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the cover
Weapon Systems for the operational elements of the Air
Force, present and future, are products of a lengthy
journey through the development planning pipeline.
Major General Kenneth R. Chapman and Lieutenant
Colonel John F. Gander explain how the develop-
ment planning specialty functions at Air Force Sys-
tems Command, yielding such recent safeguards against
the future as the AWACS, the A-10A, and the F-15
(top to bottom). In "Lethality/Vulnerability: The
Touchstone for Progress" George C. Crews discusses
another aspect of the diverse capability of AFSC.

OPTIONS
IN THE FUTURE

Major General Kenneth R. Chapman
Lieutenant Colonel John F. Gander

AIR FORCE SYSTEMS COMMAND is unique among major USAF commands in that it assigns a principal staff element to the specialty of *development* planning. AFSC's success in providing technology support for future force structure options depends to a great extent upon a strong, *technically* oriented planning staff. For this reason, the Development Plans deputate at AFSC headquarters was decoupled from the traditional planning activities in order to concentrate its total effort on plans to fulfill the dominant function of the command: to provide weapon systems for the operational elements of the Air Force, present and future.

The same planning structure exists in the AFSC product divisions as at the headquarters. Within each division, a development planning staff element carries out the responsibility for the form and content of major system acquisitions as well as guidance of the research programs that will be needed to provide hardware for the next generation of force structure.

At whatever level, development planning is not by any means a peripheral activity. The formative stages of new development/acquisition programs involve a great many years of concentrated effort over a wide range of activities. Every major system the Air Force is sponsoring—the F-15, the B-1, the AWACS, and so on down the list—has followed this lengthy journey through the development planning pipeline. Little wonder, then, that Systems Command allocates a considerable share of its resources, manpower in particular, to these activities.

Three basic motifs underlie the development planning mission of providing options in the future:

(1) Assuring that emerging technology remains relevant to the future needs of the operating forces;

(2) Structuring new programs for development and acquisition; and

(3) Seeking more effective ways to accomplish the acquisition job.

Relating Technology to Needs

The projection of future force needs involves a great deal more than a brilliant leap of the imagination or consultation with the Delphic oracle or lengthy contemplation of a crystal ball. It depends upon developing perspective from numerous and diverse factors. All planning projections used by the Air Force must be brought into focus, including the Joint Strategic Objectives Plan (JSOP), the Joint Research and Development Objectives Document (JRDOD), the U.S. Air Force Planning Concepts Document, and so on. Development planners, in order to accomplish this task, make use of two principal investigative techniques—*mission analyses* and *mission area studies*—in addition to an array of preliminary system design efforts.

mission analyses

A mission analysis is a major undertaking that draws heavily upon threat assessment and operational concepts as well as available and projected technology. On the average, such a study will last about six months and involve well over 150 man-months of intensive effort. The composition of the study team is clearly vital: personnel from the AFSC divisions, centers, and laboratories are teamed with experienced officers and civilians from the using commands and appropriate representatives from industry. A steering group of senior officers and civilians, representing both the R&D community and the interests of the operating commands, gives direction to the study team.

At present Air Force Systems Command possesses a mission analysis capability in four of its components: the Space and Missile Systems Organization (SAMSO) in Los Angeles, California; the Aeronautical Systems Division (ASD) at Wright-Patterson AFB, Ohio; the Electronic Systems Division (ESD) at Laurence G. Hanscom Field, Massachusetts; and the Armament Development and Test Center (ADTC) at Eglin AFB, Florida. These are, in effect, the "product divisions" of the Systems Command, and each is capable of turning out one or two mission analyses per year.

These major study efforts identify new and promising concepts to correct existing or potential operational deficiencies. They explore alternative options in terms of current and projected technology, propose realistic program alternatives, and identify the high-payoff areas of technology as well as critical technological limitations.

