in the full range of threat environments.

(U) MK 8 Mod 1 SEAL Delivery Vehicle (SDV): This program upgrades and extends the service life of aging MK 8 SDVs; the MK 8s were built with 1960s technology. The new MK 8 Mod 1 will incorporate more modern equipment to improve supportability/maintainability and will include upgrade of selected subsystems. The program was renamed MK 8 Mod 1 to more accurately reflect its nature as a Service Life Extension Program (SLEP) rather than a full blown Research, Development, and Acquisition (RD&A) program.

FISCAL YEAR 1994 BUDGET ESTIMATES
RDT&E DESCRIPTIVE SUMMARY

Program Element: #1160404BB
PE Title: SO Tactical Systems Development
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Date: April 1993

(U) Undersea Systems: Undersea systems to be developed to provide SOF combat swimmers with the necessary diving and diving related equipment to fulfill assigned underwater combat missions include the following:

- (U) Underwater Breathing Apparatus (UBA): Development of the Conventional Dive System (CDS) consisting of the EX-19 UBA and a full face mask for increased combat swimmer endurance and mobility regardless of water temperature.

- (U) Diver Active Thermal Protection System (DATPS): Development of self-contained active thermal protection system which allows combat swimmers to conduct missions in extreme cold water environments.

- (U) Very Shallow Water Mine Countermeasures (VSW MCM): Phased development/improvement of low magnetic and acoustic signature equipment to support the combat swimmer in the VSW MCM operational environment.

- (U) Global Positioning System (GPS): Development of a waterproof, miniaturized GPS unit for combat swimmers. This program is transitioning from a Special Operations Special Technology effort.

C. (U) PROJECT ACCOMPLISHMENTS AND PLANS:

(U) FY 1992 Accomplishments:

- (U) The EX 8 Mod 1 SDV program was renamed MK 8 Mod 1 SDV and redirected to a Service Life Extension Program (SLEP). Initiated design and integration efforts for subsystem upgrades in conjunction with the SLEP. Developed program structure and documentation. Commenced SLEP Engineering Change Proposal (ECP) design and integration.

- (U) ASDS acquisition plan and acquisition strategy report completed. The preliminary design request for proposal (RFP) was issued; proposals were received and evaluated.

- (U) Continued engineering development of Conventional Dive System (CDS).

- (U) Continued Engineering and Manufacturing Development (EMD) of DATPS.

- (U) Commenced Phase 0 studies in support of NSW Very Shallow Water (VSW) Mine-Countermeasures (MCM) Mission Needs Statement (MNS).

FISCAL YEAR 1994 BUDGET ESTIMATES
RDT&E DESCRIPTIVE SUMMARY

Program Element: #1160404BB
PE Title: SO Tactical Systems Development

Budget Activity: #4
Date: April 1993

(U) FY 1993 Planned Program:

- (U) Continue design and integration of SDV sustainment and selected subsystem upgrade ECPs for MK 8 Mod 1 SDV in conjunction with the SLEP.
- (U) Award ASDS preliminary design contract, prepare RFP for detail design and manufacturing development (DD/MD) contract, initiate Cost and Operational Effectiveness Analysis (COEA), complete preliminary design efforts, and prepare programmatic documentation to achieve Milestone II.
- (U) Continue engineering development of CDS.
- (U) Complete TECHEVAL of DATPS.
- (U) Continue Phase 0 studies for VSW MCM.

(U) FY 1994 Planned Program:

- (U) Complete prototype engineering development, integrated logistics support (ILS) documentation, technical testing, and Milestone I/II for incorporation of a waterproof and miniaturized GPS unit.
- (U) Complete Milestone I and commence Phase I demonstration and validation for VSW MCM programs efforts identified during Phase 0.
- (U) Complete OPEVAL and Milestone III of DATPS.
- (U) Award DD/MD contract to one of the competing preliminary designers for ASDS.
- (U) Complete design, integration, and testing of subsystem sustainment and selected upgrade ECPs for the MK 8 Mod 1 SDV SLEP. Complete all ECP design and integration packages in preparation for procurement and start of conversions in FY95.
- (U) Complete Technical Evaluation (TECHEVAL) and Operational Evaluation (OPEVAL) of CDS.

(U) Program to Completion: This is a continuing program.

D. (U) WORK PERFORMED BY:

(U) IN-HOUSE: Naval Surface Warfare Center, Dahlgren Division, Coastal Systems Station, Panama City, FL; Portsmouth Naval Shipyard, Portsmouth, VA; Carderock Division, Naval Surface Warfare Center, Bethesda, MD; and Portsmouth Naval Shipyard, Kittery, ME.

FISCAL YEAR 1994 BUDGET ESTIMATES
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Program Element: #1160404BB
PE Title: SO Tactical Systems Development

Budget Activity: #4
Date: April 1993

(U) CONTRACTORS: PARAMAX, Great Neck, NY; SONATECH, Santa Barbara, CA.

E. (U) COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. (U) Technical Changes: SDV performance requirements for speed, range, and passenger capacity reduced. SDV SLEP effort focuses on sustainability/maintainability ECPs for selected subsystems. Redesign of DATPS power system to interface with MK 8 Mod 1 SDV SLEP. DATPS was originally designed for MK 8 Mod 0 SDV.

2. (U) Schedule Changes: The EX 8 Mod 1 SDV program was restructured to the MK 8 Mod 1 SDV SLEP. Production decision changed from FY96 to FY95. All milestones for DATPS have been delayed due to the late approval of the Test and Evaluation Master Plan (TEMP) and redesign of power system interface with MK 8 Mod 1 SDV SLEP. CDS milestones changed due to the delay in delivery of injection molded components for EDMs and a safety mishap during TECHEVAL work-up which necessitates extending the TECHEVAL schedule.

3. (U) Cost Changes: The EX 8 Mod 1 SDV program was projected to cost $56.7M RDT&E between FY92 and FY97. The MK 8 Mod 1 SDV SLEP will cost $17.8M through FY94.

F. (U) PROGRAM DOCUMENTATION: The following projects are being developed as part of SEAL Support Systems under the Naval Special Warfare Systems R&D Master Plan: Advanced SEAL Delivery System, SO417-12, OR 243-03-89, 12/01/88; Diver Active Thermal Protection System, SO417-08, NDCP, SO417-SW, TEMP 098-10 (Rev 1) 02/22/91; Conventional Dive System (CDS), SO394-09, OR 102-02-87, 5/29/86, TEMP 856-2, 08/13/90; NSW SW MCM, USSOCOM MNS, 03/26/92; MK 8 Mod 1 SDV SLEP requirements contained in COMNAVSPECWARCOM letter 9000 Ser N8/C0054 of 15 Jul 92.

G. (U) RELATED ACTIVITIES:

(U) PE #1160404BB:

- (U) Project S375, SO Weapons Systems Advanced Development
- (U) Project S700, SOF Communications Advanced Development

(U) PE #1160407BB:

- (U) Project S275, SOF Medical Technology Development

(U) PE #0603702N:

- (U) Project SO394-09, Conventional Dive System

FISCAL YEAR 1994 BUDGET ESTIMATES
RDT&E DESCRIPTIVE SUMMARY

Program Element: #1160404BB
PE Title: SO Tactical Systems Development

Budget Activity: #4
Date: April 1993

(U) PE #0603737D:

- (U) Project S/H 1104, Balanced Technology Initiative

(U) There is no unnecessary duplication of effort within the Department of Defense.

H. (U) OTHER APPROPRIATION FUNDS: ($ in Thousands)

OTHER APPR. FUNDS PRGM.	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
SPECIAL WARFARE EQUIPMENT (P,DA)					
	4,733	935	-0-	Cont.	Cont.

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Information Exchange Project (IEP) B-80 between the United States and the United Kingdom.

J. (U) MILESTONE SCHEDULE:

Milestone (ASDS)	Milestone Date
Milestone II	1st QTR FY 94
TECHEVAL	1st QTR FY 97
OPEVAL	3rd QTR FY 97
Milestone III	4th QTR FY 97

Milestone (MK 8 Mod 1 SDV)	Milestone Date
Commence SDV SLEP	4th QTR FY 92
Commence Procurement	1st QTR FY 95
Commence Overhaul/Conversion	4th QTR FY 95

Milestone (VSW MCM)	Milestone Date
Milestone 0	4th QTR FY 92
Milestone I	1st QTR FY 94
Milestone II	3rd QTR FY 95
Milestone III	2nd QTR FY 97

Milestone (DATPS)	Milestone Date
Milestone II	3rd QTR FY 91
TECHEVAL	4th QTR FY 93
OPEVAL	1st QTR FY 94
Milestone III	2nd QTR FY 94

FISCAL YEAR 1994 BUDGET ESTIMATES
RDT&E DESCRIPTIVE SUMMARY

Program Element: #1160404BB
PE Title: SO Tactical Systems Development

Budget Activity: #4
Date: April 1993

Milestone (CDS)	Milestone Date
Milestone II	2nd QTR FY 90
TECHEVAL	1st QTR FY 94
OPEVAL	3rd QTR FY 94
Milestone III	1st QTR FY 95

Milestone (GPS)	Milestone Date
Milestone I/II	1st QTR FY 94
Milestone III	1st QTR FY 95

FISCAL YEAR 1994 BUDGET ESTIMATES
RDT&E DESCRIPTIVE SUMMARY

Program Element: #1160404BB
PE Title: SO Tactical Systems Development

Budget Activity: #4
Date: April 1993

A. (U) RESOURCES: ($ in Thousands)

PROJECT NR & TITLE	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
S1684 Special Warfare Combatant Craft	25,192	2,961	10,897	Cont.	Cont.
SUB-PROJECTS					
Navy Boat Program	792	1,136	553	Cont.	Cont.
Patrol Coastal (PC)	4,400	900	8,753	Cont.	Cont.
MARK V Special Operations Craft (MK V SOC)	20,000	925	1,591	2,130	24,721

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: This program provides for development and testing of surface combatant craft and selected items of specialized equipment to meet the unique requirements of Special Operations Forces (SOF). These craft and equipment will permit small, highly trained forces to conduct required operations across the entire spectrum of conflict.

(U) Navy Boat Program: This program provides engineering support for design and specification development for combatant craft. This will result in improved operability and safety, reduced detectability, and increased survivability for inflatable boats, rigid inflatable boats (RIBs), and other combatant craft.

(U) Patrol Coastal (PC): The need for a coastal patrol and interdiction combatant craft capability was validated during operation "Earnest Will" in the Persian Gulf and increased commitments supporting missions both in CONUS and the SOUTHCOM area of responsibility. The 170 foot PC design incorporates space, weight and power margins to accommodate improvements such as advanced lightweight weapon systems, navigational, and countermeasure systems to keep pace with state-of-the-art technology. Initial improvements include a Stabilized Weapons Platform System (SWPS), precision military Global Positioning System (GPS), and Electronic Plotter (EP) for navigation.

(U) MARK V Special Operations Craft (MK V SOC): The MK V SOC will answer the SOF need for a fast, rapidly deployable, air-transportable, and reliable combatant craft to be used primarily for medium range SEAL insertion/extraction (MRI) tasks and limited coastal patrol and interdiction (CPI) missions.

FISCAL YEAR 1994 BUDGET ESTIMATES
RDT&E DESCRIPTIVE SUMMARY

Program Element: #1160404BB
PE Title: SO Tactical Systems Development

Budget Activity: #4
Date: April 1993

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1992 Accomplishments:

- (U) Completed Technical Data Package (TDP) for the RIB program.
- (U) Continued SWPS program tech support and conducted Cost and Operational Effectiveness Analysis (COEA).
- (U) Continued composite hull evaluations to include a market survey of glass reinforced plastic (GRP)/composite manufacturers.
- (U) Continued signature reduction program for small craft.
- (U) Continued engine test and qualification efforts for candidate engines. Continued non-gas burning outboard engine (NBOE) program including testing of JP-5 and diesel fuel marine (DFM) NBOEs. Initiated procurement of multi-fuel NBOE.
- (U) Conducted feasibility studies for new generation special warfare craft.
- (U) Continued PC pre-planned product improvements (P3I) efforts.
- (U) Achieved Milestone 0 for the MK V SOC program. Conducted a market survey, initiated a COEA, established a Program Management Office (PMO) within USSOCOM, began technical trade-off analyses, and developed a Request for Proposal (RFP) for test craft.

(U) FY 1993 Planned Program:

- (U) Continue signature reduction program for small craft.
- (U) Continue composite hull evaluations.
- (U) Continue engine test and qualification efforts and NBOE efforts to include multi-fuel NBOE testing.
- (U) Continue PC P3I efforts.
- (U) Initiate developmental testing (DT) for NSW RIB.
- (U) Continue SWPS program and technical support, release RFP, contract award, contract monitoring, and complete MS 0/I/II requirements.

FISCAL YEAR 1994 BUDGET ESTIMATES
RDT&E DESCRIPTIVE SUMMARY

Program Element: #1160404BB
PE Title: SO Tactical Systems Development

Budget Activity: #4
Date: April 1993

- (U) Achieved Milestone I for the MK V Special Operations Craft (SOC) program. Milestone I reached 01 Dec 92 and RFP released for test craft 14 Dec 92. Continue award contracts for test craft, and conduct development test and evaluation (DT&E) and early operational assessments.

- (U) Begin Congressionally directed Interactive Electronic Technical Manual technology applications with Naval Electronic Systems Engineering Activity (NESEA).

(U) FY 1994 Planned Program:

- (U) Continue signature reduction program for small craft.

- (U) Continue composite hull evaluations.

- (U) Continue engine test and qualification efforts and NBOE efforts.

- (U) Continue PC P3I efforts.

- (U) Complete development test for NSW RIB.

- (U) Continue SWPS program and technical support, contract monitoring, and initiate preliminary system tests.

- (U) Continue MK V SOC program, receive test craft, reach Milestone II, and conduct development Test and Evaluation (T&E) and early op assessment and award production contract for initial operational detachment (two craft, transporters, and support equipment).

- (U) Continue Congressionally directed Interactive Electronic Technical Manual technology applications with NESEA.

(U) Program to Completion: This is a continuing program.

D. (U) WORK PERFORMED BY:

(U) IN-HOUSE: NSWC Carderock Division; NSWC Pt. Hueneme Division; NSWC Dahlgren; NSWC Louisville Division; NSWC Coastal Systems Station; Naval Electronics Systems Engineering Activity; NSWC Crane Division; NSWC White Oak; Naval Ship Systems Engineering Station; USSOCOM/SOSD; Norfolk Detachment, NSWC Carderock Division; Material Readiness Support Activity (MRSA); Aeronautical Systems Center (AFMC); Military Traffic Management Command (MTMC) Transportation Engineering Agency (TEA).

FISCAL YEAR 1994 BUDGET ESTIMATES
RDT&E DESCRIPTIVE SUMMARY

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PE Title: SO Tactical Systems Development

Budget Activity: #4
Date: April 1993

(U) CONTRACTORS: Columbia Research Corporation (CRC), Research Consultants, Incorporated (RCI), Booz, Allen, and Hamilton, Applied Physics Lab.

E. (U) COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. Technical Changes: None.

2. Schedule Changes: None.

3. Cost Changes: None.

F. (U) PROGRAM DOCUMENTATION: MK V SOC: Mission Need Statement, dated 24 Feb 92; Milestone 0 Acquisition Decision Memorandum, dated 02 Mar 92; Validated Operational Requirements Document, dated 04 Dec 92; Milestone I Acquisition Decision Memorandum, dated 03 Dec 92; Intelligence Report, dated 13 Nov 92; Threat Assessment, dated Aug 92; Program Baseline Agreement,dated 03 Dec 92; Integrated Program Summary, dated 03 Dec 92; Life Cycle Cost Estimate, dated 03 Sep 92; Phase 0 COEA, dated 24 Feb 93; Draft Test and Evaluation Master Plan; Draft Integrated Logistics Support Plan.

G. (U) RELATED ACTIVITIES:

- (U) PE# 116040BB, Project S0416, SEAL Weapons System
- (U) There is no unnecessary duplication of effort within the Department of Defense.

H. (U) OTHER APPROPRIATION FUNDS: ($ in Thousands)

OTHER APPR. FUNDS PRGM.	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
PATROL COASTAL (P,DA)					
	4,205	19,966	13,369	Cont.	Cont.
MK V SOC (P,DA)					
	-0-	-0-	9,044	Cont.	Cont.
SPECIAL WARFARE EQUIPMENT (P,DA)					
	7,283	12,047	11,496	Cont.	Cont.
PLATFORM GUN AMMO (P,DA)					
	-0-	-0-	6,984	Cont.	Cont.

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: None.

FISCAL YEAR 1994 BUDGET ESTIMATES
RDT&E DESCRIPTIVE SUMMARY

Program Element: #1160404BB
PE Title: SO Tactical Systems Development

Budget Activity: #4
Date: April 1993

J. (U) MILESTONE SCHEDULE:

Milestone (MK V SOC)	Date
Milestone 0	2nd QTR FY92
Milestone I	1st QTR FY93
Milestone II	3rd QTR FY94
Milestone III	3rd QTR FY95

Milestone (SWPS)	Date
Milestone 0/I/II	4th QTR FY93
Milestone III	4th QTR FY95

FISCAL YEAR 1994 BUDGET ESTIMATES
RDT&E DESCRIPTIVE SUMMARY

Program Element: #1160404BB
PE Title: SO Tactical Systems Development

Budget Activity: #4
Date: April 1993

A. (U) RESOURCES: ($ in Thousands)

PROJECT NR & TITLE	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
3129 Combat Talon II *	3,324	-0-	-0-	-0-	6,671

* Project Complete

B. (U) BRIEF DESCRIPTION OF PROJECT: This program supports the mission support requirements for the Combat Talon II program office. This includes communications, graphics, travel/per diem, Automated Management System (AMS) and computer support, and other essential mission requirements.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN FY 1994:

(U) Project 3129 - Combat Talon II: This current program supports the mission support requirements for the Combat Talon II program office. This includes communications, graphics, travel/per diem, AMS and computer support, and other essential mission requirements.

(U) FY 1992 Accomplishments:

- (U) Provided mission support to the CT II program office.

(U) FY 1993 Planned Program:

- (U) Not Applicable. Project completed FY92.

(U) FY 1994 Planned Program:

- (U) Not Applicable. Project completed FY92.

(U) FY 1995 Planned Program:

- (U) Not Applicable. Project completed FY92.

(U) Program to Completion:

- (U) Not Applicable. Project completed FY92.

(U) Work Performed By: Aircraft Systems Program office, Directorate of Special Operations Forces, Wright-Patterson AFB, OH.

(U) Related Activities: There is no unnecessary duplication of effort within the Department of Defense.

FISCAL YEAR 1994 BUDGET ESTIMATES
RDT&E DESCRIPTIVE SUMMARY

Program Element: #1160404BB
PE Title: SO Tactical Systems Development

Budget Activity: #4
Date: April 1993

(U) Other Appropriation Funds:

OTHER APPR. FUNDS PRGM.	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
MC-130H COMBAT TALON II (P,DA)					
	112,993	53,506	23,699	-0-	N/A

(U) International Cooperative Agreements: Not Applicable.

FISCAL YEAR 1994 BUDGET ESTIMATES
RDT&E DESCRIPTIVE SUMMARY

Program Element: #1160404BB
PE Title: SO Tactical Systems Development

Budget Activity: #4
Date: April 1993

A. (U) RESOURCES: ($ in Thousands)

PROJECT NR & TITLE	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
3284 Special Operations Forces/Aircraft Defense Systems (SOF/ADS)					
	8,806	6,691	20,943	Cont.	Cont.

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:
Project 3284 provides funds for requirements definition, development, prototype and test for defensive avionics systems. The program will identify hardware and software enhancements for each Special Operations Forces (SOF) aircraft that will reduce detection, vulnerability, and threat engagement thereby increasing the overall survivability of SOF assets. This project will identify and develop enhancements to each platform to meet the projected threat. Recommendations for equipment modification or replacement will be developed by each System Program Manager (SPM) based upon the results of on-going engineering assessments and user operational requirements. The project will examine numerous equipment options to include expendables, dispensers, infrared jamming systems, infrared suppression, radio frequency jamming systems, radar and missile warning systems and other potential candidate systems now emerging from their demonstration and development phases. SOF/ADS also provides systems for the SOF unique portions of the WR-ALC Electronic Warfare Avionics Integrated Systems Facility (EWAISF). The EWAISF directly supports software development and testing. Part of the EWAISF effort is the Systems Integration Laboratory (SIL) designed to support the incorporation of SOF/ADS modifications into specific SOF platforms. The primary objectives are to 1) develop an improved infrared countermeasure (IRCM) capability against deployed and projected infrared (IR) threats 2) improve the aircraft radio frequency countermeasures (RFCM) capability necessary to support SOF worldwide missions 3) improve IR missile launch warning receivers and IR expendables to increase the missile launch warning detection envelope and terminal threat avoidance and 4) provide a rapid reprogrammable hardware/software capability to quickly tailor the onboard systems to meet specific theater mission threats.

C. (U) PROJECT ACCOMPLISHMENTS AND PLANS:

(U) FY 1992 Accomplishments:

- (U) Began EWAISF requirements implementation of SOF defensive avionics system countermeasures techniques/software reprogramming support at WR-ALC.
- (U) Completed a directional IRCM program Acquisition Strategy that includes award of a development and production contract to provide this capability to SOF aircraft.
- (U) Began development of improved expendables.

FISCAL YEAR 1994 BUDGET ESTIMATES
RDT&E DESCRIPTIVE SUMMARY

Program Element: #1160404BB
PE Title: SO Tactical Systems Development

Budget Activity: #4
Date: April 1993

- (U) Acquired infrared and radar cross-section measurements of MH-47E aircraft to support study analysis.

(U) FY 1993 Planned Program:

- (U) Begin the Directional IRCM Product Development.
- (U) Continue the EWAISF development and upgrade.
- (U) Begin multiphased development of APR-46 panoramic radar warning receiver enhancements.
- (U) Continue development of improved expendables.

(U) FY 1994 Planned Program:

- (U) Complete evaluation of the Directional IRCM development models.
- (U) Begin the Directional IRCM Full Scale Development effort.
- (U) Continue the EWASIF development and upgrade.
- (U) Continue development of APR-46 panoramic radar warning receiver enhancements.
- (U) Begin enhancement of ALE-40 dispenser system.

(U) Program to Completion: This is a continuing program.

D. (U) WORK PERFORMED BY: Northrop Defense Systems Division, Elk Grove Village, IL; AFMC/XRJ Special Projects Division, Wright-Patterson AFB, OH; ASC/RW Electronic Warfare Programs Office and WL/AA Wright Laboratories, Wright-Patterson AFB, OH; WR-ALC/LN EW Management Directorate and WR-ALC/LU SOF Management Directorate, Robins AFB, GA; and DIRCM contractor TBD.

E. (U) COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. (U) Technical Changes: None.
2. (U) Schedule Changes: 12 month slip in DIRCM contract award.
3. (U) Cost Changes: None.

F. (U) PROGRAM DOCUMENTATION:

(U) Program Management Directive #0903(4) for Advanced Strategic and Tactical Infrared Expendables, 25 Mar 92.

FISCAL YEAR 1994 BUDGET ESTIMATES
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Date: April 1993

(U) Operational Requirements Document for Infrared Jamming System Improvements, AFSOC #001-91-1-B, 24 Mar 92.

(U) Program Management Directive #8213(6) for SOF Defensive Systems, 18 Mar 92.

(U) Mission Need Statement for Infrared Countermeasures, #001-91, 16 Sep 91

(U) System Operational Requirements Document for AC-130U Gunship, MAC #06-87-1-III, 14 May 91.

(U) System Operational Requirements Document for MC-130H Combat Talon II, MAC #005-83-IVA, 13 May 91.

G. (U) RELATED ACTIVITIES:

(U) Incorporation of new defensive avionics enhancements on the MH-53J.

(U) A commonality working group has been established to ensure EW commonality issues are addressed within the SOF fleet.

(U) There is no unnecessary duplication of effort within the Department of Defense.

H. (U) OTHER APPROPRIATION FUNDS: ($ in Thousands)

OTHER APPR. FUNDS PRGM.	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
C-130 MODIFICATION (P,DA)					
	-0-	40,800	63,817	Cont.	Cont.

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not Applicable.

J. (U) MILESTONE SCHEDULE:

(U)	DIRCM Contract Award	Apr 94
(U)	DIRCM Critical Design Review	Apr 95
(U)	DIRCM Flight Test Complete	Oct 95

FISCAL YEAR 1994 BUDGET ESTIMATES
RDT&E DESCRIPTIVE SUMMARY

Program Element: #1160404BB
PE Title: SO Tactical Systems Development

Budget Activity: #4
Date: April 1993

A. (U) RESOURCES: ($ in Thousands)

PROJECT NR & TITLE	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
3326 AC-130U Gunship *					
	26,655	22,706	32,821	-0-	93,097

* Project completed FY 1994

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: The AC-130U aircraft will be more capable and survivable than the existing AC-130A/H aircraft. The new aircraft subsystems will include precision navigation, target acquisition radar, fire control computers integrated on redundant 1553B data buses, electronic countermeasures, infrared countermeasures, aerial refueling, covert lighting, trainable weapons, all light level TV (ALLTV), infrared sensor, and secure communications systems. These subsystems will enable the gunship to strike targets with surgical accuracy, to loiter safely in the target area for extended time periods, and to perform these tasks in night or adverse weather conditions. Where practical, every effort will be made to adapt off-the-shelf equipment. To the maximum extent possible, the subsystems in the AC-130U will be common with systems on Air Force SOF aircraft. This project funds development and test of a side-firing Gunship configuration C-130 and procures one prototype aircraft.

C. (U) PROJECT ACCOMPLISHMENTS AND PLANS:

(U) FY 1992 Accomplishments:

- (U) Developed 25MM heavy barrels.
- (U) Continued flight test and evaluation to include 25MM gun and strike radar.
- (U) Continued identification and initiation of mission critical engineering change orders resulting from flight test.
- (U) Completed ALLTV Critical Design Review.
- (U) Developed integration technical manuals.
- (U) Continued software development and test.

(U) FY 1993 Planned Program:

- (U) Continue flight test and evaluation to include electronic countermeasure suite, ALLTV, and the dual target attack mode.

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- (U) Continue identifying and initiating mission critical engineering change orders resulting from flight test.

(U) FY 1994 Planned Program:

- (U) Certify the AC-130U for operational training use.
- (U) Start Type I crew training.
- (U) Complete flight test and evaluation program.
- (U) Provide mission support to Gunship Program Office.

(U) Program to Completion: Not Applicable.

D. (U) WORK PERFORMED BY: Aircraft Systems Program Office, Directorate of Special Operations Forces, Wright-Patterson AFB, OH; Rockwell International (Systems Integration), El Segundo, CA; and Lockheed Aeronautical Systems Company (Airframe), Marietta, GA.

E. (U) COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. (U) Technical Changes: None.

2. (U) Schedule Changes: None.

3. (U) Cost Changes: Funding was adjusted to support aircraft flight test.

F. (U) PROGRAM DOCUMENTATION:

(U) Program Management Directive 6235(7), 12 Mar 1992.

(U) Headquarters Military Airlift Command (MAC) System Operational Requirements Document (ORD) 06-87-1-III, 14 May 1991 (S, N/F, WINTEL).

G. (U) RELATED ACTIVITIES:

- (U) There is no unnecessary duplication of effort within the Department of Defense.
- (U) Program Element #1160404BB, (SO Tactical Systems Development), Project S800, "SOF Munitions Advanced Development."

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PE Title: SO Tactical Systems Development

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H. (U) OTHER APPROPRIATION FUNDS: ($ in Thousands)

OTHER APPR. FUNDS PRGM.	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
AC-130U ACQUISITION (P,DA)					
	77,875	-0-	27,489	Cont.	N/A

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not Applicable.

J. (U) MILESTONE SCHEDULE:

(U)	Complete Combined QT&E/QOT&E	Dec 93
(U)	Required Assets Available (RAA)	Dec 93
(U)	Initial Operational Capability	Jun 94
(U)	Full Operational Capability	Mar 95

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PE Title: SO Tactical Systems Development

Budget Activity: #4
Date: April 1993

A. (U) RESOURCES: ($ in Thousands)

PROJECT NR & TITLE	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
3642 Aircrew Training System (ATS)	36,961	19,307	24,697	Cont.	Cont.

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:
This program will develop an integrated, state-of-the-art SOF aircraft, ground-based Aircrew Training System (ATS) to support initial aircraft, mission, and special qualification, continuation training, upgrade training, and combat mission rehearsal requirements. The MC-130s were the top priority. For SOF aircraft, negotiated options are also provided for AC-130U, AC-130H, MH-53J, HC-130, and MH-60G. The AC-130U option is planned to be exercised in FY96. The ATS requirement is driven by the lack of formal schools for the majority of SOF crew members represented in the seven AFSOF aircraft and the absence of multi-aircraft, integrated, real-time combat mission rehearsal capability for SOF aircrews. Existing training rehearsal restrictions caused by airspace/weather, critical mission safety, and security consideration require a capability to rehearse extremely sensitive missions of the highest national priority in other than actual aircraft. Increasing operational taskings, joint maneuver training, and also the extensive crew member training workload for initial, continuation, mission, special mission and upgrade training for the 50 crew positions in the seven AFSOF aircraft have all contributed to the need for this comprehensive, ground training capability. Decreasing crew member experience levels in all crew positions also exacerbates the need for this capability. SOF ATS is the cost effective approach for providing training and fixed site aircrew integrated mission rehearsal capability. The solution to this multi-faceted problem is a contractor operated and maintained SOF aircrew training system composed of weapon system trainers (WSTs), mission rehearsal devices (MRDs), part task trainers, computer based training equipment, logistics support packages, courseware, and contractor provided instruction for all crew members of each aircraft. The system will provide a mix of academics, simulator training, and aircraft flight training to produce combat qualified crew members that are guaranteed by the contractor. This system will also provide combat mission rehearsal capability allowing SOF aircrews to rehearse highly classified, real-world SOF missions of the highest national priority within 48 hours of tasking by National Command Authority. With the CINCSOC validation of USSOCOM JSORD 001-91 in Aug 91, the SOF ATS became a joint Air Force/Army program providing for joint Air Force/Army mission rehearsal.

C. (U) PROJECT ACCOMPLISHMENTS AND PLANS:

(U) FY 1992 Accomplishments:

- (U) Conducted MC-130E & H Specific Hardware Critical Design Review (CDR).

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- (U) Continued modification and hardware/software integration of C-130E Weapon System Trainer (WST) to MC-130E SOFI configuration.

- (U) Continued MC-130E and H courseware development and courseware readiness reviews.

- (U) Conducted MC-130E & H WST and Mission Rehearsal Device (MRD) software and system critical design reviews.

- (U) Continued development and hardware/software integration of MRDs.

- (U) Started Mission Rehearsal Imagery Support System (MRISS) development.

- (U) Started risk reduction/integration of mission rehearsal data base generation system.

(U) FY 1993 Planned Program:

- (U) Early delivery of Load Master Part Task Trainer (LMPTT).

- (U) Complete MC-130E & H Software Critical Design Review (CDR).

- (U) Complete contract restructure.

(U) FY 1994 Planned Program:

- (U) Continue SOF ATS development.

- (U) Initiate SOF Planning Rehearsal and Execution Preparation (PREP).

(U) Program to Completion:

- (U) Talon II WST delivery.

- (U) Talon II Courseware development complete.

- (U) Talon II Courseware Readiness Review (CRR).

- (U) Initiate AC-130U option.

- (U) Complete system design/deployment for MC-130E & H WST and Mission Rehearsal Systems.

- (U) Initiate helicopter (MH-53J, MH-60G) and tanker (HC-130) options for AFSOF aircraft if funding is programmed and budgeted.

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PE Title: SO Tactical Systems Development
Budget Activity: #4
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- (U) Initiate development of Army Special Operations Forces options for MH-47E and MH-60K.

- (U) Conduct Training System Readiness Review, Mission Rehearsal System Demonstrations, and System Supportability Demonstration. Contractor assumes "Guaranteed Student" provisions of contract.

D. (U) WORK PERFORMED BY: Aeronautical Systems Center, Training System Program Office (ASC/YTS), Wright-Patterson AFB, OH. and Loral Defense Systems, Akron, OH.

E. (U) COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. (U) Technical Changes: Change Weapon System Trainer (WST) visual system requirement.

2. (U) Schedule Changes: Major program schedule changes due to limited funding necessitating program restructure.

3. (U) Cost Changes: Contract requirements exceed available funding. Program restructure is underway to align program schedule to the available funding.

F. (U) PROGRAM DOCUMENTATION:

- (U) Military Airlift Command (MAC) Statement of Need (SON) 05-83, Special Operations COMBAT TALON II/COMBAT TALON I Improvements, 21 Jan 1983.

- (U) USSOCOM JSORD 001-91, SOF Aircrew Training System, 23 Aug 91.

- (U) SOF ATS Program Memorandum Directive (PMD) 7268(6) B1011F, 17 Mar 92, (as amended).

- (U) SOF-ATS Concept of Operations Document.

- (U) SOF-ATS Interface Control Document.

G. (U) RELATED ACTIVITIES: There is no unnecessary duplication of effort within the Department of Defense, because SOF ATS has utilized existing, surplus training devices, excess aircraft parts and existing courseware wherever possible to significantly reduce program cost (contractor estimated at 6-7 million dollars). SOF ATS is being designed in close coordination with the SOF Planning And Rehearsal System (SOFPARS) program office. To the maximum extent possible ATS technology and databases will be utilized in FY94 and 95 when SOFPARS begins its major development work.

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PE Title: SO Tactical Systems Development

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Date: April 1993

H. (U) OTHER APPROPRIATION FUNDS: ($ in Thousands)

OTHER APPR. FUNDS PRGM.	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
AIRCRAFT SUPPORT (P,DA)	-0-	-0-	1,086	Cont.	Cont.

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not Applicable.

J. (U) MILESTONE SCHEDULE:

(U)	Release Request for Proposal	Jan 1989
(U)	Contract Award (Phase I)	Jun 1989
(U)	System Level Preliminary Design Review	Jan 1990
(U)	Contract Award (Phase II)	Jul 1990
(U)	MC-130E & H Weapon System Trainer (WST) and Mission Rehearsal Device (MRD) Common Hardware Preliminary Design Review	Jan 1991
(U)	MRD Mockup Review	Jan 1991
(U)	Specific Hardware Preliminary Design Review	Apr 1991
(U)	Production Authorization Milestone	May 1991
(U)	MC-130H ATS Critical Design Review	Aug 1993
(U)	Turn on of SOF Planning Rehearsal and Execution Preparation (PREP)	Q1 FY 1994
(U)	MC-130H Weapon System Trainer Delivery	Q2 FY 1995
(U)	Exercise AC-130U option	Q3 FY 1996
(U)	MC-130E Weapon System Trainer Delivery	Q4 FY 1996
(U)	MC-130E H MRD Delivery	Q4 FY 1996
(U)	System Supportability Demonstration	Q4 FY 1996

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Program Element: #1160404BB
PE Title: SO Tactical Systems Development

Budget Activity: #4
Date: April 1993

A. (U) RESOURCES: ($ in Thousands)

PROJECT NR & TITLE	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
S350 Special Operations Forces Planning and Rehearsal System (SOFPARS)	10,007	9,845	5,813	Cont.	Cont.

B. (U) BRIEF DESCRIPTION OF PROJECT: The Special Operations Forces Planning and Rehearsal System (SOFPARS) is a joint program for the United States Special Operations Command (USSOCOM). This program will develop an automated image/knowledge based mission planning and rehearsal preview capability to support Special Operations Forces (SOF) aircrews and ground/maritime teams. Phase I of SOFPARS, the SOFPARS Air Mission Planner, will be the SOF version of the Air Force Mission Support System (AFMSS). The SOFPARS Phase I will be provided to the Air Force Special Operations Command (AFSOC) and the aviation component of the United States Army Special Operations Command (USASOC) - the 160th Special Operations Air Regiment (SOAR). Phase II of SOFPARS will be the SOFPARS Ground/Maritime Planner.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN FY 1994:

(U) Project S350 - Special Operations Forces Planning and Rehearsal System (SOFPARS): SOFPARS will automate mission planning thus allowing SOF commanders and crews/teams to plan and respond quickly to missions of national importance as well as day-to-day taskings. To accomplish this task, SOFPARS will provide a multi-command level planning and rehearsal capability at major SOF headquarters, theater headquarters, SOF Forward Operating Bases (SFOB) and Forward Operating Locations (FOL). SOFPARS will also provide portable subsystems and mission execution support products for use by crews/teams deployed to operational locations. Major areas requiring automated support include information fusion, mission planning, mission rehearsal (preview), and image exploitation.

(U) Present aviation mission planning capabilities cannot adequately support the stated mission element need. Existing systems lack sufficient scope and detail for planning SOF operations. Specifically, existing systems lack sufficient processing speed and flexibility, storage capacity, growth potential, graphics (both on-screen and hard copy output), image processing and storage, and processing of combat planning folder data in a timely manner. They also lack near-real-time (NRT) access to national/tactical level data bases and the capability to update data in a timely fashion, along with the means to effectively process the data during mission planning. In the ground/maritime environment there are no predecessor mission planning systems. The mobility, complexity, quantity, and lethality of enemy threats dictate automated data input and systems that can be interfaced via electronic communication systems throughout the SOF community. The SOFPARS effort meets the

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joint requirement to ensure interoperability and standardization of the SOF mission planning process.

(U) FY 1992 Accomplishments:

- (U) Continued aviation contract (SOFPARS Phase I) and began execution of aviation planning systems production to meet MH-53J mission planning needs.
- (U) Assessed rehearsal technology, and developed implementation plan.
- (U) Integration of MH-53J mission planning modules with Air Force Mission Support System (AFMSS) Block B. Successfully completed IOT&E field test for AFMSS, demonstrating MH-53J mission planning.
- (U) Continuation of AFMSS Block B (Core Functions) Development.
    - o (U) A/W/E interface
    - o (U) Data Feeds
    - o (U) Flight Planning
    - o (U) Threat Analysis
- (U) Developmental Test and Evaluation (DT&E)/Demonstration of AFMSS (Block B).
- (U) Development of AFMSS Block C which includes additional mission planning requirements and enhanced functions.
    - o (U) Laptop
    - o (U) Delivery Planning
    - o (U) Strike Planning
    - o (U) Air Refueling
    - o (U) Data bases
- (U) Awarded contracts to three competing contractors for SOF ground/maritime planning system (initiated SOFPARS Phase II).
- (U) Released SOFPARS Phase II (Ground/Maritime) Program Requests for Proposal.

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(U) FY 1993 Planned Program:

- (U) Add MH-47D/E, MH-60G/K/L, AC-130H/U, MC-130E/H, HC-130P/N, EC-130E, and A/MH-6 to the mission planner (Phase I).
- (U) Investigate aviation element (portable) level future efforts.
- (U) AFMSS winner selected.
- (U) AFMSS Block B deliveries start.
- (U) AFMSS Block C enhancements:
    - o (U) Upgrade AFMSS Block B software.
    - o (U) Develop one-man portable mission planner hardware.
    - o (U) Integration of weapon systems such as MH-47D/E and MH-60G/K/L.
- (U) AFMSS Block B and C awarded same time.
- (U) AFMSS Block B Initial Operational Capability (IOC).
- (U) Continuation of AFMSS Block C software and laptop mission planning hardware.
- (U) Integration of additional weapon systems.
- (U) Deliver initial capability ground/maritime planner (Phase II).
- (U) Continue ground/maritime development contract effort to include field test at Ft. Bragg.
- (U) Assess mission rehearsal/preview technologies for ground/maritime planners.
- (U) Assess force/element levels planning functions in unit level planners.
- (U) Complete development of first block capability of the SOF ground/maritime planning system (SOFPARS Phase II).
- (U) Downselect from three to one contractor for the initial production of the SOF ground/maritime planning systems (SOFPARS Phase II).

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- (U) Exercise option for Integration Studies to assess additional requirements to include suitcase-portable systems and maritime planning functions.

(U) FY 1994 Planned Program:

- (U) Develop block upgrades of core software SOFPARS Phase I.
- (U) Continue integration into a portable configuration SOFPARS Phase I.
- (U) Continue ground/maritime capabilities enhancements through semi-annual software releases.

(U) Program to Completion:

- (U) Complete initial block development of Portable Mission Planning System (Phase I and Phase II).
- (U) Continue enhancement of aviation planner software through Block enhancements.
- (U) Continue capabilities enhancements of ground/maritime through software Block enhancements.
- (U) Initiate development of new software applications and tools for ground/maritime planning.
- (U) Continue development and enhancement of laptop aviation planner and suitcase-portable ground/maritime planner.
- (U) Develop rehearsal/preview capability (SOFPARS Phase III) for ground/air/maritime missions utilizing existing technology/systems to maximum extent possible.
- (U) Integrate and incorporate all SOF aircraft with aviation planner and semi-annual software upgrade releases.
- (U) Complete AFMSS Block enhancement to satisfy SOF, Air Combat Command (ACC), and Air Mobility Command (AMC) requirements.
- (U) Complete AFMSS hardware deliveries.
- (U) Continue ground/maritime capabilities enhancements through semi-annual software releases.
- (U) Develop ground/maritime planning and rehearsal capabilities for Force/Element levels.

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- (U) Program completion will be a fully integrated system enabling each SOF mission with air, ground, and maritime aspects to be finalized, practiced, and rehearsed. Integration will include connectivity between SOFPARS and SOFATS.

(U) WORK PERFORMED BY: The SOFPARS Program is being managed by the Directorate for Mission Planning Systems (ESC/YV), Electronics Systems Center, Hanscom AFB, MA. Ground and maritime requirements refinement is being accomplished by ESD/YVO and Argonne National Laboratory under approval authority of USSOCOM/SOAR-(FW&E).

(U) RELATED ACTIVITIES: Air Force Mission Support Systems (AFMSS), PE: 28006F. SOFPARS will initially piggyback on the AFMSS contract in order to meet those aviation requirements that are common to the Air Combat Command (ACC) and Air Mobility Command (AMC) as well as requirements unique to SOF. The Request for Proposal (RFP) was released in Sep 90. The contract was awarded in Apr 91. Associate contract agreements are in place with the AFMSS contractor and the SOF Aircrew Training System (SOFATS) prime contractor to ensure compatibility/ interoperability. To the maximum extent possible, ATS technology and data bases will be utilized in developing the air preview module of SOFPARS. A decision will then be made to either continue in the AFMSS program to meet remaining SOF-unique aviation requirements or to merge the AFMSS effort with ground and maritime requirements in a separate program. There is no unnecessary duplication of effort within the Department of Defense.

(U) OTHER APPROPRIATION FUNDS: ($ in Thousands)

OTHER APPR. FUNDS PRGM.	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
MISCELLANEOUS EQUIPMENT (P,DA)					
	3,471	4,311	-0-	-0-	7,782
SOFPARS (P,DA)					
	-0-	-0-	10,491	Cont.	Cont.

(U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not Applicable.

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Date: April 1993

A. (U) RESOURCES: ($ in Thousands)

PROJECT NR & TITLE	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
S375 SO Weapons Systems Advanced Development	468*	2,072*	2,066	Cont.	Cont.

* FY92/93 projects S300 and the weapons sub-projects of SO416 have been combined to form this project. FY92/93 funds above were previously detailed as follows: S300 $268/$1,722 and SO416 $200/$350.