An analysis of CONUS Air Defense completed in 1971, for example, provided a roadmap for developing a research base in advanced turbine engine propulsion, ramjet technology, hypersonic aircraft design, surveillance techniques, look down/shoot down airborne radar technology, and related areas. This research base is currently keeping pace with the potential Soviet threat in preparation for the eventuality that major force improvements in air defense will be required in future years.

Current CONUS air defenses were based on technologies of the 1950s and designed to counter high-altitude subsonic and transonic bombers. Although the Soviet Strategic Offensive Forces today consist primarily of ICBM's and SLBM's, a significant bomber force remains. For example, the present Soviet bomber force is capable of attacking the United States by penetrating at low level and launching standoff air-to-surface missiles. The CONUS air defense mission analysis quantified the capabilities of our present air defenses against these tactics and assessed the vulnerability of the present air defense ground support elements to an ICBM/SLBM attack.

The study then definitized a number of time-

phased elements, based upon realistic threat assessments and plausible technology projections, to modernize the air defense forces. The Aerospace Defense Command (ADC) and Air Force Systems Command, using the results of this mission analysis as a foundation, have jointly prepared a master plan on CONUS air defense. This plan addresses system concepts and their requisite supporting technologies for the next fifteen years.

Another example showing how mission analyses relate technology to future force structure needs derives from the recently completed study entitled Information Processing/Data Automation Implications of Air Force Command and Control Requirements in the 1980s— called CCIP-85 for short. The purpose of the study was to construct an integrated Air Force R&D program for the 1970s that will develop the information-processing technology needed to meet the likely Air Force command and control (C&C) information-processing requirements of the 1980s. The central concern was with C&C for Air Force combatant units.

Information-processing technology is barely adequate to support Air Force C&C functions today. The major technological strains are not in the computer hardware area but in software technology: the technology of transforming broad functional C&C requirements into specific, detailed, and unambiguous sequences of commands for the computer hardware to execute.

To correct this mismatch between C&C requirements and R&D support, the study provides a series of integrated R&D "roadmaps" for improving information processing. Roadmaps are included for preparation for the next-generation World Wide Military Command and Control System (WWMCCS) computer procurement, for interservice coordination activities, and for a USAF computer hardware laboratory.

These roadmaps or integrated program plans provide R&D project guidelines that lead information-processing technology in directions that could: (1) provide more versatile, yet more economical and less manpower-intensive C&C operations for the 1980s; (2) reduce the typical C&C information-processing system development time from six to four years, and the resulting computer hardware age at initial operational capability (IOC) from three or four years to one or two years; (3) reduce significantly the danger that software errors could escalate crisis situations or degrade defenses at critical times; and (4) provide combat-ready C&C information-processing systems that are far more reliable and responsive in their support of dynamic force management requirements.

mission area studies

The second major investigative tool of development planning for reconciling technology and force needs is the mission area study. By use of this technique, air power missions are arbitrarily separated into groupings (areas) that can be treated analytically to relate technology programs to specific tasks underlying the applications of air power. Mission areas "bound" the problem to facilitate analysis; they also make it simpler to estimate the potential payoffs of competing technologies. This technique for "viewing" the problem forms a communication link from the laboratories, through the development planners, to the system operators in the using commands, and to the Air Staff.

Within each mission area, the development planners maintain an overview and projection of the technical programs; from this an assessment can be made as to how adequately the technology base is providing future force structure options, so that appropriate adjustments can be made, if necessary. Where technology is thin, efforts are fortified. Where duplication is found to exist, technology programs are combined or eliminated. To insure that the technologies in question offer the highest payoffs in relation to projected needs and requirements, measures of effectiveness are generated for comparing the alternative system options de-