B. (U) BRIEF DESCRIPTION OF PROJECT: This program provides for developing and testing of specialized, lightweight individual weapons, fire control and tactical surveillance equipment to meet the unique requirements of Special Operations Forces (SOF). Individual items include, Improved Remote Battlefield Sensor System (IREMBASS), Sniper Rifle Night Vision Image Intensification System (NVIIS), Manpack Stand-off Weapon System (MSW), Offensive Handgun and Spotting Scope.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN FY 1994:

(U) Project S375 - Special Operations Weapons Systems Advanced Development: SOF often deploys as small, foot-mobile teams. Existing weapons and fire control are frequently too heavy to use under these conditions. Sniper Rifle Systems/NVIIS will provide SOF with night vision capability for sniper rifles. The Standoff Weapon System will provide forces with a large caliber, highly accurate anti-personnel,anti-material weapon system with improved, lightweight weapon with a variety of ammunition capable of engaging multiple types of SOF targets. Development of the SOF Offensive Handgun will standardize SOF handgun requirements.

(U) FY 1992 Accomplishments:

- (U) Conducted IREMBASS Milestone (MS) III In-Process Review, issued request for proposal, conducted Source Selection Evaluation Board, and awarded production contract.
- (U) SOF Offensive Handgun - Continued development for SOF use. Began Developmental Test and Integration (DTI) on 60 systems, 30 from each of the two contractors.

(U) FY 1993 Planned Program:

- (U) Conduct operational testing for the Sniper Rifle Night Vision Image Intensification System (NVIIS).

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PE Title: SO Tactical Systems Development

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- (U) SOF Offensive Handgun - Continue developmental testing and down select to one contractor and achieve Milestone II; enter into engineering and manufacturing development.

(U) FY 1994 Planned Program:

- (U) M4 Carbine SOF Modifications - Using Government agencies, perform integration of the following capabilities to M4 Carbine to allow for mounting of optional accessories (up to 25 different functions)/capabilities such as laser pointer, active aiming module, or night vision/thermal imaging devices and also fully automatic capabilities.

- (U) Spotting Scope - Conduct market survey for Non-Developmental Item (NDI) procurement of spotting scopes starting in FY94.

- (U) SOF Offensive Handgun - Contractor delivers 30 refined prototype systems and TDP, perform TECHEVAL and OPEVAL.

(U) Program to Completion:

- (U) This is a continuing program.

(U) Work Performed By: The project manager for Mines, Countermine and Demolition (PM-MCD) Picatinny Arsenal, NJ is assigned the responsibility of the Standoff Weapons System. The major supporting laboratory is the Armament Research, Development and Engineering Center, Picatinny Arsenal, NJ. Project manager for SOF Offensive Handgun is Naval Surface Warfare Center, Crane Division, IN. In-house development for NVIIS is the Naval Weapons Support Center, Crane, IN. The project manager for Small Arms (AMCPM-SA) is Picatinny Arsenal, NJ; is assigned the responsibility for the M4 Carbine SOF Modifications. Major contractors are:

- (U) IN-HOUSE: Naval Surface Warfare Center, Dahlgren Division, White Oak, MD; Naval Surface Warfare Center, Crane Division, Crane, IN.

- (U) CONTRACTORS: SOF Offensive Handgun - Colt Manufacturing Company, Inc. and Heckler & Koch USA.

(U) Related Activities: There is no unnecessary duplication of effort within the Department of Defense.

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Date: April 1993

(U) Other Appropriation Funds: ($ in Thousands)

OTHER APPR. FUNDS PRGM.	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
SOF SMALL ARMS AND WEAPONS (P,DA)					
	-0-	-0-	2,188	Cont.	Cont.
SOF INTELLIGENCE SYSTEMS (P,DA)					
	-0-	25,647	-0-	-0-	26,023
MISCELLANEOUS EQUIPMENT (P,DA)					
	14,776	-0-	-0-	-0-	14,776

(U) International Cooperative Agreements: Not Applicable.

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Date: April 1993

A. (U) RESOURCES: ($ in Thousands)

PROJECT NR & TITLE	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
S650 QUIET KNIGHT	-0-	-0-	969	Cont.	Cont.

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:
QUIET KNIGHT is an FY94 new start that provides for the development, integration, procurement, and installation of passive navigation technology with a common TF/TA radar initially for SOF fixed and rotary wing aircraft. 41 MH-53J, 14 MC-130E, associated weapon system trainers, and mission rehearsal devices are the initial aircraft associated with this project. QUIET KNIGHT is an exploitation of proven passive navigation technology resulting from the successful technology demonstration of the Balanced Technology Initiative (BTI) project. The preponderance of the effort is the integration of passive navigation with blended, power manageable TF/TA radar which is overlaid on a digital map display. Electronic order of battle is overlaid on the displays and in-flight mission planning capability is provided. The SOF fleet of aircraft will eventually all be standardized with this capability.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1992 Accomplishments: Not Applicable.

(U) FY 1993 Planned Program: Not Applicable.

(U) FY 1994 Planned Program:

- (U) Complete transition BTI program management to QUIET KNIGHT Program Office.
- (U) Complete Cost Operational Effectiveness Analysis (COEA).
- (U) Complete Acquisition Plan and Acquisition Strategy.
- (U) Complete Integrated Logistics Support Plan (ILSP).
- (U) Finalize Test and Evaluation Master Plan that was initiated during BTI program.
- (U) Complete drafting and finalize Acquisition Program Baseline using BTI program results.
- (U) Release RFP using BTI program data as a supplement.
- (U) Start source selection.

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(U) Program to Completion:

- (U) Complete source selection.
- (U) Award development contract.
- (U) Conduct Preliminary Design Review.
- (U) Determine modular system functions for fixed and rotary wing aircraft.
- (U) Evaluate candidate radar systems for modification.
- (U) Begin modular hardware development.
- (U) Begin hardware/software integration.
- (U) Conduct Critical Design Review.
- (U) Trial installation on rotary and fixed wing aircraft QUIET KNIGHT kit.
- (U) Begin production kit modification.
- (U) Conduct flight tests.
- (U) Modify rotary and fixed wing aircraft with production kits.

D. (U) WORK PERFORMED BY: USSOCOM Special Operations Research, Development, and Acquisition Center, MacDill AFB, FL. Contractor(s) to be determined.

E. (U) COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY: Not Applicable.

F. (U) PROGRAM DOCUMENTATION:

- (U) USSOCOM Mission Need Statement for MC-130 and MH-53 Enhanced TF/TA System, 2QFY93.
- (U) USSOCOM Operational Requirements Document for QUIET KNIGHT, 4QFY93.

G. (U) RELATED ACTIVITIES: The BTI QUIET KNIGHT Program. There is no unnecessary duplication of effort.

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RDT&E DESCRIPTIVE SUMMARY

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Budget Activity: #4
Date: April 1993

H. (U) OTHER APPROPRIATION FUNDS: ($ in Thousands)

OTHER APPR. FUNDS PRGM.	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
QUIET KNIGHT PROCUREMENT (P,DA)	-0-	-0-	-0-	Cont.	Cont.

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: None.

I. (U) MILESTONE SCHEDULE:

Milestone (QUIET KNIGHT)	Milestone Date
Mission Need Statement	2nd QTR FY 93
Milestone 0	4th QTR FY 93
Operational Requirements Document	1st QTR FY 94
Milestone I	1st QTR FY 94
Request For Proposal	2nd QTR FY 94
Milestone II	2nd QTR FY 95
Preliminary Design Review	3rd QTR FY 95
Critical Design Review	1st QTR FY 96

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Program Element: #1160404BB
PE Title: SO Tactical Systems Development

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A. (U) RESOURCES: ($ in Thousands)

PROJECT NR & TITLE	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
S675 Sustainment Engineering Support	-0-	-0-	9,615	Cont.	Cont.

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: This program provides a rapid response capability to support the Air Force SOF fixed and rotary wing aircraft requirements in the engineering, logistics and procurement functional areas. Scarce organic engineering resources and the rapid response requirements are the basis for sustainment engineering. The program provides the engineering required to maintain and improve the design and performance integrity of the aircraft and aircraft support systems, subsystems, equipment, and embedded computer systems software as it relates to maintenance, overhaul, repair, quality assurance, modifications, material improvements and service life extensions. Examples of engineering efforts are: investigative analysis, feasibility studies, software/hardware deficiency corrections, and aircraft modification analysis. Prior to FY 1994 sustainment engineering was funded under the O&M appropriation. This change is consistent with the Air Force effort, supported by OSD, to move sustainment engineering from O&M to RDT&E.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1992 Accomplishments:

- (U) Not Applicable.

(U) FY 1993 Planned Program:

- (U) Not Applicable.

(U) FY 1994 Planned Program:

- (U) Provide system engineering support for SOF fixed and rotary wing aircraft.
- (U) Provide software support for aircraft and aircraft support systems and subsystems.
- (U) Provide engineering support for the integrated support facility.

(U) Program to Completion: This is a continuing program.

D. (U) WORK PERFORMED BY: WR-ALC/LU SOF Management Directorate, Robins AFB, GA; E-Systems, Ft. Worth, TX; Lockheed Corporation, Aircraft Systems

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Division, Ontario, CA; Bell Helicopters, Ft. Worth, TX; Georgia Tech Research Institute, Atlanta, GA; and Systems Research Laboratory, Dayton, OH.

E. (U) COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. (U) Technical Changes: Not Applicable.

2. (U) Schedule Changes: Not Applicable.

3. (U) Cost Changes: Not Applicable.

F. (U) PROGRAM DOCUMENTATION: Not Applicable.

G. (U) RELATED ACTIVITIES: There is no unnecessary duplication of effort within the Department of Defense.

H. (U) OTHER APPROPRIATION FUNDS: Not Applicable.

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not Applicable.

J. (U) MILESTONE SCHEDULE: Not Applicable.

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Date: April 1993

A. (U) RESOURCES: ($ in Thousands)

PROJECT NR & TITLE	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
S700 Special Operations Forces Communications Advanced Development	3,369*	4,527*	7,911	Cont.	Cont.

* To better portray joint Special Operations Communications efforts, Projects D474, SF300, and the C3I development and support sub-projects of Project SO417 have transitioned to this project. FY92/93 funds were previously detailed as follows: D474 $2,333/$3,896, SF300 $411/$5, and SO417 $625/$626.

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:
This program provides for development and testing of selected items of specialized equipment to meet the unique requirements of Special Operations Forces. Specialized equipment will permit small, highly trained forces to conduct required operations across the entire spectrum of conflict. These operations are generally conducted in harsh environments, for unspecified periods, in locations requiring small unit autonomy. Special Operations Forces must infiltrate by land, sea, and air to conduct unconventional warfare, direct actions, or deep reconnaissance operations in denied areas against insurgent units, terrorists, or highly sophisticated threat forces. The requirement to operate in denied areas controlled by a sophisticated threat mandates that Special Operations Forces systems remain technologically superior to threat forces to ensure mission success.

C. (U) PROJECT ACCOMPLISHMENTS AND PLANS:

(U) FY 1992 Accomplishments:

- (U) Special Operations Improved Cryptographic System (SOICS), is a Non-Development Item (NDI) acquisition employing available Commercial-Off-The-Shelf (COTS) and National Security Agency Commercial COMSEC Endorsement Program (CCEP) products to allow rapid fielding of the system. Completed DOD 5000 Milestone 0 and I/II documentation. Developed and received validation of the Operational Requirements Document (ORD) for the SOICS. Updated program documentation: Acquisition Strategy, System Threat Assessment, Life Cycle Cost Estimate, T&E Master Plan, Integrated Logistics Support Plan, Competitive Resources Life Cycle Management Plan. Completed Market Investigation, developed Source Selection Plan and released solicitation (Request for Proposal) which includes the Statement of Work, and Technical Description. Conducted Milestone I/II In-Process Reviews. Conducted Source Selection Evaluation Board.

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- (U) The Special Operations Radio Frequency Management System (SORFMS), concept consisted of HF transmitter/sounder subsystem, HF sounding and interference receiver subsystems, and frequency management subsystem. It is believed that Non-Developmental Item (NDI), software, will provide the capability of predictions of maximum usable frequencies links up to 24 hours in advance through an improved prediction mode, configure multi-station nets from set-of-stations so each requires only one frequency to communicate between all stations. This program enhances the survivability of outstations teams. Software includes the incorporation of SOF antenna characteristics into the database, software code documentation, and interface codes with existing systems.

- (U) Army Special Operations Command Network (ASOCNET), will provide an integral part of the Command Control (C2) systems for Special Operating Forces. This network is a system of computers, terminals and a data base connected by communications lines. It is a Out of Continental United States (OCONUS) data communications link supporting the command and control requirements of the United States Special Operations Forces Command, a component of the United States Special Operations Command. The requirements have been obtained through formal studies conducted in accordance with the Army Information Engineering process. ASOCNET will provide a robust infrastructure for development and operation of integrated C2 systems. It will consist of family of Local Area Networks (LAN) connected together to form Metropolitan Area Networks (MAN) both at Fort Bragg, NC and at geographical disperse sites. ASOCNET will include a Wide Area Network (WAN) that connects sites which are remote from Fort Bragg, NC. It will be composed of both SECRET and UNCLASSIFIED networks. Milestone 0/I Trade Off Analyses/Trade Off Determination have been accomplished, prepared Abbreviated Analysis and Best Technical Approach, initiated Systems Engineering Analysis. Updated program documentation: Acquisition Strategy, updated System Threat Assessment, Life Cycle Cost Estimate, T&E Master Plan, Integrated Logistics Support Plan, Competitive Resources Life Cycle Management Plan. Completed Market Investigation, and released the ASOCNET solicitation (Request For Proposal). Conducted Source Selection Evaluation Board for ASOCNET.

- (U) Initiated basic design for Miniature Multi-Band Beacon (MMB), prototype development program. Conducted system requirements and preliminary critical design reviews. Revised and finalized the T&E master plan. Prepared and coordinated Life Cycle Cost Estimate. Updated Integrated Logistics Support Plan and coordinated plans for technical testing and customer testing.

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- (U) Special Operations Power Supply Converters (SOPS), is a family of small light weight power sources (solar panels, AC/DC power converters and hand-cranked generators) with interconnecting cables and adapters to support the recharging of SOF rechargeable batteries contained in SOF outstation communications equipment. Completed operational tests, began low rate initial production and started fielding of Limited Procurement Urgent (LPU) systems, and obtained LPU Materiel Release. Achieved First Unit Equipped and Initial Operating Capability (IOC) for LPU systems.

- (U) Improved Digital Message Data Group (DMDG) MOD, completed certification of an embedded COMSEC device.

- (U) AN/PRC-117 Radio (SINCGARS), continued development of an embedded SINCGARS electronic counter-countermeasures (ECCM) in the AN/PRC-117 radio.

- (U) Naval Special Warfare Task Unit Communications (NSWTUCS). Developed the performance specification, drawings, and all programmatic documents. Conducted MS I/III Acquisition Review Board (ARB), and transitioned to procurement.

- (U) Special Operations Television System (SOTVS), initiated development of programmatic documentation.

- (U) Hand Held Thermal Imager, initiated development of programmatic documentation.

- (U) Naval Special warfare Thermal Weapons Sight (NSWTWS), initiated development of programmatic documentation.

- (U) Naval Special Warfare Water Pressure Proof Night Vision Goggles (NSWWPPNVG), initiated development of programmatic documentation. Conducted a market investigation of this technology.

- (U) SOF Naval Special Warfare Combatant Craft Drop-In Communications Package (NSW DICP/RCID), initiated development of programmatic documentation.

- (U) HF Radio, initiated development of programmatic documentation.

- (U) KN-200 NI Optic, initiated development of programmatic documentation.

- (U) Continued advanced development efforts for Naval Special Warfare Communications.

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- (U) Naval Special Warfare Intra-Team Radio (NSWITR), initiated development of programmatic documentation and conducted market investigation of this technology.

- (U) Acoustic Detection System (ADS), Special In-Process Review (IPR) conducted on 23 Jan 92 resulted in the ADS program termination. Technical solution was not feasible.

- (U) Aircraft Wireless Intercom System (AWIS), completed documentation for MS0/III. Draft Operational Requirement Document (ORD) submitted for approval.

- (U) PORPOISE Radio program terminated due to lack of definitive user requirements.

- (U) Special Access Program (SAP), support of program test.

(U) FY 1993 Planned Program:

- (U) Special Operations Improved Cryptographic System (SOICS), source selection was terminated. It is planned to use the JASORS Digital Message Entry Device (DMED). DMED is currently in development and can be placed into production in FY 95 upon completion of additional development testing in FY 94. DMED will then require only a software update to be fully compatible with the production JASORS.

- (U) Special Operations Radio Frequency Management System (SORFMS), development program terminated due to non-availability of funds. Off-the-shelf software identified provides an interim capability and will be procured to meet this requirement.

- (U) Army Special Operations Command Network (ASOCNET), complete source selection evaluation. Award RDT&E contract to conduct analysis of existing systems, requirements, system design. Demonstrate/Validate critical technologies.

- (U) AN/PRC-117 SINCGARS, conduct Critical Design Review for MS III Acquisition Review Board (ARB), and transition to procurement.

- (U) Hand Held Thermal Imagery, conduct MS I/III ARB and transition to procurement.

- (U) Naval Special Warfare Thermal Weapon Site (NSWTWS), conduct MS I/III ARB and transition to procurement.

- (U) Naval Special Warfare Water Pressure Proof Night Vision Goggle (NSWWPPNVG), conduct MS I/III ARB and transition to procurement.

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- (U) HF Radio, conduct MS I/III ARB and transition to procurement.

- (U) KN-200 Night Optics, conduct MS I/III ARB and transition to procurement.

- (U) Special Operations Power Sources (SOPS), convene MS I/III IPR, obtain production approval. Award SOPS contract for 781 standard systems. Complete SOPS TECOM Technical Tests (LPU). SOPS TC standard approval.

- (U) Improved Lightweight Satellite Antenna (ILSA), perform the Market Survey, develop the ILSA Acquisition Strategy, complete Concept Formulation phase, and start development of the Procurement Data Package. Initiate Market Survey to determine potential vendors of suitable equipment.

- (U) Naval Special Warfare Task Unit Communications System (NSWTUCS), complete prototype engineering development, conduct technical/customer testing. Prepare documentation package and conduct Milestone II Acquisition Review Board.

- (U) SOF Naval Special Warfare Combatant Craft Drop-In Communications Package (DICP), review program requirements and prepare Acquisition Strategy for the NSW Combatant Craft Radio Control/Intercom (RC/I) System. Initiate all initial program documentation for the SOF NSW DICP and RC/I; including, Acquisition Plan, Integrated Program Summary, Life Cycle Cost Analysis, Integrated Logistics Support Plan, and Test and Evaluation Master Plan. Preliminary Design Review for the NSW DICP, prepare documentation package and conduct MS I Review for the NSW DICP and RC/I. Critical Design Review for NSW DICP and conduct MS II Review. Prepare documentation to release Request For Proposal (RFP) and Market Investigation for NSW RC/I to ensure RFP reflects current technology, reliability, and associated costs. Conduct Source Selection Evaluation Board for NSW RC/I. Award low-rate contract with options. (Note name change in FY 94 to "Tactical Radio System").

- (U) Naval Special Warfare Standard Waterproof Intra-Team Radio (NSWITR), review program requirements and prepare Acquisition Strategy.

- (U) Miniature Multi-Band Beacon(MMB), complete prototype engineering development, conduct technical testing and customer testing, prepare procurement data package for Low Rate Initial Production, prepare In Process Review package and conduct MS III IPR, issue request for proposal, conduct Source Selection Evaluation Board.

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- (U) Conduct Market Survey on Special Forces Base Station (SFBS), prepare Concept Formulation Package, develop Acquisition Strategy, generate Life Cycle Cost Estimate and initiate Reliability/Availability/Maintainability (RAM).

- (U) Research and prototype an advanced data transfer system to interconnect SOF Special Tactics Teams and the deployed ASSOC elements. Primary emphasis will be on evaluating a man-portable digital data transmitting system capable of operating under field conditions.

(U) FY 1994 Planned Program:

- (U) Army Special Operations Command Network (ASOCNET), mature and finalize design, validate manufacturing and production process. Test and evaluate system and conduct MS III Acquisition Review Board and enter into production.

- (U) Naval Special Warfare (NSW) Tactical Radio System, complete prototype engineering development, conduct technical testing, seek MS III approval to enter production phase.

- (U) Special Forces Base Station (SFBS), initiate and conduct MS I, release Request For Proposal, conduct Source Selection Evaluation Board (SSEB), and develop prototype of systems design, fabrications, integration, and conduct demonstration/validation test. Continue integrated logistics support, Computer Resources Management Plan (CRMP), and preparation for milestone decision.

- (U) Special Operations Communications Assemblage (SOCA) II, Special Operations Communications Assemblages, Technology insertion and upgrade investigation of SOCA I. MS O conduct study of available technologies and prepare for MS I Acquisition Review Board.

- (U) Improved Lightweight Satellite Antenna (ILSA), prepare technical program data package, conduct MSI/II. Validate manufacturing and production process, Test and Evaluate.

- (U) NSW Intrateam Radio, continue update of initial program documentation including, Acquisition Plan, Integrated Program Summary, Life Cycle Cost Analysis, Integrated Logistics Support Plan, and Test and Evaluation Master Plan. Conduct Market Survey to determine potential vendors of suitable equipment, and conduct technical evaluation of candidate systems. Prepare documentation package and seek MS0/II approval. Conduct Source Selection Evaluation Board and award low-rate contract with options for the NSW ITR.

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- (U) Joint Tactical C4I Mod, initiate development of programmatic documentation required for NDI Milestone I/III decision leading to Procurement in FY95.