Satellite Control Center of AFSC's Space and Missile Systems Organization (SAMSO), Los Angeles
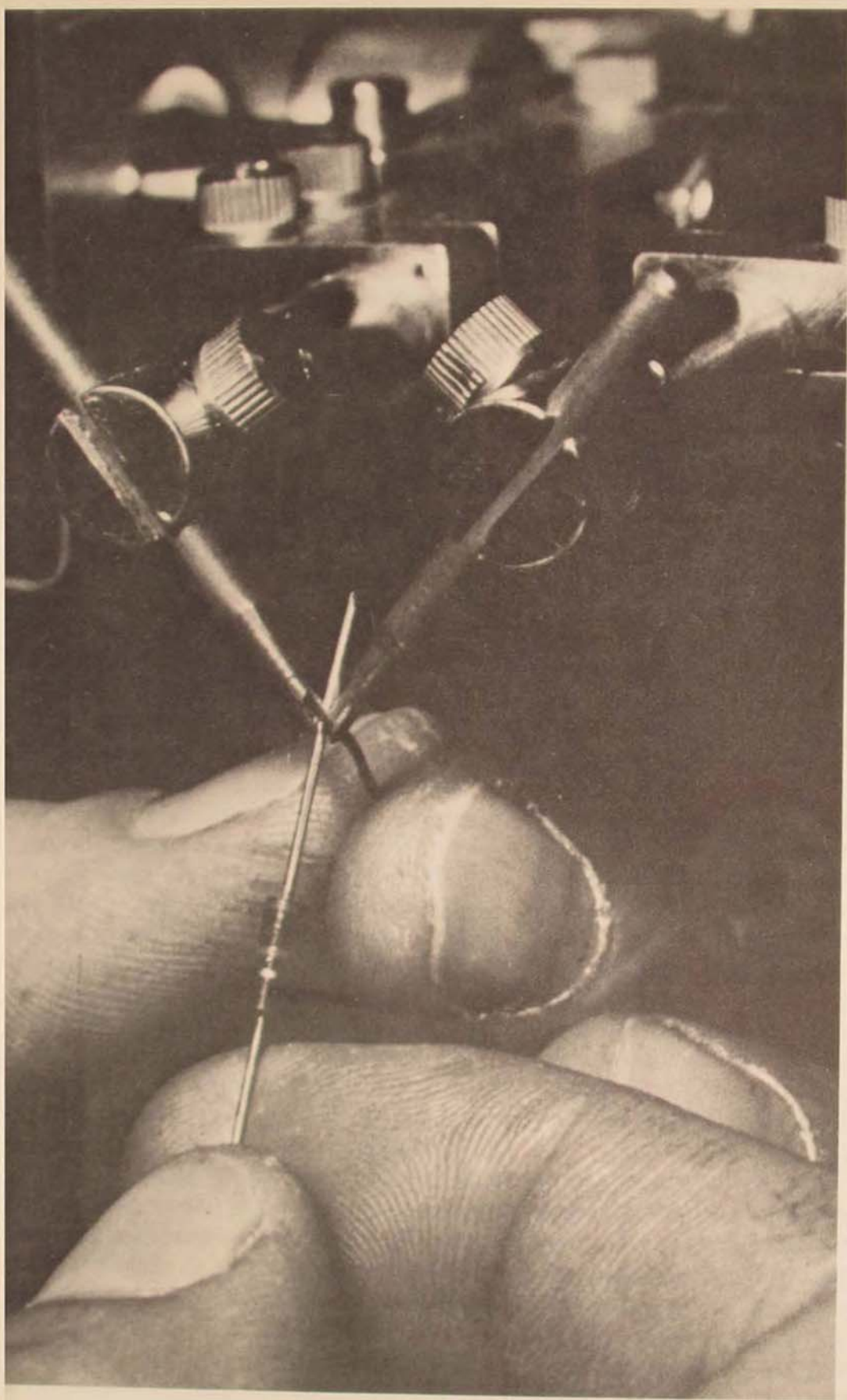
veloped from competing technologies. Finally, in order that the results may be put to work where they count, they are sequenced to coincide with the annual formulation of the RDT&E budget.