- (U) Mobile Comm, conduct market survey for integrated AFSOF Mobile Communications. Develop Acquisition Strategy; conduct Life Cycle Cost Estimates; and determine critical system characteristics for MS 0/I decision.

(U) Program to complete:

- (U) Modernization of Team Communication, development of SF Base Station and headquarters C4I continues. Continue the advance development efforts for NSW communications and electronics.

D. (U) WORK PERFORMED BY: In-house development organizations are U.S. Army Communications and Electronics Command, Ft. Monmouth, NJ; Naval Research Laboratory, Washington, DC; Naval Surface Warfare Center, Crane Division, Crane IN; Naval Air Warfare Center, Warminster, PA; and Naval Electronic Systems Engineering Activity, St. Inigoes, MD. Major contractors are: International Telephone and Telegraph Co., Fort Wayne, IN; Barrymore Research Corp., Sunnyvale, CA; Motorola Co., Inc., Scottsdale, AZ; and SRI, Menlo Park, CA.

E. (U) COMPARISON WITH FY 1993 DESCRIPTIVE SUMMARY:

1. (U) Technical Changes: Not Applicable.

2. (U) Schedule Changes: Not Applicable.

3. (U) Cost Changes: Not Applicable.

F. (U) PROGRAM DOCUMENTATION: To Be Determined.

G. (U) RELATED ACTIVITIES: There is no unnecessary duplication of effort within the Department of Defense.

H. (U) OTHER APPROPRIATION FUNDS: ($ in Thousands)

OTHER APPR. FUNDS PRGM.	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
COMMUNICATION EQUIPMENT & ELECTRONICS (P,DA)					
	21,928	19,067	19,193	Cont.	Cont.

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not Applicable.

J. (U) MILESTONE SCHEDULE: To Be Determined.

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A. (U) RESOURCES: ($ in Thousands)

PROJECT NR & TITLE	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
S800 SOF Munitions Advanced Development	16,247*	14,150*	14,788	Cont.	Cont.

* FY92/93 projects S489, SF400, and the munitions sub-projects of SO416 have been combined to form this project. FY92/93 funds above were previously detailed as follows: D489 $10,002/$9,521, SF400 $4,454/$4,098, and SO416 $1,791/$531.

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: One purpose of this project is to provide advanced Special Operations specific munitions for the AC-130 gunship. Third World countries and terrorist organizations now possess highly sophisticated weapon systems that threaten gunship survivability. Gunship targets may be defended by a broad spectrum of air defenses and may be in close proximity to friendly personnel. Therefore, advanced munitions that provide greater standoff attack capability and enhanced lethality, while minimizing collateral damage, are essential for mission success. The efforts which comprise this project (described below) resulted from a comprehensive USAF study that identified those munitions technologies which could enhance gunship effectiveness and increase aircraft survivability. Requirements are further defined in the Statement of Need for AC-130 Gunship Advanced Munitions. Other projects provide for development and testing of selected items of specialized munitions and equipment to meet unique requirements for SOF.

(U) Improved 25mm Ammunition: The AC-130U 25mm gun system utilizes high explosive incendiary (HEI) ammunition to provide effective suppressive firepower. Available HEI ammunition does not meet present gunship requirements for increased standoff ranges. The requirements are beyond the present HEI performance which prevent effective gunship suppressive firepower beyond an 8000 foot slant range due to its present design, which requires residual impact velocity for proper functioning of a chemical fuze. This project modifies a 25mm round by replacing the current chemical fuze with a superquick fuze to meet increased standoff requirements and achieve point detonation. Tests for safety/reliability as well as operational flight test evaluations are included.

(U) Improved 40mm Ammunition: The BOFORS L-60 40mm gun system is used to provide precise firepower against light armored vehicles. The short time of flight and projectile lethality of existing 40mm high explosive ammunition make this weapon system ideal against mobile targets. However, the system lacks an effective round of ammunition to successfully engage and defeat light armored vehicles while minimizing collateral damage. Further, an improvement is needed over the current MK-27 fuze which is prone to fail and is a safety hazard. This project will develop, test, and evaluate an Armor Piercing Fin

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Stabilized Discarding Sabot (APFSDS) round of ammunition and other fuze technology designed to help satisfy these requirements.

(U) Improved 105mm Ammunition: The AC-130 105mm Howitzer gun system is intended to provide lethal firepower against light armor and hardened targets. It is presently limited to High Explosive (HE) and White Phosphorus (WP) ammunition which are marginally effective against the target list. This effort will evaluate candidates to modify or develop lethality improvements to include fuzing, penetration, propulsion, and warhead improvements.

(U) Standoff Munitions: These lethality enhancements will increase survivability. The AC-130 gunship requires munitions that can be fired from ranges beyond that of threatening Anti-Aircraft Artillery (AAA) and Surface-to-Air Missiles (SAMs) and still be effective against hardened targets. These improved standoff weapons may exist in the current inventory and with some modification, be effective by increasing survivability or, they may be identified as having application for further development. Included in this project is an effort to improve LIDAR coherent laser radar technology to give the user ballistic wind measurement from the gunship to the target. The fire control system will compensate for wind error and eliminate the need to fire and tweak the guns before acquiring the target, while still achieving a first hit capability. An added benefit will be that the technology could also be used to detect wind shear.

(U) 40/105mm Blast Reduction: All non-SOF unique ammunition to date has proven to be unsuitable for aircraft use because of the inherent blast overpressure which causes damage to the aircraft and disrupts sensored mechanisms when the projectile exits the muzzle of the gun. This project evaluates alternative methods and muzzle devices for 40 and 105mm guns to reduce said blast and overpressure while minimizing weapon signature. Blast reducers will further diminish technical risk for new ammunition developments by allowing increased muzzle energy and possibly permit some existing high energy ammunition to be used by SOF gunships.

(U) Penetration Augmented Munition (PAM): Presently SOF has a limited capability to significantly damage concrete structures or pylons assigned as targets. This man portable, one step setup systems would meet the requirements and replace the need for up to 180 lb of C4 explosive per emplacement.

(U) Selectable Lightweight Attack Munition (SLAM): A hand emplaced detonation device with various detonation methods (magnetic, command, timed, and infrared) used against light armor, POL sites, payload aircraft, etc..

(U) Time Delayed Firing Device (TDFD): An expendable demolition initiation device, less than 6 cu in, weight 10 oz, adjustable from 5 minutes to 30 days. The TDFD will satisfy the requirements for a variable time detonation system which will be significantly safer than the existing M1 Time Pencil and can be utilized with PAM and SLAM.

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(U) Remote Activated Munitions System (RAMS): Provides the capability to initiate demolition charges in support of interdiction and sabotage.

(U) Absolute Time Firing Device/Advanced Limpet Fuze (ATFD/ALF): This device will allow detonation of explosives and Limpet mines in absolute time. Functional up to 200 ft below water surface.

(U) EX-51: A secondary firing device which functions under certain conditions to protect emplaced explosive charges.

C. (U) PROJECT ACCOMPLISHMENTS AND PLANS:

(U) FY 1992 Accomplishments:

- (U) Improved 25mm Ammunition - Awarded contract for development effort to modify/develop an improved superquick fuze. Developed training round concept and tested for operational use.
- (U) Standoff Munitions - Initiated contract action to implement hardware modifications to achieve the desired goals for increased survivability and weapons effectiveness.
- (U) 40/105mm Blast Reduction - Designed/fabricated/tested muzzle overpressure and flash reduction devices.
- (U) Initiated fabrication and test of engineering prototype subsystem hardware for Penetration Augmented Munition (PAM).
- (U) Fabricated hardware and conducted engineering evaluation testing of Selectable Lightweight Attack Munition (SLAM).
- (U) Completed technical and user tests to type classify Time Delayed Firing Device (TDFD) for Low Rate Initial Production (LRP).
- (U) ATFD/ALF MK56 Mod 0 - Achieved Milestone II, completed Acquisition Decision Memorandum (ADM), and entered Full Scale Engineering Development (FSED).
- (U) FD EX51 - Continued in FSED; initiated fabrication production of representative units.

(U) FY 1993 Planned Program:

- (U) Improve 25mm Ammunition - Complete development/ modification and test of fuze.
- (U) Improve 40mm Ammunition - Complete design/development improvements and initiate production of 40mm APFSDS round.

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- (U) Standoff Munitions - Initiate development of the capability for low cost/high payoff hardware solutions for increased standoff and improve delivery of munitions against lightly armored targets.

- (U) 40/105mm Blast Reduction - Continue improvements in design/fabrication/testing to decrease muzzle overpressure and flash reduction.

- (U) Complete Penetration Augmented Munition (PAM) subsystem and testing and initiate Mil. STD. Testing Fuzing Test.

- (U) Fabricate hardware, complete user testing, and initiate technical testing of Selectable Lightweight Attack Munition (SLAM).

- (U) Award a Time Delayed Firing Device (TDFD) procurement contract.

- (U) Initiate Remote Activated Munition System (RAMS) program, conduct Market Survey, and prepare documentation to support Development or Non-Developmental Item (NDI) decision.

- (U) Obtain RAMS prototype brassboard hardware, conduct demonstration testing, and complete initial operational testing.

- (U) FD EX51 - Continue manufacture of production representative units for TECHEVAL and OPEVAL.

(U) FY 1994 Planned Program:

- (U) Improved 105mm Ammunition - Evaluate Army developed ammunition for use on the AC-130 gunship.

- (U) Standoff Munitions - Continue development of standoff capability for the AC-130 gunship.

- (U) PAM - Conduct System Integration Test; (Conduct Critical Design Review); fabricate production prototype hardware and initiate technical and user tests.

- (U) SLAM - Complete technical tests, MS III IPR, and TC standard.

- (U) Finalize RAMS design, fabricate and evaluate engineering hardware in Military environment, and initiate build of test hardware.

(U) Program to Completion: This is a continuing program.

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D. (U) WORK PERFORMED BY: AC-130 Munitions work is performed by Aeronautical Systems Center, SOF Munitions Program Office, ASC/YHB, Eglin AFB, FL. The Project Manager for Mines, Countermines and Demolitions (PM-MCD), Picatinny Arsenal, NJ is assigned the responsibility for landmine, countermine and explosive demolition development. The major supporting laboratory is the Armament Research, Development and Engineering Center (ARDEC), Picatinny Arsenal, NJ. The concept design was designed in-house by the ARDEC, Picatinny Arsenal, NJ. The major contractors employed at this time are: Alliant Techsystems Inc. at Hopkins and Edina, MN for Penetration Augmented Munition (PAM), Selectable Lightweight Attack Munition (SLAM), PGU-38U, and AAI, Hunt Valley, MD for TDFD and PGU-31B. Development contractors for Remotely Activated Munitions System (RAMS) are to be determined. EX51 execution agency is NSWC, Dahlgren Division, White Oak, MD.

E. (U) COMPARISON WITH FY 1992/1993 APB DESCRIPTIVE SUMMARY:

1. (U) Technical Changes: None.

2. (U) Schedule Changes: SLAM Type Classification has been rescheduled for FY94 and PAM to FY95 due to funds availability. ATFD MK58 Mod 0 Milestone II rescheduled for FY93, due to design problems with the Explosive Foil Initiator. FD EX51 TECHEVAL rescheduled for FY94, due to redesign and retest of DT II A hardware problems.

3. (U) Cost Changes: SLAM - $840K increase in FY92 due to additional safety certification tests. TDFD - $940K increase in FY92 due to additional safety certification tests.

F. (U) PROGRAM DOCUMENTATION:

(U)	Improved Munitions for the AC-130 Gunship - AFSOC MNS	09 Nov 90
(U)	AC-130 Gunship Advanced Munitions - AFSOC SON	Jan 91
(U)	AC-130 Ammo - AFSUCON	29 Jan 91
(U)	40mm APFSDS PGU-31/B for the AC-130 Gunship - ORD AFSOC SORD	05 Feb 91
(U)	40mm PGU-31/B - Acquisition Procurement Baseline	12 Aug 91
(U)	PAM - JFKSWCS ROC	16 Apr 91
(U)	ESLAM/SLAM - JFKSWCS ROC	15 Feb 90
(U)	TDFD - JFKSWCS LTR RQMT	24 Feb 84
(U)	RAMS - JFKSWCS MNS (Remote Initiators)	Nov 91
(U)	RAMS - JFKSWCS-ORD	Feb 93 (in Draft)
(U)	ATFD/ALF MK56 Mod 0 - OR 156-03-87	04 Apr 87
(U)	FD EX51 OR 152-03-87	03 Apr 87
(U)	FD EX51 Temp (REV 3)	Jan 93

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G. (U) RELATED ACTIVITIES: There is no unnecessary duplication of effort within the Department of Defense.

H. (U) OTHER APPROPRIATION FUNDS: ($ in Thousands)

OTHER APPR. FUNDS PRGM.	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
SOF PYRO/DEMO (P,DA)					
	21,030	13,181	12,568	Cont.	Cont.
SOF PLATFORM GUN AMMO (P,DA)					
	39,934	38,147	19,032	Cont.	Cont.

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not Applicable.

J. (U) MILESTONE SCHEDULE:

Milestone (AC-130 Lethality Enhancement)	Milestone Date
Milestone I/II	TBD
Milestone (PAM)	Milestone Date
ROC	3rd QTR FY91
Milestone I/II	3rd QTR FY91
Milestone III	2nd QTR FY95
FUE	1st QTR FY97
Milestone (SLAM)	Milestone Date
ROC	2nd QTR FY90
Milestone I/II	3rd QTR FY90
Milestone III	2nd QTR FY94
FUE	1st QTR FY97
Milestone (TDFD)	Milestone Date
LTR RQMT	2nd QTR FY84
Milestone I/II	3rd QTR FY88
Milestone IIIA (TC-LRP)	3rd QTR FY92
Milestone III (TC-STD)	N/S
FUE	1st QTR FY95
Milestone (RAMS)	Milestone Date
MNS	1st QTR FY92
ORD	In Draft
Milestone I/II	4th QTR FY93

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Milestone III	3rd QTR FY95
FUE	2nd QTR FY97
Milestone (ATFD/ALF MK56)	Milestone Date
OR 156-03-87	14 Apr 87
Milestone I	2nd QTR FY91
Milestone II	1st QTR FY93
TECHEVAL	TBD
OPEVAL	TBD
Milestone III	TBD
FUE	TBD
Milestone (FD EX51)	Milestone Date
OR 152-03-87	03 Apr 87
Milestone I	2nd QTR FY89
Milestone II	2nd QTR FY90
TECHEVAL	2nd QTR FY96
OPEVAL	4th QTR FY96
Milestone III	2nd QTR FY97
FUE	4th QTR FY98
Milestone (ESLAM)	Milestone Date
TBD	TBD
Milestone (SEMEC)	Milestone Date
ORD	3rd QTR FY93
Milestones	TBD
Milestone (Demo Kit)	Milestone Date
TBD	TBD

FISCAL YEAR 1994 BUDGET ESTIMATES
RDT&E DESCRIPTIVE SUMMARY

Program Element: #1160404BB
PE Title: SO Tactical Systems Development

Budget Activity: #4
Date: April 1993

A. (U) RESOURCES: ($ in Thousands)

PROJECT NR & TITLE	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
S900 SOF Miscellaneous Equipment Advanced Development					
	1,245*	1,313*	1,804	Cont.	Cont.

* FY92/93 projects D477, D478, and D479 have been combined to form this project. FY92/93 funds above were previously detailed as follows: D477 $150/$343, D478 $0/$294, and D479 $1,095/$2,939.

B. (U) BRIEF DESCRIPTION OF PROJECT: SOF Miscellaneous Equipment addresses several critical areas with identified deficiencies. Presently, the current ability to safely insert and resupply special operations forces requires improvement. Major thrusts of the program are to reduce the detection and vulnerability of airdrop operations and airdrop aircraft to enemy air defenses, and to provide an improved airdrop resupply capability for special operations forces. The current focus is on increasing the accuracy, and increasing the survivability of airdrop items; and increasing the operating envelope of personnel airdrop. Additionally, this program provides for the development, modification, and testing of lightweight specialized clothing and equipment required for special operations conducted in harsh environments over extended periods of time in areas where support base operations are not feasible. Also, this program provides for the development and testing of day/night observation devices/systems to be used with individual and small caliber crew served weapons. These items must be effective at extended ranges and ruggedized to accompany special operations forces in their air, land, and sea environment. Individual projects are:

- (U) ARABS - Aerial Resupply Accompanying Bundle System - Used for offset resupply of material as an accompanying system to the Ram Air Parachute System.
- (U) ARABS/MC - ARABS Material Change - A pre-planned product improvement that provides Global Positioning System (GPS) compatibility to ARABS as well as an improved flare system.
- (U) HISAC - High Speed Airdrop Container - Container used for high speed, low altitude resupply of materials up to 500 lbs from USAF fighter aircraft.
- (U) AR2 - Automatic Ripcord Release - An AR2 is a safety device for high altitude, low opening and high altitude high opening parachute operations.
- (U) POOS - Parachute Offset Oxygen Supply System - Improved personal oxygen supply system for high-level paratroopers.

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RDT&E DESCRIPTIVE SUMMARY

Program Element: #1160404BB
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- (U) ANR - Active Noise Reduction - addresses cockpit noise relative to speech intelligibility.

- (U) LEWS - Lightweight Extreme Weather Shelter - Lightweight portable individual tent for use in arctic environments.

- (U) DPV - Diver Propulsion Vehicle - Principle effort toward developing improved batteries for sub-surface vehicles.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN FY 1994:

(U) FY 1992 Accomplishments:

- (U) ARABS (Unmodified) - Completed testing and Tech Data Package development of ARABS. Conducted Milestone III IPR, Type Classified, and awarded production option for unmodified systems.

- (U) ARABS/MC - Performed market investigation and conducted Milestone I IPR. Developed scope of work for Global Positioning System (GPS).

- (U) AR2 - Completed the technical and user test.

- (U) POOS - Identified material developer.

- (U) LEWS - Completed technical/user test. Began procurement with stock funds.

- (U) DPV - Completed evaluation of batteries. Re-evaluated hardware requirements.

- (U) HISAC - Completed Technical Feasibility Test (TFT). Finalized technical data package. Continued aircraft certification.

(U) FY 1993 Planned Program:

- (U) ARABS/MC - Award pre-planned product improvement R&D contract for the inclusion of GPS and improve flare system into the ARABS.

- (U) HISAC - Requirement canceled due to changing mission requirements and world situation. Program close-out and document storage will include a drawing package.

- (U) AR2 - Conduct Milestone III In Process Review (IPR) and award initial production contract. Becomes a stock funded item.

FISCAL YEAR 1994 BUDGET ESTIMATES
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PE Title: SO Tactical Systems Development

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- (U) POOS - Program requirement being re-evaluated in view of changing threat.

- (U) LEWS - Complete Production Data Package (PDP) documentation and manuals. Preparation of commercial item description and type classification standard.

- (U) DPV - Requirement remains valid but program has been canceled. Technology cannot yet meet user requirement. User will re-evaluate requirement.

(U) FY 1994 Planned Program:

- (U) ARABS/MC - Complete Technical Feasibility Test (TFT) and initiate TT/UT and the development of the Technical Data Package.

- (U) ANR - Complete technology investigation and conduct testing to verify signal-to-noise muting for speech and other information-bearing sounds.

(U) Program to Completion: This is a continuing program.

(U) WORK PERFORMED BY: U.S. Army Natick Research and Development Center, Natick, MA; Naval Coastal Systems Center, Panama City, FL; U.S. Army Ft. Belvoir R&D Center, Ft. Belvoir, VA; Yuma Proving Ground, Yuma, AZ; Combat Systems Test Activity, MD; Eglin AFB, FL; Sandia National Laboratories, Albequerque, NM; U.S. Army Armament Research, Picatinny Arsenal, NJ; U.S. Naval Ordinance Station, Indian Head, MD; and Para-Flite, Inc., Pensauken, NJ.

(U) RELATED ACTIVITIES: There is no unnecessary duplication of effort within the Department of Defense.

(U) OTHER APPROPRIATION FUNDS: ($ in Thousands)

OTHER APPR. FUNDS PRGM.	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
MISCELLANEOUS EQUIPMENT (P,DA)					
	6,552	-0-	-0-	Cont.	Cont.

(U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not Applicable.

FISCAL YEAR 1994 BUDGET ESTIMATES
RDT&E DESCRIPTIVE SUMMARY

Program Element: #1160405BB
PE Title: SO Intelligence Systems Development

Budget Activity: #4
Date: April 1993

A. (U) RESOURCES: ($ in Thousands)

PROJECT NR & TITLE	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
S400 Special Operations Intelligence Research and Development					
	10,057*	27,254*	6,686	Cont.	N/A
Total	10,057	27,254	6,686		

* PE # 1160409BB (Other Force Programs; Project 400A) contains $5,780 in FY92 and $770 in FY93 for SOF Intel R&D. Total funding for SOF Intel R&D is $15,837 in FY92 and $28,024 in FY93.

B. (U) DESCRIPTION: This program provides for the identification, development, and testing of selected SOF intelligence equipment to eliminate deficiencies in providing timely intelligence to deployed forces.

FISCAL YEAR 1994 BUDGET ESTIMATES
RDT&E DESCRIPTIVE SUMMARY

Program Element: #1160405BB
PE Title: SOF Intelligence Research and Development

Budget Activity: #4
Date: April 1993

A. (U) RESOURCES: ($ in Thousands)

PROJECT NR & TITLE	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
S400 SOF Intelligence Research and Development	10,057*	27,254*	6,686	Cont.	Cont.

* PE 1160409BB (Other Force Programs; Project S400A) contains $5,780 in FY92 and $770 in FY93 for the Multi-Mission Advanced Tactical Terminal (MATT) Program. Total funding for the MATT program is $10,929 in FY92 and $10,646 in FY93.