Let us consider, as an example, the search and rescue mission area. The mission-essential elements in combat search and rescue are (1) notification (alerting and dispatching rescue forces based on emergency data from wingman reports, distress/bailout calls, or voice/beacon signals); (2) localization (accurate identification and location of downed personnel); (3) recovery (getting the downed crew member(s) from the hostile ground environment into the rescue vehicle); (4) the rescue vehicles themselves.

Primary equipment available at this time includes beacons, radios, flares, markers, crash position indicators, hoists, harnesses, and the Fulton recovery system. Rescue vehicles include the HC-130 airplane and the HH-3, HH-43F, and HH-53 helicopters.

Near-term options for enhancing recovery encompass distress incident locators and accurate localization devices; recovery equipment to minimize loiter and hovering time for the rescuing vehicle; and improved recovery vehicles (e.g., a replacement for the HH-53).

Longer-range requirements look toward an advanced rescue system that would include a self-contained rescue device, combat rescue aircraft, and possibly a replacement for the HC-130. In addition, the imminence of the space shuttle under development by NASA and the opportunity it will provide for extended space operations necessitate Air Force reaction to the problems of space rendezvous and rescue.

In general, the mission area studies are a continuous process, constantly making trade-offs among stated requirements, concepts of operations, and available or projected technology. They draw upon many other more specialized studies of critical subsets of the broader mission task. In all, these analytical and study techniques establish the bases—which

are primarily technological in nature—for more detailed definition of optional capabilities for the force structure.

Structuring New Programs

From the foregoing it is obvious that the studies and mission area work form the nucleus for additional development on a more detailed basis—specialized and specific major design study efforts and actual hardware development. This planning process is a rather extensive and often time-consuming part of the acquisition cycle.[1] The B-1 program was approximately eight years in the planning process. The Subsonic Cruise Armed Decoy (SCAD) program was worked and reworked over a period of four years, through innumerable variants in the system design, the most demanding of which concerned protecting the armed option. Additionally the Air Force could not afford a large investment in the system, so a low-cost acquisition plan had to be structured. This was done by placing responsibility for system integration with the Program Director and the Aeronautical Systems Division.

scoping requirements

Long before the using commands formally state their requirements in terms of new weapon systems, development planners are on the scene, assessing the potential threat, directing technology, and anticipating user-level needs. The mission area work and related studies have set the stage for the "requirements process"—on the one hand, by examining current systems for their effectiveness against anticipated threats, seeking new ideas, and studying ways of improving their capabilities (the problem-oriented approach); on the other hand, by seeking to formulate new uses for areas of technology for which there is no current application (the solution-oriented approach).

The requirements process is the pipeline through which the operating elements of the

Air Force obtain new or improved operational capabilities. It starts with the submission of a Required Operational Capability (ROC) document, establishing a need, outlining existing deficiencies, describing the operational concept, and setting performance parameters. By keeping in close contact with the user organizations, through mission analyses, staff visits, and exchange of planning documents, development planners have an appreciation for their needs and can better provide appropriate technical information and solution alternatives.

If Headquarters USAF decides affirmatively on an ROC submission, a Program Management Directive (PMD) is issued. The PMD furnishes guidance for initiating the program. Usually the AFSC planners are directed to provide analyses of the preliminary system/key subsystem performance specifications and to verify the demonstrated state of the art for key subsystems, components, and fabrication/production techniques. At the same time, the credibility of cost and schedule estimates is established, and the procurement strategy and management plan are outlined.

The completed analyses—trade-off studies and preliminary design and development studies—of the program concept as well as the preferred management approach are utilized to structure the development program package. A key aspect of this work is constant iteration between system capabilities requested in the ROC and the cost, schedule, and technology contraints under which the system must be acquired.

This work also supports Air Force inputs to the draft Development Concept Paper (DCP). The DCP is a decision paper for the Secretary of Defense and contains the record of primary program information, the decision rationale, and the decision-review thresholds. The latter are program boundaries which, if breached or expected to be exceeded, cause a review of the program by the Secretary of Defense.

This work of scoping requirements can span many years. The route by which the fighter-experimental (F-X) concept of 1961 evolved into today's F-15 and A-X demonstrates how a program is fashioned to meet requirements.

The F-X started out as an aircraft with *good* air-to-air capability and excellent air-to-ground capability—a multimission aircraft. After several iterations, additional evaluations, and an interim buy (the A-7), the original requirements were transformed into requirements for a CAS aircraft tailored to survive in the European environment (the A-X) and an air superiority fighter capable of successfully countering the potential Soviet threat aircraft projected for the 1975–1985 time period (the F-15).

the acquisition cycle

The acquisition cycle consists of five major phases: (1) conceptual phase; (2) validation phase; (3) full-scale development phase; (4) production phase; and (5) deployment phase. Approval by the Secretary of Defense is required before proceeding with the second, third, and fourth phases. Development planning activities occur primarily in the conceptual and validation phases of the acquisition cycle. The conceptual phase is a highly iterative process, with continuous dialogue among planners, designers, technologists, developers, and users. The objective of this phase is to define and select the system concepts that best meet user requirements, under the constraints imposed by technological feasibility and resources. The final output is a preferred program approach in the event a decision is made to proceed into the next (validation) phase of the acquisition cycle.

In the validation phase, the characteristics of the system concept are refined and validated through study and analyses, hardware development, or prototype testing. The overall objective here is to establish firm and realistic performance specifications that will meet operational requirements and to determine whether to proceed with full-scale development.

The development planners transfer the program to the system engineers at a time in the

A contract for the Close Air Support A-10A has been awarded to Fairchild Industries, Republic Division. Ten R&D A-10As will first be built, with an option to produce 48 additional ones.

validation phase when they have determined that it is in good financial shape, the schedule is established, the program is technically sound, and an organization, the System Program Office (SPO), has been formed to run it.

adaptability in buying

The "fly-before-buy" philosophy rejuvenated by former Deputy Secretary of Defense David Packard ushered in a whole new set of flexible procurement techniques—prototype development, competitive flyoffs, advanced prototyping—

for structuring new development and acquisition approaches. Much of the restructuring evolved out of what had been learned (the hard way) in earlier management experiences with such programs as the C-5, the F-111, and the short-range attack missile (SRAM).