B. (U) BRIEF DESCRIPTION OF PROJECT: This project provides for the identification, development, and testing of selected SOF intelligence equipment to eliminate deficiencies in providing timely intelligence to deployed forces.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN FY 1994:

(U) Project S400 - SOF Intelligence Research and Development: This project consists of the following sub-projects:

- (U) Special Operations Command Research, Analysis, and Threat Evaluation System (SOCRATES): SOCRATES is an on-going evolutionary sub-project providing a wide range of mission required automated intelligence and imagery support to HQ USSOCOM, component commands and operating forces as well as USCENTCOM and components in garrison. SOCRATES, a Wide Area Network (WAN) based multi-functional intelligence system, incorporates a variety of computers, data bases, intelligence communication systems, secure phones, facsimile equipment, imagery processing, secondary imagery dissemination and map handling equipment. SOCRATES provides SOF with unprecedented access to both national and specially-focused intelligence products, satisfying long-standing intelligence deficiencies identified in all five regional CINC Theater Intelligence Architectures. SOCRATES funding includes development and acquisition of the Man-Transportable SOCRATES (MTS) to provide a rugged, deployable capability to the Forward Operating Base (FOB) level. Product improvements are focused on integration of emerging Intelligence Community systems, technology, and standards into the SOCRATES architecture.

- (U) Joint Intelligence System - SOF Imagery Receiver and Intelligence System (IRIS): The IRIS is a man-portable, "S" band receive-only terminal that will provide a method of receiving near real time imagery, via established intelligence communications, at field locations. The system

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RDT&E DESCRIPTIVE SUMMARY

Program Element: #1160405BB
PE Title: SOF Intelligence Research and Development
Budget Activity: #4
Date: April 1993

will receive either Sensitive Compartmented Information (SCI) or collateral imagery products.

- (U) Joint Intelligence System - Joint Intelligence System Integration (JISI): The JISI sub-project funds a series of integration efforts within the authority of the Intelligence Threat Warning System MNS to incorporate various SOF intelligence systems on the respective platforms employed by each of the SOF commands. Integration efforts will permit the operation of each intelligence system from within a controlling suite installed aboard a SOF platform without any system or platform degradation.

  (U) Presently, two internal sub-projects, PRIVATEER and SILENT SHIELD, have been established to integrate SOF intelligence systems within the naval patrol craft and SOF aircraft, respectively. Candidate systems for integration as part of PRIVATEER and SILENT SHIELD include SOF Signals Intelligence Manpack System (SSMS), MTS, MATT, and SOF IRIS. Additionally, MATT and SOF IRIS will be integrated onto the SOF Intelligence Vehicle (SOF IV). Consolidation of these integration efforts into a separate sub-project was done to permit greater visibility of the RDT&E funding profiles required to complete the associated integration tasks. This separation allows greater flexibility in managing concurrent activity and precludes any single program from having to allocate a disproportionate share of the integration costs. Additionally, this integration effort specifically complies with the Congressional directive to provide joint intelligence capabilities, vice component specific, to all USSOCOM components.

- (U) Joint Intelligence System - Language Identification and Voice Identification Device (LIVID): The LIVID sub-project will develop and provide a lightweight, man-portable ability to quickly and accurately identify threat activity through speech identification technology.

- (U) Joint Intelligence System - SSMS and SSMS Product Improvement Program (PIP): The SSMS is a man-portable, lightweight intercept and direction finding (DF) system that uses no more than three DF antenna arrays to provide simultaneous coverage in the 1.5-1300 MHz frequency ranges. The system permits intercept and DF operations from either fixed positions or when being carried by an operator. A product improvement program is being pursued to further downsize the base system and incorporate some processor enhancements.

- (U) Joint Intelligence System - Special Warfare Imaging and Anti-Surveillance System (SWISS): The SWISS sub-project will

evaluate and procure a lightweight, man-portable ability to quickly and accurately determine the presence of hidden devices and other objects within structures of operational interest.

- (U) Joint Intelligence System - Communications Monitoring Equipment (CME): The Communications Monitoring Equipment project will develop, downsize, and procure highly specialized tactical communications monitoring equipment to meet SOF intelligence requirements.

- (U) SOF Tactical Exploitation of National Capabilities (TENCAP): SOF TENCAP is a phased sub-project which will address requirements to integrate national systems capabilities into USSOCOM intelligence programs, to use national intelligence communications capabilities for SOF, and to demonstrate equipment capabilities in biennial JCS Special Projects.

- (U) SOF Modular Remote Sensing System (MOSS): This sub-project will provide the necessary research, development and testing of an advanced, modular receiver suite of intelligence equipment to be used by deployed SOF elements. Current technology will be adapted to achieve performance and light-weight application advantages over existing intelligence systems.

- (U) MATT: The MATT sub-project provides near-real-time (NRT) electronic intelligence (ELINT) to air and land (and eventually maritime) elements allowing them to effectively avoid, defeat or destroy enemy threat systems. The program encompasses the development of a miniaturized multi-channel airborne (and ground) qualified receiver/processing system (MATT) capable of incorporating both national and tactical data; and integration efforts within on-board avionics systems.

(U) FY 1992 Accomplishments:

- (U) SOCRATES: Initiated development of prototype Text Information and Imagery Management System (TIIMS) on SOCRATES to provide for on-line storage and retrieval of free-formatted text based documents. Test and evaluation of workstation hardware and software required for migration from a DOS based to a UNIX based X-Windows operating system environment. Test and evaluation of intelligence/operations interface capabilities. Test, evaluation, and integration of Intelligence Community secondary imagery dissemination development standards and software into SOCRATES. Began initial MTS specification development.

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RDT&E DESCRIPTIVE SUMMARY

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- (U) Joint Intelligence System - CME: Phase I prototype completed. Initiated Phase II prototyping effort (non-MFP 11 funding).

- (U) SOF MOSS: Completed development of concept of operations, acquisition strategy, Test & Evaluation Master Plan (TEMP), and Integrated Logistics Support Plan (ILSP). Engineering Design Model (EDM) contract awarded.

- (U) MATT: Completed three Engineering Design Models and conducted operational demonstration/validation. Conducted Developmental Test and Evaluation (DT&E). Commenced MH-53J integration, design, and program requirement. Initiated development of roll-on/roll-off test beds for system Initial Operational Test and Evaluation (IOT&E).

(U) FY 1993 Planned Program:

- (U) SOCRATES: Conduct test and evaluation for transition of X-Windows applications into the UNIX environment. Continue evaluation and integration of Intelligence Community secondary imagery dissemination standards and software into the SOCRATES. Develop prototype to satisfy MTS requirements and begin integration testing.

- (U) SOF IV: Integration of MATT and SOF IRIS into the SOF IV platform.

- (U) SIGINT SUPPORT SOF: Integration and evaluation of miniaturized transceiver systems, direction finding processors on printed circuit boards, laptop equipment control software with integrated analytical tools, communications networking and downsized antenna systems.

- (U) PRIVATEER: Procurement of hardware for prototypes, hardware system integration effort, prototype test and evaluation and required intelligence communications support.

- (U) Silent Shield: Develop prototype, train on prototype systems and installation and development of program data.

- (U) TENCAP: Acceleration of the implementation of a TENCAP program. TENCAP projects for FY93 are JCS Special Project 93, project BEACHCOMBER; Concept and architecture development; prototyping efforts of tracking capabilities developed in FY92; evaluation of the application of National Systems in supporting combat recovery.

- (U) Joint Intelligence System - JISI: Integrate SOF IRIS and national system software onto the SOF IV.

FISCAL YEAR 1994 BUDGET ESTIMATES
RDT&E DESCRIPTIVE SUMMARY

Program Element: #1160405BB
PE Title: SOF Intelligence Research and Development
Budget Activity: #4
Date: April 1993

- (U) Joint Intelligence System - CME: Conduct DT&E of Phase II prototype (non-MFP 11 funding). Initiate Phase III prototyping effort (non-MFP 11 funding). Integrate SOF IRIS and national system software onto the SOF IV.

- (U) SOF MOSS: Complete development of prototype. Conduct OT&E of prototype.

- (U) MATT: Incorporate Enhanced Tactical Information Broadcast Service (ETIBS) capability. Conduct IOT&E. Conduct OT&E Phase II-B (platform). Obtain NSA certification. Finalize functional configuration audit and physical configuration audit. Initiate integration efforts, software development and the development of the interface control document (ICD) for the Combat Talon I (CTI).

(U) FY 1994 Planned Program:

- (U) SOCRATES: OT&E of Man Transportable SOCRATES (MTS) prototype. Complete MTS operational testing with theater SOCs. Transition to production phase of MTS. Prototype multimedia SOCRATES workstation with advanced data compression and data retrieval capabilities. Test, evaluate, and integrate a multi-tasking capability within SOCRATES workstation architecture.

- (U) Joint Intelligence System - SOF IRIS: Complete integration of advanced capabilities into prototype. Complete operational testing.

- (U) Joint Intelligence System - JISI: Integrate and test SSMS and MTS on SOF patrol craft. Develop and test control software applications and database processing functions within an intelligence controller suite.

- (U) Joint Intelligence System - SOF SIGINT Manpack System (SSMS) Product Improvement (PIP): Conduct developmental testing of selected product improvements, to include netted direction finding capabilities. Obtain Milestone IV authority to conduct PIP.

- (U) Joint Intelligence System - CME: Improve/upgrade Phase II prototype. Conduct OT&E of Phase II prototype. Continue Phase III prototyping efforts.

- (U) SOF TENCAP: Begin development of a prototype to provide remote tracking capability. Develop concept for national systems support to hydrographic surveys. Develop Special Project 95 objectives.

FISCAL YEAR 1994 BUDGET ESTIMATES
RDT&E DESCRIPTIVE SUMMARY

Program Element: #1160405BB
PE Title: SOF Intelligence Research and Development
Budget Activity: #4
Date: April 1993

- (U) MATT: Finalize integration interface control document (ICD) for Combat Talon I. Begin integration of MATT onto MH-53J. Initiate MATT integration design onto Combat Talon I. Begin integration design development for Combat Talon II.

(U) Program to Completion: This is a continuing program.

(U) Work Performed By: Prototyping efforts on SOF MOSS, LIVID, and CME will be completed by NSA. SOF IRIS development will be executed by Electronic Systems Center (ESC), Hanscom AFB, MA. MTS development will be accomplished by STPO, Indian Head, MD. Development of MATT will be done by Naval Research Laboratory.

(U) Related Activities: There is no unnecessary duplication of effort within the Department of Defense. CONSTANT SOURCE is a tactical data display/processor which will utilize MATT as its source for Electronic Order of Battle (EOB) updates. Since inception, SOCRATES has extended the intelligence automation capabilities provided by the National Foreign Intelligence Program (NFIP) to SOF through the integration of commercial and government owned capabilities. Continuous coordination through the Military Intelligence Board, DoDIIS Management Board, and the Systems Integration Management Office (SIMO) process insure that related capabilities are fully coordinated and not duplicated. The SOST project, along with some other Service funding, has accomplished prototyping efforts in support of Joint Intelligence System SOF IRIS, Joint Intelligence System LIVID, and Joint Intelligence System SSMS.

(U) Other Appropriation Funds: ($ in Thousands)

OTHER APPR. FUNDS PRGM.	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
MISCELLANEOUS EQUIPMENT (P,DA)					
	10,982	-0-	-0-	N/A	10,982
SOF INTELLIGENCE SYSTEMS (P,DA)					
	-0-	44,913	26,665	Cont.	Cont.

(U) International Cooperative Agreements: Not Applicable.

FISCAL YEAR 1994 BUDGET ESTIMATES
RDT&E DESCRIPTIVE SUMMARY

Program Element: #1160409BB
PE Title: Other Force Programs

Budget Activity: #5
Date: April 1993

A. (U) RESOURCES: ($ in Thousands)

PROJECT NR & TITLE	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
S400A Other Force Programs					
	6,080	1,170	0	0	8,250
Total	6,080	1,170	0	0	

B. (U) DESCRIPTION: Funding for this program element was transferred from the S200 and S400 projects, Special Operations Special Technology (SOST) and SOF Intelligence R&D. SOST is a rapid prototyping program for the acquisition of SOF-peculiar equipment with provisions to continue successful projects through procurement. SOF Intelligence R&D provides for the identification, development, and testing of selected SOF intelligence equipment to eliminate deficiencies in providing timely intelligence to deployed forces. Projects include specialized signal intelligence (SIGINT) efforts include the Special Operations Forces Modular Remote Sensing System (SOF-MOSS) and Multiple-Access Tactical Terminal (MATT). State-of-the-art ADP applications are tested and evaluated within USSOCOM's Special Operations Command Research, Analysis and Threat Evaluation System (SOCRATES).

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RDT&E DESCRIPTIVE SUMMARY

Program Element: #1160409BB
PE Title: Other Force Programs
Budget Activity: #5
Date: April 1993

A. (U) RESOURCES: ($ in Thousands)

PROJECT NR & TITLE	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
S400A Other Force Programs	6,080*	1,170*	-0-	N/A	7,250

* Funds distributed as follows: FY92 $300K to S200 and $5780K to S400; FY93 $400K to S200 and $770K to S400.

B. (U) BRIEF DESCRIPTION OF PROJECT: Funding for this RDT&E project was transferred from the S200 and S400 project, Special Operations Special Technology (SOST) and SOF Intelligence R&D. This project represents only a partial funding profile for the SOST and Multi-mission Advanced Tactical Terminal (MATT) projects. All Descriptive Summary information is contained in S200 and S400.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN FY 1994:

(U) Project S400A - (MATT): See S200 and S400, Special Operations Special Technology (SOST) and SOF Intelligence R&D.

(U) FY 1992 Accomplishments:

- (U) See S200 and S400, Special Operations Special Technology (SOST) and SOF Intelligence R&D.

(U) FY 1993 Planned Program:

- (U) See S200 and S400, Special Operations Special Technology (SOST) and SOF Intelligence R&D. Project transition to PE #1160405BB, Special Operations Intelligence Systems Development, and PE #1160402BB, Special Operations Advanced Technology Development, in FY 1994.

(U) FY 1994 Planned Program:

- (U) Not Applicable.

(U) Program to Completion: Project transition to PE #1160405BB, Special Operations Intelligence Systems Development, and PE #1160402BB, Special Operations Advanced Technology Development, in FY 1994.

(U) Work Performed By: See S200 and S400, Special Operations Special Technology (SOST) and SOF Intelligence R&D.

(U) Related Activities: See S200 and S400, Special Operations Special Technology (SOST) and SOF Intelligence R&D.

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RDT&E DESCRIPTIVE SUMMARY

Program Element: #1160409BB
PE Title: Other Force Programs

Budget Activity: #5
Date: April 1993

(U) Other Appropriation Funds: See S200 and S400, Special Operations Special Technology (SOST) and SOF Intelligence R&D.

(U) International Cooperative Agreements: Not applicable.

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RDT&E DESCRIPTIVE SUMMARY

Program Element: #1160407BB
PE Title: SO Medical Technology Development

Budget Activity: #2
Date: April 1993

A. (U) RESOURCES: ($ in Thousands)

PROJECT NR & TITLE	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
S275 Special Operations Medical Technology Research and Development					
	984*	1,187*	1,310	Cont.	Cont.
Total	984	1,187	1,310		

* To better portray continuity of medical RDT&E, the FY92 and FY93 medical RDT&E (formerly called Navy RDT&E) from Project SO417 PE #1160404BB has been moved into this line. This added $685K in FY92 and $646K in FY93.

B. (U) DESCRIPTION: This program provides studies and non-system basic and exploratory research and development. The focus is on medical technologies, centering on physiologic, psychologic and ergonomic factors affecting the ability of forces to perform their missions.

FISCAL YEAR 1994 BUDGET ESTIMATES
RDT&E DESCRIPTIVE SUMMARY

Program Element: #1160407BB
PE Title: SOF Medical Technology Development

Budget Activity: #2
Date: April 1993

A. (U) RESOURCES: ($ in Thousands)

PROJECT NR & TITLE	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	To Complete	Total Program
S275 Special Operations Forces Medical Technology Research and Development	984*	1,187*	1,310	Cont.	Cont.

* To better portray continuity of medical RDT&E, the FY92 and FY93 medical RDT&E (formerly called Navy RDT&E) from Project SO417, PE #1160404BB has been moved into this line. This added $685K in FY92 and $646K in FY93.

B. (U) BRIEF DESCRIPTION OF PROJECT: This program provides studies and non-system basic and exploratory research and development. The focus is on medical technologies, centering on physiologic, psychologic and ergonomic factors affecting the ability of forces to perform their missions.

(U) Inhaled Gas Toxicology: This project develops central nervous system toxicity risk algorithms for long duration, continuous, and intermittent exposures to varying oxygen partial pressures; evaluates cumulative toxicity effects of multi-day, long duration, high oxygen partial pressure diving on the lungs, eyes, and other organ systems; develops pharmacological interventions to reduce or eliminate oxygen toxicity; and develops means to rapidly and simply assess the quality of divers' breathing air derived from submarine air banks.

(U) Decompression Procedures for Special Diving Environments: This project develops and test tables to compute minimal safe post-diving surface intervals before flying in aircraft at less than 1 atmosphere (ATA) cabin pressure, or before locking into submarines with reduced ambient pressure; extends development of the nitrous decompression algorithm to allow safer dives in lakes at high altitude; extends development of the nitrous decompression algorithm to include long duration (4-12h), high oxygen partial pressure (>0.7 ATA), multilevel diving with the EX-19 Underwater Breathing Apparatus (UBA); and evaluates the impact on decompression requirements of diving in hot water and in sound pressure fields.

(U) Thermal Protection of Divers: This project assesses the psychomotor performance decrements associated with slow body core cooling during long duration missions; investigates energy efficient means of improving manual dexterity and tactile sensation in cold water; develops means of rapidly adapting to the cold environment, both dry and wet; defines temperature-time profiles for the development of cold sensitization and non-freezing cold injury in divers; develops means of ameliorating the greatly reduced physical work capacity produced by long immersions in cold water; and develops limits and methods for diving in hot water.

(U) Combat Casualty Triage, Management and Computer-Assisted Diagnosis: This project develops improved methods of rewarming hypothermia victims in submarines, pressure chambers, and in other operational settings; develops

recompression algorithms and procedures for use in submarine escape trunks and in the water; and develops supportive treatments for decompression sickness and gas embolism when recompression chambers are not available. It will interface with standard DoD medical records programs.

(U) Shock and Vibration Hazards of Small Boat Operations: This project develops vibration intensity/exposure time curves for injury prediction; defines the type and mechanism of musculoskeletal and other organ damage associated with high speed rigid and inflatable hull boats; and develops shock/vibration standards for small boat design.

(U) Exercise-related Injuries: This project will evaluate the effectiveness of applying sports medicine diagnostic, therapeutic, and rehabilitative techniques in the management of the traumatic and overuse injuries commonly encountered among NSW operators.

(U) Mission-related Physiology: This project will evaluate biomedical factors which need to be considered in the development of new systems; develop accurate measures to evaluate NSW mission-related performance; provide for the dissemination of the results of the studies described in this document to NSW mission planners; develop nutrition and hydration guidelines for NSW operations; and develop nutritional guidelines for maximum aerobic conditioning and strength enhancement.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN FY 1994:

(U) Project S275 - Special Operations Forces Medical Technology Research and Development: Current medical research and equipment does not meet force requirements. The unique nature of special operations and the requirements for lightweight, sustainable medical equipment; high altitude life support capabilities for combat parachutists; and improved life support capabilities for the combat swimmer must be resolved. This project addresses the physiologic, psychologic, and ergonomic aspects of all operations, and provides guidelines for the development of selection and conditioning criteria, thermal protection, decompression procedures, and life support systems. This project will support the development of biomedical enhancements for the unique requirements of SEALs and SEAL Delivery Vehicle teams in the conduct of their diverse underwater missions.

(U) FY 1992 Accomplishments:

- (U) Continued the following two-year studies:
  - o (U) Cold water impact on combat swimmer performance.
  - o (U) Radio frequency warming techniques.
  - o (U) Shock and vibration hazards in High Speed Boat (HSB) operations.

FISCAL YEAR 1994 BUDGET ESTIMATES
RDT&E DESCRIPTIVE SUMMARY

Program Element: #1160407BB
PE Title: SOF Medical Technology Development

Budget Activity: #2
Date: April 1993

- (U) Initiated exploratory studies and developments focused mainly on enhancing capabilities of special operations maritime swimmers/divers, as follows:

  - o (U) Surface Interval Oxygen Repetitive Dive Tables. This project is physiological study and procedure development to support repetitive SOF swimmer dives at short intervals. It will determine effectiveness of surface interval oxygen in reducing surface interval duration or increasing repetitive dive time and will develop and test decompression tables for surface interval oxygen breathing.

  - o (U) Emergency Oxygen Decompression Procedures. Physiological study and procedure development related to decompression requirements which hamper handling combat casualties in SEAL Delivery Vehicle Drydeck Shelter operations. This project will develop a computer algorithm to describe decreases in decompression time with oxygen breathing, and will develop procedures for use of the algorithm with all current Navy air or N2O2 decompression tables.

  - o (U) Inhaled Gas Toxicology. This project develops central nervous system toxicity risk algorithms for long duration, continuous, and intermittent exposures to varying oxygen partial pressures; evaluates cumulative toxicity effects of multi-day, long duration, high oxygen partial pressure diving on the lungs, eyes, and other organ systems; and develops pharmacological interventions to reduce or eliminate oxygen toxicity.

(U) FY 1993 Planned Program:

- (U) Initiated exploratory studies and developments focused mainly on enhancing capabilities of special operations forces, as follows:

  - o (U) Autologous Erythrocyte Infusion. This project determines the efficacy of "blood doping" (reinfusion of soldier's own blood) to enhance physical performance and prevent altitude sickness for rapid deployment, short duration, high altitude missions.