Thus it is natural that the management approaches to major new weapon system programs like the F-15, B-1, and A-X emphasize flexibility and allow the latitude for program goal adjustments when they are justified. The F-15 program, for example, involved competitive development of some critical components
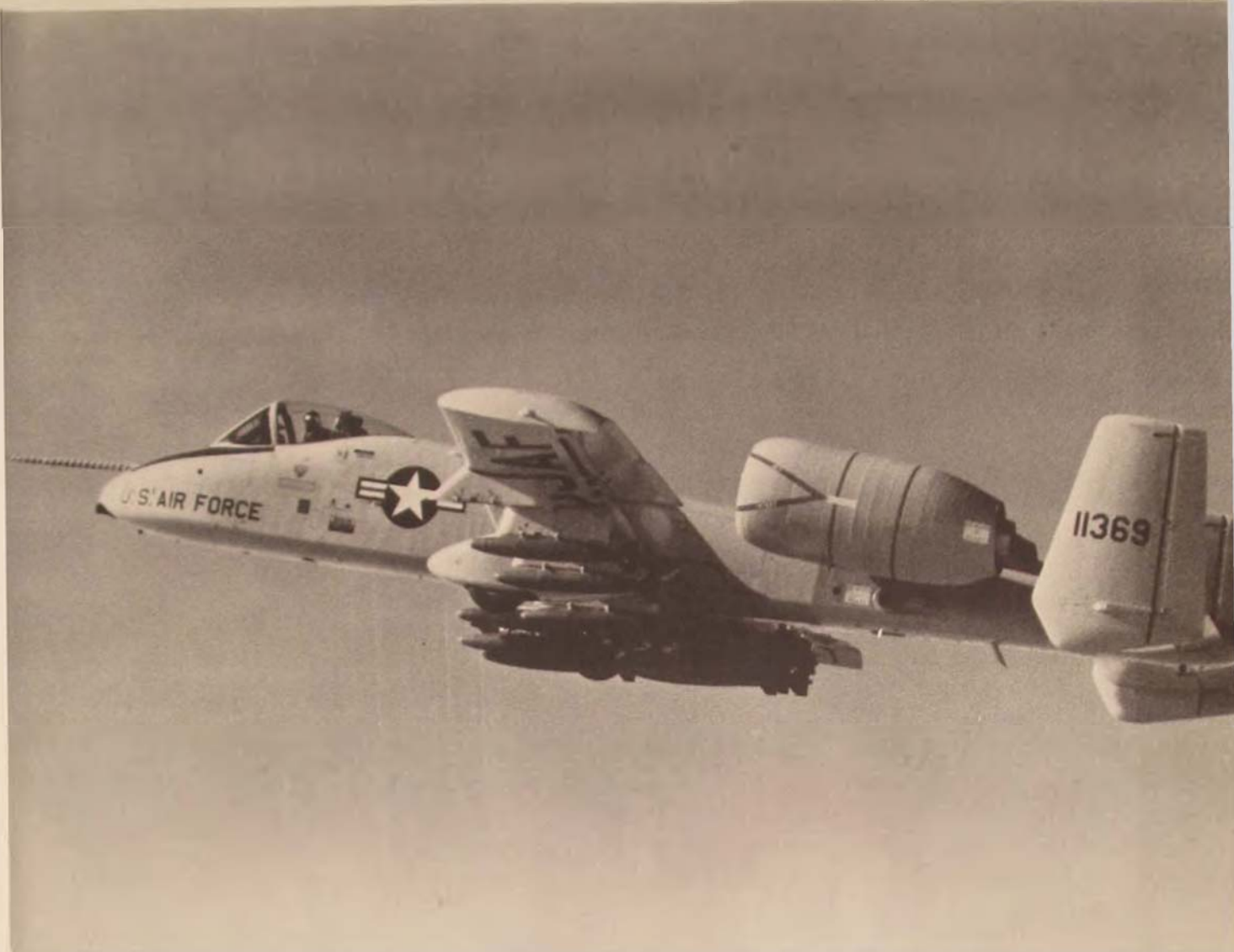
(like the attack radar) and extensive hardware testing to verify that design specifications were being met within cost goals.

The B-1 program is a classic fly-before-buy example. The A-X development concept went one step further: it was keyed to a competitive prototype selection of a development contractor. In addition, firm price proposals were required from each of the contractors before the end of the competition, thereby giving assurance that the Air Force objective of low cost can be met.

A further step beyond the A-X program is the structuring of the advanced prototyping program. Here the objective is to provide prototype hardware with which the Air Force can test and evaluate new design concepts, relevant technology, and military usefulness as they apply to anticipated requirements. This, in turn, will reduce the uncertainties of possible future developments in terms of technology, operations, performance, cost, and scheduling.