- (U) Complete/continue multi-year projects initiated in FY92.

- (U) Initiate medical/physiological studies relating to SOF performance including: exercise-related injury, vibration/shock injury in high speed boat operations, quantification of NSW mission-related performance, computer-

FISCAL YEAR 1994 BUDGET ESTIMATES
RDT&E DESCRIPTIVE SUMMARY

Program Element: #1160407BB
PE Title: SOF Medical Technology Development

Budget Activity: #2
Date: April 1993

based corpsman training programs, and NSW maximum performance nutrition.

(U) FY 1994 Planned Program:

- (U) Complete/continue multi-year projects initiated in prior years.

- (U) Initiate medical/physiological studies in such areas as: flying after diving and high altitude diving, submarine high pressure air as diver breathing air, revised dry deck shelter atmosphere control guidelines, submarine air bank contaminants, thermal protection garment comparison, computer-based corpsman training.

(U) Program to Completion: This is a continuing program.

(U) Work Performed By: Funding will be provided to the appropriate Service laboratory to execute these projects against valid SOF biomedical requirements. Naval Medical Research Institute, Bethesda, MD; Naval Medical Research and Development Command, Bethesda, MD; U.S. Army Research Institute of Environmental Medicine, Natick, MA; Naval Aerospace Medical Research Laboratory, Pensacola, FL; Naval Health Research Center, San Diego, CA; NSWC Dahlgren Division Coastal Systems Station, Panama City, FL; and SMG Uniformed Services University.

(U) Related Activities: There is no unnecessary duplication of effort within the Department of Defense.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

DIRECTOR TEST AND EVALUATION, DEFENSE (0450)

FY 1994 BUDGET ESTIMATES

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **0604940D** Budget Activity: **6-Defensewide Support**

PE Title: **Central Test and Evaluation Investment Program**

A. (U) RESOURCE ($s in Thousands):

Project Number and Title: **940-Central Test and Evaluation Investment Program**

	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	Cost To Complete
Total	93,067	106,806	115,819	Cont

B. (U) BRIEF DESCRIPTION OF ELEMENT:

Since FY 1990 this program element has been and continues to be used to centrally fund critically needed Test and Evaluation (T&E) investments in the functional categories of: test mission command, control, communications and instrumentation; electronic combat systems, threat and computational simulation test and evaluation; space systems T&E; weapons effects test capabilities; targets; and physical and environmental test capabilities. DoD-wide coordination of this program, referred to as the Central T&E Investment Program (CTEIP), is accomplished through a joint review group with key OSD, Service and Agency representatives that establish a corporate investment approach and priorities.

For FY 1994 to FY 1999 this program will provide the needed Test & Evaluation Capability to support the robust growth in advanced technologies that are now incorporated in new weapons systems. The past decade saw vigorous development in new technologies such as hypersonics, smart munitions, directed energy, kinetic energy, low observables and complex electronic combat technologies. With this explosion of new technology, new investments in test capability declined to the point where the replacement cycle is over 60 years. A primary goal of CTEIP is to ensure that appropriate investments are made in test capability to realistically and rigorously test the weapons systems that will incorporate these new technologies. An aggressive revitalization of the DoD T&E capabilities is responsive to Congressional desire to ensure adequate capability for realistic, rigorous testing and is supportive of the "fly-before-buy" management concept. In response to action by Congress in 1991, CTEIP created a separate, but integrated project to fund near-term multi-Service critical test investment needs for the operational test community. This special project entitled Resource Enhancement Project (REP) funds operational test requirements whose non-availability for scheduled operational tests could introduce high risk in the development/evaluation of new weapon systems.

This T&E investment program is especially critical as DoD transitions to lower budgets, with the requirement for more extensive testing of weapon systems before they enter into production. This effort provides planning, management and engineering support for a comprehensive DoD-wide investment strategy that establishes common approaches for all the Services to use and avoids potential duplication in development of new T&E capability. Cost and Operational Effectiveness Analyses Studies are conducted to validate T&E requirements, to define integrated support systems, and determine overall cost effectiveness. The use of DoD-wide criteria for requirement validation, prioritization, and risk assessment ensures an effective test resource investment program. An FY 1992 project introduced Global Positioning System (GPS) technology into a wide variety of T&E applications that will increase the mobility and interoperability of T&E assets. The Services are now purchasing and installing this technology at several test centers. The FY 1993 program has been coordinated with Service representatives and presents sound tri-Service requirements for T&E investments. The FY 1994 and 1995 programs will continue these programs and, as appropriate, implement completed projects at Service activities. Several projects are scheduled for completion including: the IR Scene Generator project will become operational and has a projected work load at this time. The Scene Generator will enable the testing of IR weapons against realistic threats. Also, completing in FY 1994 is the J-MASS project which will make significant contributions towards a common architecture for building digital models of threat simulators with reusable code. Also, in FY 1994, the critically needed Aerial Cable Test Facility for tri-

Service requirements will be completed. As a result of FY 1992 and FY 1993 Congressional language, the Common Airborne Instrumentation System (CAIS) is being developed for tri-Service application. The FY 1994-1999 program will continue to support projects that are critical to the conduct of current testing shortfalls and known mid-term needs as well as meet the needs of a healthy science and technology program that is expected to continue to accelerate. The T&E community must work hand-in-hand with the science and technology programs to insure that the test capability is there when needed.

C.(U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1992 Accomplishments:
- Demonstrate tri-Service digital simulator architecture
- Award contract for Aerial Target Cable System.
- Award Common Airborne Instrumentation System Development contract.
- Award contracts for Low Rate Initial Production of GPS suites and for Tactical Translator development.
- Demonstrate initial GPS range positioning and interoperability with pre-production equipment.
- Complete specifications for the Joint Smart Munitions Test Suite.
- Achieve IOC for EW background environment simulator at ACETEF
- Complete development specifications for tri-Service Data Acquisition Package.
- Complete design of Reprogrammable Emitters
- Complete specifications for C3I Fire Support Automated Test Suite.
- Complete survey of acquired Missile Launch Target Ship.
- Complete configuration design study for Surface Ship Target Platform.

(U) FY 1993 Plans:
- Delivery and achieve IOC of one standardized threat simulation model.
- Integration of MOTR and multiple tracking platforms for SMTS.
- Complete feasibility study for DoD standard datalink.
- Deliver anti-radiation target system B.
- CAIS CDR will be completed for all systems components.
- Complete the Aerial Target Cable System at tri-Service Range.
- Initiate new competitive production contract of GPS suites.
- Initiate project in IR Plume identification and classification.
- Complete development of Data Acquisition Package.
- Award contract for Surface Ship Target Platform.
- Achieve IOC for the Missile Launch Target Ship.
- Complete Feasibility study for Advanced Static RCS measurement test facility.
- Initiate feasibility study for Tem-Reverberation Chamber.
- Initiate project in range internetting capability.

(U) FY 1994 Plans

- Complete Direct Write Scene Generation subsystem acquisition and fabrication.
- Complete interoperability study for Next Generation Target Control System.
- Complete design methodology for IR Plume Identification and Classification.
- Complete design of Computational Fluid Dynamics model for testing aircraft/stores carriage/release certification.
- Achieve IOC for the Aerial Target Cable System.
- Complete initial design for Advanced Air Intercepter Simulator(pod).
- Complete feasibility study for Non-Cooperative Vector Scoring methodology.
- Achieve IOC of the Smart Munitions Test Suite.
- Deliver third and fourth Anti-Radiation missile target systems

- Complete all phases of currently planned work at ACETEF.
- Achieve IOC for the Common Airborne Instrumentation System.
- Achieve FOC for Data Acquisition Package.
- Achieve IOC of C3I Fire Support Automated Test Suite.
- Achieve IOC for lead Surface Ship Target Platform.
- Complete feasibility study for Tem-Reverberation Chamber.
- Complete GPS RAJPO Development program.

D. (U) **WORK PERFORMED BY:** In-house DoD/Service resources and various contractors - General Dynamics, Fort Worth, TX; Analytical Services, NJ; CALSPAN Corporation,Tullahoma, TN and Buffalo, NY; Mitre Corporation, McLean, VA; Interstate Electronics, Los Angeles, CA; General Research Corporation, McLean, VA; Stanford Research Institute, Palo Alto, CA; Softech Inc., Fairborn, OH; Schneider Services International, Tullahoma, TN; New Mexico State Univ, Las Cruces, NM; Digital Equipment Corp., Merrimack, NH; Ayden Vector Inc.,Newtown, PA; Sandia National Labs, NM; and other contractors to be determined.

E. (U) **RELATED ACTIVITIES:** More than twenty PEs fund T&E capability improvements. Close coordination within DoD is necessary to preclude unwarranted duplication of capabilities. The CTEIP effort is in direct response to Congressional direction to strengthen OSD management of test investments. This PE is integral to that stronger management role by OSD. The objectives of the CTEIP are:

- A high degree of interoperability and inter-connectivity between test centers, ranges, and areas of T&E expertise.
- Consistency and commonality in instrumentation, targets and threat simulators.
- Development and exploitation of the use of high fidelity simulation with hardware-in-the-loop as an acceptable critical method of test.
- Development of mobile capabilities, as an alternative to multiple or rarely used fixed facilities.
- To maintain a T&E technology development program.
- Use of a common threat definition in all T&E processes from the earliest identification of threat information.
- To provide a focus for test technology and capability development in T&E areas.

F. (U) **OTHER APPROPRIATION FUNDS:** None.

G. (U) **INTERNATIONAL COOPERATIVE AGREEMENTS:** None.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **0605130D** Budget Activity: **6-Defensewide Support**

PE Title: **Foreign Comparative Test**

A. (U) RESOURCE ($s in Thousands):

Project Number and Title: **930-Foreign Comparative Test**

	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	Cost To Complete
Total	17,100	31,301	34,913	Cont

B. (U) BRIEF DESCRIPTION OF ELEMENT: The Foreign Comparative Testing Program supports the test and evaluation of allied nations' weapons, munitions, subsystems, equipments, and technologies against US Service requirements or mission area shortcomings. The Program Element was established and is strongly supported by Congress to encourage DoD Components to consider all viable defense procurement alternatives, to include investigating Non-Developmental Item (NDI) solutions. The FCT Program enables the Services to test and evaluate equipment produced by U.S. allies prior to embarking on costly and lengthy research and development efforts. The tests may compare one or more foreign items against a Service requirement or may involve a side-by-side comparison of one or more foreign items against domestically produced US equipment. FCT funds the T&E of the foreign items; the Services fund for the US items.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS: Since 1980, the FCT Program has undertaken the test and evaluation of 290 foreign equipment items. Much has been learned that has materially improved U.S. systems or has resulted in better specifications for future systems. Additionally, approximately twenty-one percent of the items tested have fully met Service requirements, resulting in subsequent procurements of 56 different items, totalling over $2.1B.

(U) FY 1992 Accomplishments:
Funded the test and evaluation of 27 different equipment items developed by allies and other countries friendly to the United States, as described below:

- ARMY

SWEDISH MOBILE ARMY SURGICAL HOSPITAL (MASH): A lightweight modular shelter system, developed by Trelleborg AB and in service with Swedish Armed Forces, which could potentially meet an Army requirement for a shelter system which provides a contamination-free, environmentally-controlled work space for a MASH 30 bed hospital, in which personnel are able to carry out medical and combat service support tasks for extended periods of time.

SWEDISH, BRITISH IMPROVED MINE FUZES FOR THE M15 MINE: Improved mine fuzes to retrofit existing fuzes on M15 mines. The improved fuzes would increase the effectiveness of the mines by giving them a full vehicle-width attack capability.

BELGIAN MODIFICATIONS TO HAWK LAUNCHERS: Modifications to HAWK Launchers would enable the launchers to be used to safely transport HAWK missiles from one location to another without the necessity of down-loading them from the launchers and uploading them into the launchers at the new location. Considerable manpower and vehicle saving could be realized.

MULTINATIONAL MUZZLE VELOCITY SYSTEMS: Three foreign muzzle velocity systems (MVS) designed to provide accurate muzzle velocity data for all field artillery cannon systems and propellant/projectile combinations from 105mm through 203mm. Developed by AWA Defense Industries of Australia, Marconi of the UK, and Reshef Systems of Israel, the candidate MVSs have potential to replace the M90 Chronograph currently in use.

MULTINATIONAL ULTRA LIGHTWEIGHT CAMOUFLAGE SCREENING: Camouflage screening systems which are "ultra lightweight" (i.e., suitable for covering Army aircraft such as the AH-64 Apache helicopter without inducing aircraft damage) and designed for effective concealment during tactical deployment.

SWISS, AUSTRIAN M109 HOWITZER AUTOLOADERS: Semi-Automatic Autoloaders (SALs) developed by K&W Swiss Federal Armaments Works, WF Swiss Federal Arms Factory, and Intertechnik (Austria). These systems provide automated ramming concepts to load projectiles into 155mm cannon chambers, thus greatly increasing the weapons' rate of fire.

ARTILLERY COMMUNICATIONS AURAL PROTECTION SYSTEM (ACAPS): Headsets for artillery crewmen to provide double ear protection against hazardous impulse noise from artillery and machine guns. One type of ACAPS permits crewmen to communicate verbally. Another type allows connection to an intercom or radio system to communicate through an intercom or radio system.

GERMAN HEAVY ASSAULT BRIDGE (LEGUAN): MAN Bruckengerate GHH LEGUAN bridge system, designed to support Military Load Class (MLC) 70 traffic over gaps up to 24 meters. The German version consists of a wheeled carrier with laying mechanism and bridge. For the U.S. test program, the bridge and its laying mechanism have been fitted to a modified Abrams tank chassis.

SWEDISH 9MM PENETRATOR CARTRIDGE: M39B penetrator cartridge manufactured by Swedish Ordnance (formerly FFV Ordnance). This cartridge features a thick-walled nose area in the bullet jacket design for enhanced body armor penetration. The round, standard in the Swedish Armed Forces since 1970, is being considered by the Army as a potential replacement for the US M882 ball cartridge.

GERMAN IMPROVED RIBBON FLOAT BRIDGE: ANGHH Folding Float Bridge (FFB 2000 series) which could provide a non-developmental item (NDI) option for upgrading US bridging to Military Load Class (MLC) 70 loads. The system consists of integral float-deck elements connected longitudinally to form a continuous roadway or ferry.

SWEDISH 84MM HIGH EXPLOSIVE DUAL PURPOSE (HEDP) ROUND: 84MM HEDP round, manufactured by Swedish Ordnance (formerly FFV Ordnance). The fin-stabilized round, optimized for combat in urban areas, is fired from the Swedish CARL GUSTAF M3 recoilless rifle, which underwent successful FCT Program evaluation in FY 1988/1989 and was type classified and fielded in FY 1990 with U.S. Army Ranger Battalions.

SWEDISH AIRCRAFT DEHUMIDIFICATION: Desiccant Wheel Dehumidifiers manufactured by Munters AB. This system provides dry air flow to aircraft for the purpose of reducing moisture-induced failures to equipment, thus potentially increasing the Mean-Time-Between-Failure (MTBF) of aircraft components.

NATO HAWK MISSILE LOADER/TRANSPORTER UPGRADE: NATO-developed kit to upgrade the HAWK missile battery loader/transporter. Germany has the upgrade program lead for NATO. The kit includes a multi-fuel engine replacement for the gasoline engine, drive train improvements, a new automatic transmission, and main boom/chassis interface bearing redesign.

BRITISH IMPROVED CHEMICAL AGENT MONITOR: Graseby Ionics Improved Chemical Agent Monitor (I-CAM), a hand-held device for monitoring nerve and blister agent contamination on personnel, supplies, and equipment. I-CAM is advertised as having improvements in the detector and in instrument circuitry over the basic Graseby CAM, which was previously evaluated under the FCT Program and subsequently adopted for Army, Navy, and Air Force use. If successful, the I-CAM will reduce the logistics/maintenance burden and enhance reliability.

FRENCH FOCAL PLANE ARRAY: The focal plane array has potential applications in systems needing improved night vision capabilities.

- NAVY/MARINE CORPS

BRITISH DIGITAL FLIGHT CONTROL SYSTEM FOR F-14: GEC Digital Flight Control System for the F-14. This system offers an off-the-shelf replacement for the current analog flight control system and is intended to correct a serious safety of flight issue identified by the Navy.

BRITISH FORWARD AREA PORTABLE DEGAUSSING RANGE: A portable degaussing range for use to identify the degaussing requirements for ship used in minehunting. This system may be employed in locations near any potential theater of operations.

BRITISH LONGLINE WEAPON MOUNT 101 MK3: Longline 101 MK3, a general weapon mount with single-handle control for ease of use and positive no-movement locking, to determine if it meets USMC requirements for the Tactical Vehicle Fleet and Riverine Assault Craft. The mount is utilized by British UK special forces on its Light Strike Vehicles.

BRITISH PROGRAMMABLE FIRING VALVE: Strachen and Henshaw Programmable Firing Valve (PFV), which is associated with the Ram Pump Ejection System on UK Royal Navy submarines, for quieting purposes.

CANADIAN PORTABLE HELIPORT LIGHTING SET (PHLS): PHLS developed by Cyrtigen International. System provides visual and infrared landing zone marking which is highly visible to pilots, with or without night vision aids. Consisting of approach path indicators, landing zone marking lights, and UHF radio receivers in each component, the PHLS can also be used to mark forward positions of friendly front lines during close air support missions.

SWEDISH LIGHT OIL BURNER: A burner unit for potential use in the Marine Corps Tray Ration Heating System. This unit burns virtually any kind of liquid fuel and is in widespread use in Europe.

BRITISH MINEFIELD LANE MARKING SYSTEM: Pearson Engineering Pathfinder Minefield Lane Marking System, which is mounted on armored vehicles to automatically deploy reusable marker rods around a breached path, such as a minefield, for follow-on assault troops. The system is currently employed by the British Defense Forces' Chieftain Main Battle Tank and Centurion tank.

ISRAELI ANTI-MAGNETIC MINE ACTUATING DEVICE (AMMAD): Israeli Aircraft Industries (IAI) AMMAD, a magnetic landmine countermeasures device designed to activate the fuze on magnetically-influenced mines.

BRITISH HIGH PRESSURE PURE AIR GENERATOR (HIPPAG): A continuously recharging pure air cryogenic cooling system developed by Dowty Fuel Systems, as a direct replacement for the high pressure nitrogen receivers used in the LAU-7A Sidewinder (AIM-9) launcher. This system is designed to cool infrared

sensors on heat-seeking missiles.

- AIR FORCE

BRITISH ENHANCED ELECTRONIC WARFARE SCENARIO GENERATOR (E-EWSG): A computer software package produced by Software Sciences (previously Thorn EMI Software), to determine if it satisfies a USAF requirement for a common Modeling and Simulation Architecture (M&SA) for electronic combat/electronic warfare applications. E-EWSG is reportedly capable of more accurately modeling the electromagnetic environment present during modern day electronic combat scenarios.

DANISH ELECTRONIC COMBAT INTEGRATED PYLON SYSTEM (ECIPS): Per Udsen ECIPS, an aircraft weapons pylon modified to carry electronic countermeasures (ECM) payloads. In service with the Royal Danish Air Forces' F-16 aircraft, ECIPS will be evaluated to determine if it satisfies a USAF requirement for tactical self-protection electronic warfare (EW) systems.

BRITISH UK-10 ION PROPULSION ENGINE: A lightweight engine for use on satellites for station-keeping purposes.

(U) FY 1993 PLANS: Projects selected in September 1992 for funding in FY 1993 are listed below. Continuing projects are marked with an asterisk (*). Additional projects will be started during the year, pending availability of funds from other projects and Congressional approval.

- ARMY

SWEDISH 9MM PENETRATOR CARTRIDGE*: The M39B penetrator cartridge, manufactured by Swedish Ordnance, will continue testing to determine whether it is a suitable replacement for M882 Ball ammunition currently in use. Featuring a thick-walled nose area in the bullet jacket design, the M39B has the potential to satisfy tri-service requirements for improved body armor penetration.

NATO HAWK MISSILE LOADER/TRANSPORTER UPGRADES*: The HAWK Missile Loader/Transporter Modernization project will continue the test and evaluation of upgrades developed by Thyssen Nordseewerke. The upgrades include a more reliable multi-fuel engine, new automatic transmission, drive train improvements and main boom support/chassis interface bearing design.

SWEDISH AIRBEAM HOSPITAL*: A lightweight shelter system developed by Trelleborg AB, and in service with Swedish Armed Forces, will continue evaluation to determine whether it meets an Army requirement for a shelter system which provides the contamination-free, environmentally-controlled work space of a mobile 30-bed Army hospital, in which personnel are able to carry out medical and combat service support tasks for extended periods of time.

UK, SWEDISH IMPROVED FUZES FOR M-15 LAND MINES*: Three foreign mine fuzes will continue testing to determine whether they satisfy an Army requirement for enhancement of the currently-fielded M-15 conventional land mine. The candidates developed by Marconi (UK), Ferranti (UK), and Bofors (Sweden), possess advanced vehicle-width attack capabilities and increased countermeasures resistance, as well as improved performance, longer life, and lower maintenance.

GERMAN IMPROVED RIBBON FLOAT BRIDGE*: The German (MAN) Improved Ribbon Float Bridge will continue evaluation to determine whether it meets the Army requirement for Military Load Class (MLC)

70 bridging. Included in testing is a bridge transporter, designed for the MAN bridge bays, by Bennes Marrel of France .

SWEDISH, UK SMART MORTAR PROJECTILE TECHNOLOGY: STRIX, a 120mm autonomous anti-armor projectile developed by Swedish Ordnance and Saab Missiles, and MERLIN, an 81mm autonomous projectile developed by British Aerospace, will begin evaluation in FY 93 as part of an Army series of seeker/sensor tests, designed to lead to the US development of a precision guided mortar.