Basically, however, the major motivation for the advanced prototyping program was the possibility of making further significant improvements in the acquisition process itself. In
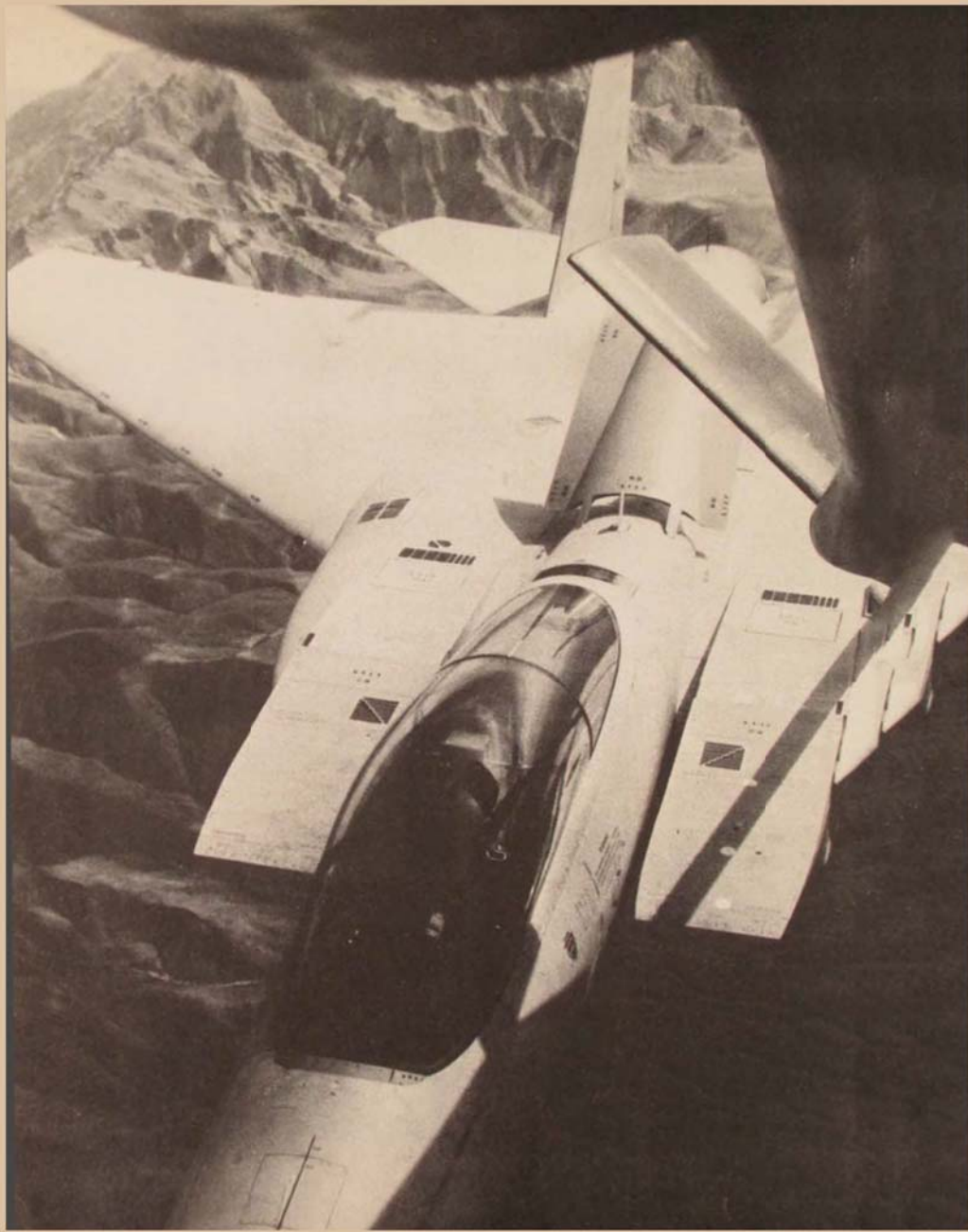
Another product of the flexibility in the acquisition process is the F-15 (opposite, refueling), intended for air superiority in the 1975–85 period. ... The Advanced Medium STOL Transport (AMST) is in the contract stage of developing prototypes by McDonnell Douglas and Boeing (the latter's concept illustrated at right).

the management approach fashioned for these projects the Air Force retains responsibility for establishing technology objectives, for maintaining the proper balance between the objectives and program progress, and for evaluating the final results of the project. The contractor is assigned responsibility for establishing the technical approach, for study design and fabrication standards, and for exercising adequate management control of the project.

Each project office is manned by a small team of from three to five men, supported by AFSC's laboratories, centers, and product divisions. This is in contrast to the 50- to 400-man system program offices that are found in full-scale development and production efforts for major programs. The industry teams should experience the same order of manpower

benefits because of the close working relationship and reduced manpower complexity.