- NAVY/MARINE CORPS

UK DIGITAL FLIGHT CONTROL SYSTEM FOR F-14 AIRCRAFT (DFCS)*: A flight control system developed by GEC Avionics for the European Fighter Aircraft (EFA) program will continue test and evaluation to potentially satisfy a Navy requirement to correct a safety-of-flight issue in F-14 fighter aircraft. The DFCS utilizes advanced digital technology and is expected to prevent aircraft losses due to unrecoverable flat spins.

UK FORWARD AREA DEGAUSSING RANGE*: A Transportable Degaussing Range, produced by Dowty Magnetics, will continue evaluation during FY 1993 to determine whether it meets a Navy requirement for a deployable Forward Area Degaussing Range where surface ships are "ranged" to collect magnetic signature data. This data is used to calculate magnetic parameters of the ship, for the purpose of calibrating on-board degaussing systems which reduce the ship's magnetic signature for naval mine countermeasures purposes.

UK SUBMERGED TOWED ACOUSTIC BEACON JAMMER: A naval mine warfare countermeasures system will begin testing and evaluation in FY 1993 to determine whether it satisfies a classified Navy requirement. The system description is classified.

GERMAN GIANT INFRARED DECOY SYSTEM: An Infrared Anti-Ship Missile (IR-ASM) Defense Decoy, developed by BUCK Werke GmbH, will begin evaluation during FY 1993 to determine whether it meets the Navy's requirement for anti-ship missile countermeasures systems. GIANT is compatible with the Navy's MK36 Decoy Launcher System and has potential to replace the Navy's MK186 TORCH Decoy.

CANADIAN ADVANCED FIBER-OPTIC HELMET MOUNTED DISPLAY (AFOHMD): AFOHMD, developed by CAE Electronics and operational in a German Air Force TORNADO aircraft simulator and offering a full color visual scene, will begin evaluation to determine whether it satisfies Navy and Marine Corps strike mission training and mission rehearsal visual system requirements.

UK INTERROGATE FRIEND OR FOE (IFF) TRACKER SYSTEM: The Aircraft Data and Positioning System, developed and manufactured by Cossor Electronics, will begin test and evaluation in FY 93. The Cossor tracker is capable of interrogating and simultaneously tracking up to eight aircraft targets. It will be tested to determine whether it satisfies a Navy requirement for precision/automatic aiming for the transmit antennas of the Navy's AN/ULQ-13(V)1 Countermeasure Signal Simulator Vans, which are employed by the Navy's Multi-Electronic Warfare Support Group (MEWSG) for electronic warfare training.

AUSTRALIAN LASER AIRBORNE DEPTH SOUNDER SYSTEM (LADS): LADS will be evaluated beginning in FY 93 to determine whether it meets a Navy requirement for rapid collection of bathymetric data in coastal/shallow water areas where ship operations are costly, logistically difficult, or threatened by hostile fire. LADS is a self-contained, laser-technology, hydrographic surveying system, produced by BHP Engineering and Vision Systems for the Royal Australian Navy. When combined with Global Positioning System (GPS) data, LADS produces accurate high-density digital depth and positional data for fulfillment of shallow water survey requirements, such as those required for amphibious combat operations.

UK THERMAL/TV IMAGING AIRBORNE LASER DESIGNATOR (TIALD): The TIALD pod is a target acquisition and designation system ,in production by GEC-Ferranti for the UK Royal Air Force (RAF) and employed extensively by RAF tactical aircraft during Desert Storm operations. TIALD will be evaluated on the AV-8B Harrier aircraft to determine whether it satisfies a Marine Corps requirement to provide a dual mode (TV/IR) dual field-of-view acquisition and tracking sensor, and autonomous laser designation and ranging capability which currently does not exist in the Harrier fleet.

- AIR FORCE

UK ENHANCED ELECTRONIC WARFARE SCENARIO GENERATOR (E-EWSG)*: A computer software package produced by Data Sciences (formerly Software Sciences) will continue evaluation to determine whether it satisfies Air Force requirements for a common Modeling and Simulation Architecture (M&SA) for accurately modeling modern day electronic combat/electronic warfare environments.

UK ION ENGINE THRUSTER (UK-10)*: The UK-10 is a 10-centimeter diameter xenon ion engine thruster propulsion system manufactured by Matra-Marconi UK, and designed for ten-year satellite stationkeeping missions. The UK-10, which will be flown on the European Space Agency's ARTEMIS geostationary satellites scheduled for operation beginning in 1995, will continue testing to determine its suitability for USAF satellite stationkeeping missions.

UK IMPROVED PRACTICE BOMB RELEASE SYSTEM (CBLS-300): The CBLS-300-CG will begin test and evaluation in FY 93. Developed and manufactured by ML Aviation, it is an advanced practice bomb carrier which claims high reliability and significant reduction in maintenance burden over the current Air Force SUU-20 practice bomb dispenser. The design incorporates four ejector release units operated by a rechargeable cold gas system which ejects the practice ordnance.

ISRAELI, ITALIAN DISTANCE MEASURING EQUIPMENT/PRECISION (DME/P): Three airborne interrogators developed by ELTA Electronics (Israel), Alcatel Face (Italy) and Marconi Italiana (Italy), which offer advances in azimuth and elevation guidance for all-weather precision approach and landing systems, will be evaluated to determine whether they satisfy an Air Force requirement for a ranging source for the Microwave Landing System (MLS), in development in the United States.

FRENCH ARC HEATER MANIFOLD: The manifold developed by Aerospatiale is a device which combines and redirects the super high energy arc heater exit flow which produces the high temperature and pressure (High Mach) environments required for testing advanced propulsion systems. The French manifold will begin testing and evaluation to potentially meet an Air Force requirement for ground test facilities involved in testing scramjets (supersonic combustion ramjets) related to the development of hypersonic vehicles of the future.

RUSSIAN K36 SERIES EJECTION SEAT: The K36, developed by the Zvezda Design Bureau of the Former Soviet Union, is a modular ejection seat which reportedly has been validated for operation at speeds up to Mach 4. The ejection seat design which will begin evaluation in FY 1993, incorporates a large rocket motor under the seat to propel an occupant a considerable distance from the point of ejection initiation. The Russian item has application to the Air Force program to develop technologies for a fourth generation escape system (one which provides safe escape at speeds up to 700 KEAS [Knots-Estimated-Airspeed] and which is characterized by a controlled thrust vector for flight stabilization and trajectory control).

GERMAN BONDLINE ENERGY MEASUREMENT SYSTEM: Advanced laser measurement instrumentation and associated optical equipment developed by Fraunhofer-Institut fur Chemische Technologie (ICT) will begin evaluation in FY 1993. The German instrumentation is coupled to a computerized data analysis system for the measurement of non-contact biaxial strain distribution (part of the calculations of the energy required to

make a good bondline in solid rocket motors [SRMs]). The system has potential to solve serious Air Force problems with bondline failures in SRMs.

FRENCH DEPLOYABLE SATELLITE GROUND RECEIVING STATION ("EAGLE VISION"): "Eagle Vision" is a ground station (and associated subsystems) which is capable of receiving and rapidly processing commercially-derived satellite imagery (SPOT, LANDSAT). In the late stages of development by Matra, the proposed system will begin evaluation to determine whether it meets Air Force requirements for automated image-based mission planning, target/threat identification and analysis, and mission rehearsal systems which are responsive to theater and lower-echelon commanders in rapidly changing tactical situations.

(U) FY 1994 PLANS:

- Projects for FCT funding in FY 1994 will be nominated by the Services by 1 June 1993. In accordance with DoD Directives, the Services nominate projects for this program the year preceding the fiscal year for which funding is sought. Projects are normally expected to be completed within two years after approval. Requests for continuation funding of projects funded in FY 1993 must be submitted as updated project proposals by the Services, and continuation will be approved or rejected based on progress made so far.

(U) WORK PERFORMED BY: Funds from this element are provided to the Military Services to conduct the test and evaluation of foreign systems which they have nominated for evaluation and which have been approved by OSD. Funds are used to lease (preferred) or purchase articles for test, modify test articles or directly related equipment, provide technical and field test support and test data reduction, conduct engineering studies, cover refurbishment costs of returning test or test support articles to their original configuration, analyze test results, and pay for major ancillary support costs. The evaluation of most Army material is conducted through elements of the US Army Test and Evaluation Command, Aberdeen Proving Grounds, MD., in coordination with the development command or separate laboratory of the US Army Materiel Command having responsibility for like US material. Army commands and agencies representing user, training, and logistics interests are tasked in a support role appropriate to evaluation requirements. For Naval systems, evaluations are monitored by the Office of the Assistant Secretary of the Navy (Research, Engineering and Systems), the Office of the Chief of Naval Operations, and Headquarters, US Marine Corps. Naval testing is conducted in laboratories and test centers such as the Naval Weapons Center, China Lake, CA; Surface Weapons Center, Dahlgren, VA; Naval Coastal Systems Center, Panama City, FL; Naval Surface Weapons Center, White Oak, Silver Spring, MD, etc.. Air Force evaluations are under the management of the Air Force Systems Command, Andrews Air Force Base, MD, and are carried out by its subsidiary units such as the Air Force Flight Test Center, Edwards AFB, CA; Aeronautical Systems Division, Wright-Patterson AFB, OH; Rome Air Development Center, Griffiss AFB, NY; Electronics Systems Division, Hanscom AFB, MA; and the Armament Development and Test Center, Eglin AFB, FL. Depending on the specific equipment and the arrangements made for its evaluation, foreign countries may provide test articles, spare parts, and support equipment or services as requested.

(U) RELATED ACTIVITIES: International Cooperative R&D, Exploitation of Foreign Weapons Systems, Program Manager funded tests of foreign major end items.

(U) OTHER APPROPRIATIONS FUNDS: None.

(U) INTERNATIONAL COOPERATIVE AGREEMENTS: The United States has negotiated a number of Memorandums of Understanding/Agreement pursuant to cooperative testing programs funded through this program element.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **0605131D** Budget Activity: **6-Defensewide Support**

PE Title: **Live Fire Test**

A. (U) RESOURCE ($s in Thousands):

Project Number and Title: **931-Live Fire Test**

	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	Cost To Complete
Total	16,008	10,331	7,726	Cont

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program element supports the Congressional statutory requirements for Live Fire Test and Evaluation (LFT&E). The primary objectives of LFT&E are to assure that the vulnerability of our crew-carrying weapons platforms and the lethality of our conventional munitions is known and acceptable before entering full-rate production. LFT&E encompasses realistic tests involving actual U.S. and threat hardware or, if not available, acceptable surrogate threat hardware. LFT&E is integral with the realities of conventional warfare. While it is impossible to make war safe by designing overly robust protection, it is possible to improve the odds in favor of U.S. forces by recognizing that some amount of battle damage will occur and by designing and testing to assure that "cheap kills" do not occur. LFT&E represents the real world complexity of weapons effects, providing insights which have a high probability of improving weapons effectiveness, reducing vulnerability, and making a difference in future conflict. The value of vulnerability and lethality testing was driven home by Operation DESERT STORM, where the survivability and combat performance of ten major combat systems and munitions, including the Army Tactical Missile System, M1 Abrams Tank, Bradley Fighting Vehicle System, AH-64 APACHE Attack Helicopter, and the F-15 and F-16 were enhanced as a direct result of design changes and systems modifications identified as a result of this testing. Additionally, Live Fire Testing saves money in the acquisition of weapon systems by testing and evaluating the vulnerability/lethality of weapon systems early in the development phase. The objective is to identify and correct design deficiencies before weapons proceed beyond low-rate initial production (LRIP). This program is essential, especially in view of the escalating costs of new, technologically-sophisticated weapon systems.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1992 Accomplishments:

- Prepared the Office of the Secretary of Defense independent Live Fire Test Reports on AMRAAM, HARM, Torpedo MK-50, TOMAHAWK BLOCK III, SM-2 BLK IIIA, and Sensor Fuzed Weapon (SFW) for submission to Congress.
- Reviewed and approved LFT&E strategies and plans for 51 major (covered) systems.
- Monitored on-site tests and conducted independent assessments of the DDG-51 Arleigh Burke-Class destroyer, SSN-21 SEAWOLF-Class submarine, HOMS HELLFIRE, LONGBOW HELLFIRE, JAVELIN (Advanced Anti-Armor Weapon System - Medium (AAWS-M)), AMRAAM, Line-of-Sight Anti-Tank (LOSAT)(AAWS-Heavy), LX Amphibious Warfare Ship, TSSAM, XM-919, Strategic Sealift Ship, Torpedo MK-50, Vertical Launched/ASROC (VLA), TOMAHAWK BLOCK III, Sense and Destroy Armor Submunition (SADARM), SM-2 BLK IIIA, Brilliant Anti-tank Munition (BAT), M1A2 Abrams Tank, M113A3 Upgrade, V-22 OSPREY, A/F-18E/F, FAADS-LOS-F-H, PALADIN, Multiple Launch Rocket System-Terminally Guided Warhead (MLRS-TGW), XM-830E1 Munition, F-16 (CAS/BAI) aircraft, C-17A Transport, F-22, Corps Surface-to-Air Missile (CORPS SAM), Ground Based Interceptor (GBI), Brilliant Pebbles (BP), Theater High Altitude Air Defense (THAAD), Space Based Interceptor (SBI), PATRIOT PAC-3 and other LFT oversight systems.

- Provided LFT&E oversight for Product Improvement Programs (PIP) and P3I of existing systems.
- Reviewed Test and Evaluation Master Plans (TEMPs) for all systems under OSD Live Fire Oversight as well as other related systems.
- Participated in Defense Acquisition Board (DAB) and Defense Acquisition Executive Summary (DAES) committee reviews.
- Served on OSD Halon/ODC Replacement Task Force.
- Initiated support for the enhancement of the (surface) Ship Vulnerability Model (SVM) to support LFT&E programs.
- Initiated baseline assessment of transport aircraft vulnerability.
- Initiated development of a Crew Casualty Assessment Action Plan.
- Initiated vulnerability evaluation of most recently acquired foreign aircraft threats.
- Initiated assessment of vulnerability of aircraft to on-board munitions for the three Services.
- Initiated development of a Crew Casualty Assessment Methodology.
- Continued development of a vulnerability/lethality design guide.
- Continued analytical assessment and dissemination of Joint Live Fire (JLF) test results.
- Continued development of Anthropomorphic Casualty Emulator (ACE) for aircraft system Live Fire Testing.
- Continued ballistic shock damage mechanism testing and capability testing of vehicles subjected to controlled damage.
- Continued support for the development of the Large Underwater Explosive Research Pond to be used in the shock hardening assessment of US Navy submarines and surface ships.
- Supported the development of Human Tolerance Gas Toxicity Model.
- Supported, monitored, and reported on tests of anti-tank guided missiles (ATGM) versus threat tank, thermal signature tests, Joint Live Fire tests (JLF) of Soviet fighting vehicles, vulnerability testing of F-16 cockpit, and full aircraft vulnerability tests of F-15 and F/A-18.
- Conducted lessons-learned workshops on Operation DESERT STORM and Joint Live Fire aircraft systems.
- Sponsored Secretary of the Navy sea systems LFT&E program development initiatives.
- Coordinated Four Power Agreement on international Live Fire Testing and develop sub-annexes, and Technical Arrangements.
- Completed Live Fire Testing upgrades at Naval Air Warfare Center, China Lake.
- Developed and published the Proceedings of the Second (multi-service) Workshop on Crew Casualty Assessment.

(U) <u>FY 1993 Plans:</u>

- Prepare the Office of the Secretary of Defense independent Live Fire Test Reports on M113A3 Upgrade, DRAGON II/DRAGON PIP, HELLFIRE Optimized Missile System (HOMS), M1A2, M109A6 PALADIN, XM-830E1, XM-900E1 and XM919 munitions, MH-60K/MH-47E Special Operations Aircraft (SOA), and AC-130U and other systems approaching Milestone III (MS III).
- Review and approve LFT&E strategies and plans.
- Monitor on-site tests and conduct independent assessments of SADARM, SSN-21, DDG-51, NEW SUB Submarine, TSSAM, LX Amphibious Ship, HOMS, JAVELIN, LOSAT, LONGBOW HELLFIRE, XM919 Munition, Torpedo MK-50 (MOD 1), BAT, RAH-66 COMANCHE, STINGRAY, OH-58D Armed Warrior, M1A2, LONGBOW APACHE, V-22, AFAS, FARV-A, M109A6, AC-130U, AGS, WAM, JSOW, A/F-18E/F, F-22, F-16 CAS/BAI, C-17A, CORPS SAM, GBI, BP, THAAD, SBI, PATRIOT PAC-3 and other LFT oversight systems.
- Provide LFT&E oversight for Product Improvement Programs (PIP) and P3I of existing systems.
- Review Test and Evaluation Master Plans (TEMPs) for all systems under OSD Live Fire Oversight as well as other related systems.
- Participate in Defense Acquisition Board (DAB) and Defense Acquisition Executive Summary (DAES) committee reviews.
- Serve on OSD Halon/ODC Replacement Task Force.
- Provide testimony to Congress on LFT&E.
- Initiate vulnerability evaluation of low observable (LO) materials.

- Initiate exploitation of the SA-5 system.
- Initiate the development of shipborne blast and fire hardened instrumentation for use in LFT&E testing.
- Initiate study on testing surrogates for live ammunition.
- Initiate development of underwater range target program for testing weapon's and platform's threat responses.
- Initiate study of standard characteristics of foreign ammunition (SCOFA).
- Initiate development of fragment transport methodology.
- Support the enhancement of the Submarine Vulnerability Effectiveness Model (SUBVEM) to support LFT&E programs.
- Support development of a missile intercept kinetic energy (KE) simulator.
- Implement National Research Council (NRC) LFT&E Study recommendations.
- Conduct a workshop on Joint Live Fire armor/anti-armor systems.
- Conduct analysis of the impact of composites use on helicopter vulnerability.
- Continue to sponsor Secretary of the Navy sea systems LFT&E program development initiatives.
- Support, monitor and report on lethality tests of full-scale, combat-configured threat helicopter and fixed-wing aircraft, evaluation of advanced aircraft engine vulnerability, test and evaluation of advanced reactive projectiles, improvements of modelling techniques for aircraft systems/materials, and structural evaluation of advanced materials.
- Support, monitor, and report on JLF test of threat armor vehicles.
- Continue vulnerability evaluation of most recently acquired foreign aircraft threats.
- Continue development of Anthropomorphic Casualty Emulator (ACE).
- Continue development of a Crew Casualty Assessment Methodology.
- Continue ballistic shock damage mechanism testing and capability testing of vehicles subjected to controlled damage.
- Continue to support, monitor and report on assessments of on-board munitions for the three Services.
- Continue to support, monitor and report on hydraulic fluid flammability vulnerability assessment, enhancement of the (surface) Ship Vulnerability Model (SVM), and the development of the Large Underwater Explosive Research Pond.
- Provide support to improve the LFT&E process in the areas of target and instrumentation enhancement.
- Provide oversight and assistance in the development of the U.S. Navy generic Live Fire Test and Evaluation programs.
- Assess data requirements for testing full-scale aircraft.
- Complete OSD Plan to replace Halon/ODC for Fire Suppression.
- Complete baseline assessment of transport aircraft vulnerability and publish report.
- Complete development of a Crew Casualty Assessment Action Plan.
- Complete vulnerability test of full-scale, combat-configured threat helicopter.
- Complete assessment of on-board munitions for the three Services.
- Publish vulnerability/lethality design guide.
- Complete analytical assessment and impact of Joint Live Fire (JLF) test results and publish report on JLF test results.
- Complete hydraulic fluid flammability vulnerability assessment and publish report.
- Complete Live Fire Testing upgrades at Wright-Patterson AFB.
- Publish T-62 suspension capability test report.
- Publish BMP-2 test report.
- Finalize Four Power Agreement on international Live Fire Testing and develop sub-annexes, and Technical Arrangements.

(U) <u>FY 1994 Plans</u>:

- Prepare the Office of the Secretary of Defense independent Live Fire Test Reports on SADARM, C-17A, DDG-51 AEGIS Class Destroyer (Preliminary Report), Torpedo MK-50 (MOD 1), and other systems approaching MS III.
- Review and approve LFT&E strategies and plans.
- Monitor on-site tests and conduct independent assessments of SADARM, AGS, SSN-21 and NEW SUB

submarines, DDG-51, LX Amphibious Ship, Torpedo MK-50 (MOD 1), JAVELIN, LOSAT, C-17A, F-22.
- Provide LFT&E oversight for Product Improvement Programs (PIP) and P3I of existing systems.
- Review Test and Evaluation Master Plans (TEMPs) for all systems under OSD Live Fire Oversight as well as other related systems.
- Participate in Defense Acquisition Board (DAB) and Defense Acquisition Executive Summary (DAES) committee reviews.
- Provide testimony to Congress on LFT&E.
- Initiate the development of a standardization process for vulnerability assessment techniques.
- Initiate assessment of vulnerability of weapons platforms with Halon alternatives.
- Implement National Research Council (NRC) LFT&E Study recommendations.
- Support development of surrogate targets for use in the Navy's LFT&E vulnerability and lethality programs.
- Support development of an automated system for measuring shock severity of ships resulting from attack.
- Support development of analytical capabilities to measure ship shock explosive charge due to underwater penetration.
- Support development of a buoyant automated recording system for explosives effects testing.
- Conduct surrogate targets analysis.
- Conduct analysis of 155mm artillery fragmentation characteristics.
- Conduct internal blast compartment tests of ship structures.
- Conduct analysis of user casualty reduction in relation to overall aircraft vulnerability.
- Continue to sponsor Secretary of the Navy sea systems LFT&E program development initiatives.
- Support, monitor, and report on Live Fire Tests of a second foreign vehicle.
- Continue exploitation of the SA-5 system.
- Continue to support, monitor and report on vulnerability evaluation of low observable (LO) materials, to include battle damage repair (BDR) and the test and evaluation of Blue-on-Blue aircraft systems.
- Continue to support the development of the Large Underwater Explosive Research Pond, (surface) Ship Vulnerability Model (SVM), and enhancement of the Submarine Vulnerability Effectiveness Model (SUBVEM).
- Continue development of shipborne blast and fire hardened instrumentation for use in LFT&E and development of an underwater range target program for testing weapon's and platform's threat responses.
- Continue development of a Crew Casualty Assessment Methodology.
- Continue to support, monitor, and report on vulnerability testing of full-scale, combat-configured, threat fixed-wing aircraft, advanced aircraft engine vulnerability evaluation, test and evaluation of advanced reactive projectiles, improvement of modelling techniques for aircraft systems/materials, structural evaluation of advanced materials, tests of live ammunition surrogates, ballistic shock damage mechanisms capability testing of vehicles subject to controlled damage, and assessments of aircraft on-board munitions for the three Services.
- Support, monitor, and report on JLF test of threat armor vehicles.
- Publish test report on foreign vehicle.
- Complete development of Anthropomorphic Casualty Emulator (ACE).
- Complete development of fragment transport methodology.
- Complete support for development of a missile intercept kinetic energy (KE) simulator.

(U) **WORK PERFORMED BY:** Live Fire Testing, evaluations and assessments are performed by Government Research Centers/Laboratories, such as Army Research Laboratory and Army Test and Evaluation Command, APG, MD; Air Force Armament Laboratory, Eglin AFB, FL; Air Force Aeronautical Laboratory, Wright-Patterson AFB, OH; Naval Surface Warfare Center, Dahlgren and Norfolk, VA and Annapolis, Carderock, and White Oak, MD; Naval Air Warfare Center, Point Mugu and China Lake, CA; Naval Research Laboratory, Washington, DC, Chesapeake Beach, MD, and Mobile, AL; Naval Submarine Medical Research Center, Groton, CT; White Sands Missile Range, NM; Lawrence Livermore National Laboratories, Livermore, CA; and by contractor personnel under the guidance and supervision of the Deputy Directors, Test and Evaluation/Land and Maritime Programs and Air and Space Programs, OUSD(A).

(U) **RELATED ACTIVITIES**: None.

(U) OTHER APPROPRIATIONS FUNDS: None.

(U) INTERNATIONAL COOPERATIVE AGREEMENTS: Draft Four Power Agreement for conduct of JLF of U.S., Allied, and NATO weapon systems.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **0605804D** Budget Activity: **6-Defensewide Support**

PE Title: **Test and Evaluation**

A. (U) RESOURCE ($s in Thousands):

Project Number and Title: **920-Test and Evaluation**
932-Joint Technical Coordinating Group for Aircraft Survivability (JTCG/AS)

	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	Cost To Complete
920	76,427	102,583	105,695	Cont
932	7,623	8,000	8,439	Cont
Total	84,050	110,583	114,134	Cont

B. (U) BRIEF DESCRIPTION OF ELEMENT: The program element supports the efforts of the Director, Test and Evaluation, Office of the Under Secretary of Defense for Acquisition (OUSD(A)) to manage the DoD test and evaluation process. Unique programs within this PE include Joint Test and Evaluation (JT&E), Threat Simulators (TS), Precision Guided Weapons Countermeasures (PGWCM), Defense Evaluation Support Activity (DESA), and Joint Technical Coordinating Group for Aircraft Survivability (JTCG/AS).

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) Project 920 - T&E: JT&E programs are coordinated with OSD elements, the Joint Staff and the Services and focus on evaluating, in a joint military environment, whether a weapon system meets its detailed performance specifications, solving technical problems, developing T&E methodologies, and validating models and simulations. Threat Simulators (TS) is a continuing effort to provide OSD oversight and management of Service Threat Simulator developments to ensure increased commonality, minimize duplications and provide consistent validation. TS funds the CROSSBOW-S and EXCOM management functions, and the development of threat systems specifications. The Susceptibility Model Assessment and Range Test (SMART) project will develop, verify and validate a credibility assessment methodology for models used in the survivability discipline. This project also funds T&E support, including independent analyses, specific and generic weapons systems tests and equipment. Precision Guided Weapons Countermeasures (PGWCM), a DoD T&E Directorate, conducts DT&E and OT&E of Electro-Optical and Millimeterwave weapons and CM equipment for the Services and OT&E Agencies. Defense Evaluation Support Activity (DESA), a DoD T&E Activity, provides T&E expertise to the Services, Defense Agencies, and other Departments and Agencies.

(U) FY 1992 Accomplishments:
- Chartered new JT&E programs:
  - Infrared Band IV Countermeasures (CM);
  - Joint Camouflage Concealment and Deception (JCCD);
  - Smart Weapons Operability Enhancement (SWOE);
  - Conducted JT&E Feasibility Studies;
  - Joint Tactical Missile Signature Measurement (JTAMS);
  - Joint Improved Battlefield Surveillance (JIBS);
  - Joint Combat Identification (JCID);
- JT&E program status:

  - Concluded Joint Electromagnetic Interference (JEMI) and distributed the JEMI Final Report;
  - Completed Band IV CM, JCCD, and SWOE Program Test Designs; and
  - Continued Joint Over the Horizon Targeting (JOTH-T), Joint Logistics Over the Shore (JLOTS), and Joint Air Defense Operations/Joint Engagement Zone (JADO/JEZ) testing.
- Conducted JT&E annual nomination review;
- Assessed FY 1992 new nominations for JT&E potential;
- PGWCM tested 19 EO and MMW guided weapons systems in a countermeasures environment (e.g., HOMS Product Improvement, Brilliant Anti-Armor Submunition (BAT), IR Maverick, TOW I & II, Miniature Laser Warning Receiver System (MINLAWS));
- DESA continued to provide T&E expertise to JT&E programs, the Services, Defense and other Agencies and Departments.
- TS completed one ITEAMS threat system design validation and one digital threat model;
- TS began two ITEAMS efforts;
- TS continued to execute the DoD validation program for threat simulators and digital threat simulations;
- TS continued to review, prioritize, approve, resource, and manage the development of threat simulators and digital threat simulators and participate in field testing of FMA/FME hardware;
- TS continued to maintain and update the Joint Electronic Warfare Center Threat Simulator Handbook data base.
- SMART: Identified and prioritized models, completed SMART proof of concept, and developed the model accreditation process.

(U) **FY 1993 Accomplishments/Plans:**

- Chartered new JT&E program:
  - JTAMS;
- Conduct JT&E Feasibility Studies:
  - Joint Theater Task Force Crisis Management (JT2CM);
  - Joint Command and Control for Power Projection (JC2P2).
- JT&E program status:
  - Concluded JOTH-T JT&E and published Final Test Report;
  - Conclude JADO/JEZ testing;
  - Completed JTAMS Program Test Design and initiated testing; and
  - Continue JLOTS, Band IV CM, SWOE, and JCCD testing.
- Conduct JT&E annual nomination review;
- Study FY 1993 new nominations for potential JT&Es.
- PGWCM will test 20 to 25 EO and MMW guided weapons systems in a countermeasures environment (e.g., BAT, MMW Maverick, AGM-130, Autonomous Guidance for Conventional Weapons (AGCW), Longbow MMW, EO Long Range Oblique Photography System (EO LOROPS), UH-1N Electronic Warfare Suite, Advanced Tactical Reconnaissance System (ATARS).
- DESA continues to provide T&E expertise to JT&E programs, the Services, Defense Agencies, Department of Energy, and other National Agencies.
- TS will complete two ITEAMS threat system design validations;
- TS will begin three ITEAMS threat system design validations and three digital threat model;
- TS will continue to execute the DoD validation program for threat simulators and digital threat simulations;
- TS will continue to review, prioritize, approve, resource, and manage the development of threat simulators and digital threat simulations and participate in field testing of FMA/FME hardware;
- TS will continue to maintain and update the Joint Electronic Warfare Center Threat Simulator Handbook data base.
- SMART will continue model assessments and accreditation, process establishment, and special application studies.

(U) **FY 1994 Plans:**

- Charter new JT&E programs:

  - JT2CM; and
  - JC2P2.
- JT&E program status:
  - Complete JLOTS and SWOE testing;
  - Distribute JLOTS and JADO/JEZ final reports;
  - Complete JT2CM and JC2P2 Program Test Designs and initiate testing; and
  - Continue Band IV CM, JCCD, and JTAMS testing.
- Conduct JT&E annual nomination review;
- Study FY 1994 new nominations for potential JT&Es;
- PGWCM will test 20 to 25 EO and MMW guided weapons systems in a countermeasures environment (e.g., MLRS Terminally Guided Warhead, BAT, MMW Maverick, LONGBOW);
- DESA will continue to provide T&E expertise to JT&E programs, the Services, Defense Agencies, Department of Energy, and other National Agencies.
- TS will begin one "Rest of the World" (ROW) Digital threat model;
- TS will complete two ITEAMS threat system design validations;
- TS will complete three digital threat models;
- TS will continue to execute the DoD validation program for threat simulators and digital threat simulations;
- TS will continue to review, prioritize, approve, resource, and manage the development of threat simulators and digital threat simulations and participate in field testing of FMA/FME hardware;
- TS will continue to maintain and update the Joint Electronic Warfare Center Threat Simulator Handbook data base.
- SMART will continue model assessments and accreditation, process establishment, and special application studies.

(U) Project 932 - Joint Technology Coordinating Group for Aircraft Survivability (JTCG/AS): This project supports joint combat survivability aircraft development, test and evaluation programs and other activities. This organization serves as the DoD focal point for aircraft survivability and represents the Joint Logistics Commanders (JLC) and the Joint Aeronautical Commanders Group (JACG) in dealings with OSD, industry, and other Service agencies. They plan, coordinate and conduct joint aeronautical vehicle survivability programs and activities.

(U) FY 1992 Accomplishments:
- Initiated Halon Candidate Replacement Agent and System Project, Tailored Flare Project, and Model Accreditation Project.
- Continue Damage Tolerant Composites Project, Survivability Biased Engine Controls (SUBEC) Project, Mixed Mode Surface and Actuator Flight Control System (FCS) Architecture, Integration of Joint Live Fire Technologies Data into Vulnerability Methodologies, Infrared Focal Plane Array (IRFPA) Countermeasures Project, and Methodology Integration Project.
- Completed Aircraft Battle Damage Repair (BDR) R&D Plan, Countermeasures Handbook for Survivability, Methodology Integrator Standardization, and Reduced Bandwidth FLIR CCM Project.

(U) FY 1993 Plans:
- Initiate Aircraft BDR R&D Project, Helicopter Ceramic Insulation Project, Air-to-Air System Performance Evaluation Model (AASPEM) 4.0 Project, Fire/Explosion Protective System Project, and Weapons Bay Vulnerability Project.
- Continue Evaluation of Halon Candidate Replacement Agents and Systems, Tailored Flare Project, Model Accreditation Project, and Methodology Integration Project.
- Publish Countermeasures Handbook for Survivability.
- Complete IRFPA Countermeasures Project, Integration of JLF Data into Vulnerability Methodologies, Design and Advanced Testing Procedures for Damage Tolerant Composites, SUBEC Development Project, and Development of FCS Architecture.

(U) **FY 1994 Plans:**

- Initiate Aircraft Vulnerability/Survivability Model Improvements, Onboard Laser CM/IR Field Tests, Advanced Ceramic Armor Project, and Critical Engine Component Vulnerability Project.
- Continue Aircraft BDR R&D Project, Helicopter Ceramic Insulation Project, AASPEM 4.0 Project, Fire/Explosive Protective System Project, Model Accreditation Project, and Methodology Integration Project.
- Complete Evaluation of Candidate Halon Replacement Agents and Systems, and Tailored Flare Project.

(U) **WORK PERFORMED BY:** The T&E major field activities include: Kirtland AFB, NM; White Sands Missile Range, NM; NWC, China Lake, CA; NSWC, Dahlgren, VA; Wright-Patterson AFB, OH; APG, MD; NADC, PA; MICOM, AL; and Eglin AFB, FL. Major contractors for T&E projects include MITRE, IDA, SAIC, and TRW. Service laboratories/activities for JTCG/AS projects are involved in performing work under this PE: Naval Air Warfare Center, China Lake, CA; Naval Air Development Center, Warminster, PA; Naval Surface Weapons Center, Dahlgren, VA; Naval Postgraduate School, Monterey, CA; Naval Research Laboratory, Washington DC; Wright Laboratories, Foreign Aeronautical Science and Technology Center, Aeronautical Systems Division, Wright Patterson AFB, OH; Ballistic Research Laboratory, APG, MD; Materials Research Center, MA; Center for Night Vision and Electro-Optics, Fort Belvoir, VA; Foreign Science and Technology Center, Charlottesville, VA; and Electronics Systems Division, Hanscom AFB, MA.

(U) **RELATED ACTIVITIES:** None.

(U) **OTHER APPROPRIATIONS FUNDS:** Directly related PEs for JTCG/AS are: Navy PE 0603260N, Aircraft Survivability and Vulnerability; Air Force 0603205F, Adaptive Flutter Suppression; 0603202F and 0603204F, Self Repairing Flight Control System; 0603211F, Advanced Composites; 0603743F, Electronic Warfare Technology; 0603203F, Advanced Avionics for Aerospace Vehicles; 0603217F, Aircraft Power Systems; and all Army Aircraft Survivability Equipment PEs from the ASE Program Manager's Office (AVSCOM) and Materials Technology Laboratory, Watertown, MA.

(U) **INTERNATIONAL COOPERATIVE AGREEMENTS:** None.

FY 1994 BUDGET ESTIMATES

DESCRIPTIVE SUMMARIES

FOR THE

OFFICE OF THE DIRECTOR OF

OPERATIONAL TEST AND EVALUATION

APRIL 1993

FY 1994 BUDGET ESTIMATES RDT&E DESCRIPTIVE SUMMARY

Program Element: 0605118D

Budget Activity: Defensewide Mission Support

PE Title: Director of Operational Test and Evaluation

Date: April 1993

A. (U) RESOURCES ($ in Thousands)

Project Number & Title: P310 Director of Operational Test and Evaluation

	FY1992 Actual	FY1993 Estimate	FY1994 Estimate	To Complete	Total Program
Project Title:	Director of Operational Test and Evaluation (DOT&E), Project Number 310				
	12,836	12,333	12,650	Contin-	Contin-
Total	12,836	12,333	12,650	uing	uing

B. (U) BRIEF DESCRIPTION OF ELEMENT:

DOT&E is responsible for policy and procedures for all aspects of operational test and evaluation within the Department of Defense (DoD), with particular focus on OT&E that supports major weapon system production decisions. Currently there are approximately 200 Major Defense Acquisition (MDA) programs on the DOT&E oversight list. These MDAs may not proceed beyond low-rate initial production (LRIP) until adequate operational test and evaluation of the program is completed. This requires early involvement by DOT&E in the planning phase of each program to ensure adequate testing and satisfactory progress through the acquisition milestones toward operational effectiveness, suitability goals and full-scale production. Key elements of the DOT&E's authority for major defense acquisition programs include: the approval of Service OT&E plans; assessment of the adequacy of OT&E and the operational effectiveness and suitability of the weapon system; and participation in DoD-wide planning, programming and budgeting activities to highlight test and evaluation capabilities, needs and priorities.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN FY 1994:

(U) Project Number and Title: 310 Director of Operational Test and Evaluation

(U) Prior Accomplishments:

•Reviewed and approved, disapproved, or returned for revision long-range Test and Evaluation Master Plans (TEMPs) for a number of systems, including the following: Hellfire (AGM 141A), All Source Analysis System (ASAS), Palletized Loading System (PLS), NAVSTAR GPS, Airborne Self Protection Jammer (ASPJ), DDG-51/SPY-1B/D, Advanced Tactical Fighter (F-22), Landing Craft Air Cushen (LCAC), LAMPS Mk III(SH-60B), Stand-Off Land Attack Missile(SLAM), STINGER RMP, Advanced Interdiction Weapons System(AIWS/JSOW), UHF Follow-On, AMRAAM, SADARM, F/A-18E/F, EA-6B ADVCAP, Vertical Launch ASROC (VLA), T-45 Training System, Fixed Distribution System (FDS), Sensor Fused Weapon (SFW), MCM-1, AIR/RIM-7R, SQY-1, Coast Guard Helo Engine, LOSAT, Trident, D-5 Missile, B-2, ASAT, P-3C, Peacekeeper Rail Garrison, SM-2 Block III, HIP, MK-48 ADCAP Torpedo, M1A2 Tank, SM-2 Block IV, UAV-SR, HARPOON Block ID, JAVELIN (AAWS-M), SIMATS, DDG-51, and MK 50 Torpedo.

•Reviewed and approved, disapproved, or returned for revision operational test plans for a number of systems including the following: JPATS, ASPJ, T-45 Training System, F/A-18 C/D, F-14D, A-6E SWIP, KIOWA WARRIOR, HOMS, PALADIN (SM-2), Block IIIA, Mk 50 Torpedo, Vertical Launch ASROC, DDG-51, LAMPS MK III, FDS, HARPOON BLOCK 1D, SURTASS BLOCK UPGRADE, LCAC, HARM - BLOCK IV, C-17, M1A2 Tank; Palletized Loading System (PLS) and Unmanned Aerial Vehicle--Short Range.

•Monitored operational tests on the following systems: AMRAAM, ASPJ, C-17, F-15E, SFW, T-45 GOSHAWK, A-6E SWIP, SM-2 Block IIIA, Mk 50 Torpedo, Vertical Launch ASROC, DDG-51, LAMPS Mk III, SLAM, HARPOON BLOCK ID, LCAC, AN/BSY-1, C-17, HARM BLK IV, MC-130H, A-10/F16, JSTARS, ATACMS, SADARM, JSTARS, ATACMS, SADARM, JSTARS/GSM, PALADIN, M1A2 TANK, Palletized Loading System (PLS), Unmanned Aerial Vehicle--Short Range.

•Provided independent performance assessments on the following systems: JPATS, ASPJ, AMRAAM, SFW, AIWS/JSOW, JDAM, T-45A GOSHAWK, SIMATS, AIR-TO-AIR STINGER, KIOWA WARRIOR, JAVELIN, MK 50 TORPEDO, Vertical Launch ASROC, LAMPS MK III, SLAM, LCAC, AN/BSY-1, MC-130H, F-22, JSTARS.

•Submitted reports or certifications to Congress on the following systems: AMRAAM, SIMATS, USMC Medium Machine Gun.

•Jointly, with Director for Test and Evaluation, Office of Under Secretary for Acquisition, through functional analysis and coordination with the TEMP and Operational Test Plans approval process, reviewed and validated FY 1994-1999 operational test capability candidates. Provided justification of approved projects in support of the President's budget. Represented operational test requirements to the Foreign Material Procurement Review Board for acquisition of threat equipment.

(U) FY 1993 Planned Program:

•Current plans call for review of TEMPs on the following systems: ASR, F-15E TEWS, SFW, TSSAM, AX, V-22 OSPREY, Medium Lift Replacement Helo, F/A-18 C/D, SM-2, SEA SPARROW, DDG-51, SOQ-89, FDS, SURTASS/T-AGOS, MCM, Mk-48 ADCAP, SSN-21, AN/BSY-2, LX, AAA, SH-60F, C-17, F-16, JSTARS, SADARM, Howitzer Improvement Program, STINGRAY, M1A2 Tank, UAV-MR, SM-2 Block IIIB, C-17, Longbow Apache, Theater Missile Defense, and several command, control, communications and intelligence (C3I) systems.

•Operational test plan reviews and test monitoring are planned for the following systems: ATARS, AMRAAM, F-15E TEWS, T-45 Training System, JAVELIN, SM-2, SEA SPARROW, DDG-51, SH-60F, C-17, F-16, MC-130H, JSTARS/GSM, SADARM (155), MK-48 ADCAP, SH-60F, PLS, M1A2 Tank, UAV-SR, and FMTV.

•Independent assessment reports are planned for submission on the following systems: ATARS, T-45 Training System, ALQ-131 BLOCK II, PALADIN, HOMS, DDG-51, LAMPS Mk III, T-AGOS (SWATH) HARPOON, SH-60F, C-17, JSTARS, JSTARS/GSM, MK-48 ADCAP, PLS, KIOWA WARRIOR, M1A2 Tank, UAV-SR, PLS and FMTV.

(U) FY 1994 Planned Program:

•Review Service TEMPs and test plans, monitor field operational tests, and conduct assessments on programs to include evaluation of projected resource requirements and funding levels for OT&E. Programs to be reviewed include C-17, MILSTAR, F/A-18C/D, F-22, V-22, BAT, TOMAHAWK TMPCU, FDS-D, AFATDS, JAVELIN, M1A2 Tank, EPLRS, JCALS, SBIS, ULLS, Mine Countermeasures (MCM) Ship, MH-53E, SURTASS upgrade, DDG-51, DSP, CSOC, CMU, B-2, ATARS, BAT, AMRAAM, SFW, JSOW, JDAM, F/A-18E/F, TSSAM, MED LIFT REPL HELO, T-45 Training System, V-22 OSPREY, KIOWA WARRIOR, AGS, AH-64C, SM-2, PHALANX Close-In Weapon System, DDG-51, SURTASS, FDS, NEW SUB, SSN-21, AN/BSY-2, LX, AAA, MK-48 ADCAP, F-22, C-17, F-16, SADARM, JSTARS and others.

•Identify initial operational test and evaluation "exit criteria" for major acquisition systems to proceed beyond LRIP.

(U) Work Performed By:

All assessments are performed in-house with technical and analytical support provided by the Institute for Defense Analyses located in Alexandria, VA and office automation support by Advanced Systems Development also located in Alexandria, VA.

(U) Related Activities:

None

(U) Other Appropriation Funds:

None

(U) International Cooperative Agreements:

None