The advanced prototyping program has moved closer to realization with the awarding of contracts to General Dynamics and Northrop to build two lightweight fighter (LWF) prototype aircraft. Technically, the LWF project was fashioned to achieve extremely high maneuverability while still maintaining precise control. There is no Air Force commitment to production of these vehicles.

The Advanced Medium STOL Transport (AMST) is another project in this category. It is to be a medium-weight, high-performance aircraft that can operate in and out of austere short landing strips. The project is scoped to provide data on the cost and design features associated with short-field performance in an

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aircraft of the C-130 class. McDonnell Douglas and Boeing have been awarded contracts to develop AMST prototypes.

digital avionics

The concept of modularity is another interesting example of a way to structure development programs. The aim is to design a system to some minimum performance level but provide flexibility in the design so that performance growth can be achieved through modular (or "building block") modifications. This is not a simple thing to do, but neither is it simple to restructure our defense posture every few years as machines are made obsolete by new technology or changes in the potential threat.

One form of modularity being advocated today is in avionics. A series of programs is being launched to prove the feasibility and desirability of a digital avionics concept. Digital avionics uses the same principles employed in the modern computer: physical characteristics are converted to numbers represented by a series of discrete ones and zeros or on and off switches. (The older analog systems use continuously varying electric characteristics to represent physical characteristics; for example, a varying voltage to represent temperature change or fuel level, as in a car.) The essence of the digital avionics concept is that airborne electronic subsystems—software, computers, sensors, displays, controls, and the like—are integrated via this discrete (digital) process for managing the resources of the aircraft. The beauty is that no major technological advances are required; the concept requires only the bringing together of existing and proven technologies in a total system of on-board equipment and two-way data and control linkages between large numbers of aircraft and ground (or airborne) terminals.

The end product will be a highly automated system that is far more responsive to command and control and makes better use of the pilot's decision-making capabilities than today's analog systems. Beyond that, digital avionics appears capable of slowing the accelerating cost-growth characteristics of the way we now design, produce, operate, and maintain electronic subsystems. As an example, we can expect a 32 percent weight and 17 percent volume savings in power-distribution systems alone.

Lower costs will also accrue from commonality of components among different types of aircraft, as well as from the basic modularity whereby added capability, as required, can be "plugged in" to the core system. These same characteristics, of course, should substantially improve reliability and maintainability, helping to bring the operations and maintenance (O&M) costs of new weapon systems down to a tolerable level. After all, the investment cost of avionics on today's typical attack aircraft represents 30 percent to 40 percent of the total system cost, and in too many cases a few years of maintenance cost more than equals the original investment.

All in all, the digital avionics approach is doubly attractive, from the standpoint of reduced initial and total life-cycle costs and from the standpoint of the marked improvements in performance that it promises.

Improving Acquisition

Accelerating competition for public funds, coupled with increasing cost of individual weapon systems, decreasing purchasing power of the dollar, and increasing personnel cost, is reducing the number of new weapon system program starts. (Figure 1) In addition, defense hardware acquisition costs have been rising over the past 20 years at roughly five times the rate of inflation. There are simply not enough funds available to replace the existing force structure at parity within foreseeable budget limitations and at the same time to match currently planned forces with currently projected equipment costs.

Control of system costs therefore becomes a

Figure 1

A2D
F4D
F3H
X-3
A-3D
S-2
F-100
F10F
B57
F-102
F-104
SP-5
B-66
F11F | C-97
C-123 | C-121
F-101 | C-124
F-8 | C-130
F-105 | C-133
F5D | C-135
F-107 | B-52
F-106 | B-58 | A-6
E-1 | YB-60 | E-2
F-4 | YP-6M | C-140
A-5 | P-3A | X-21 | C-141
X-15 | R-3Y | C-2 | YF-12 | S-3
 | | F-111 | XB-70 | F-14
 | | XC-142 | FB-111 | F-15
 | | A-7 | C-5 | A-X | B-1
 | | | | LWF | MST

ode 1st flight   1950s   1960s   1970s
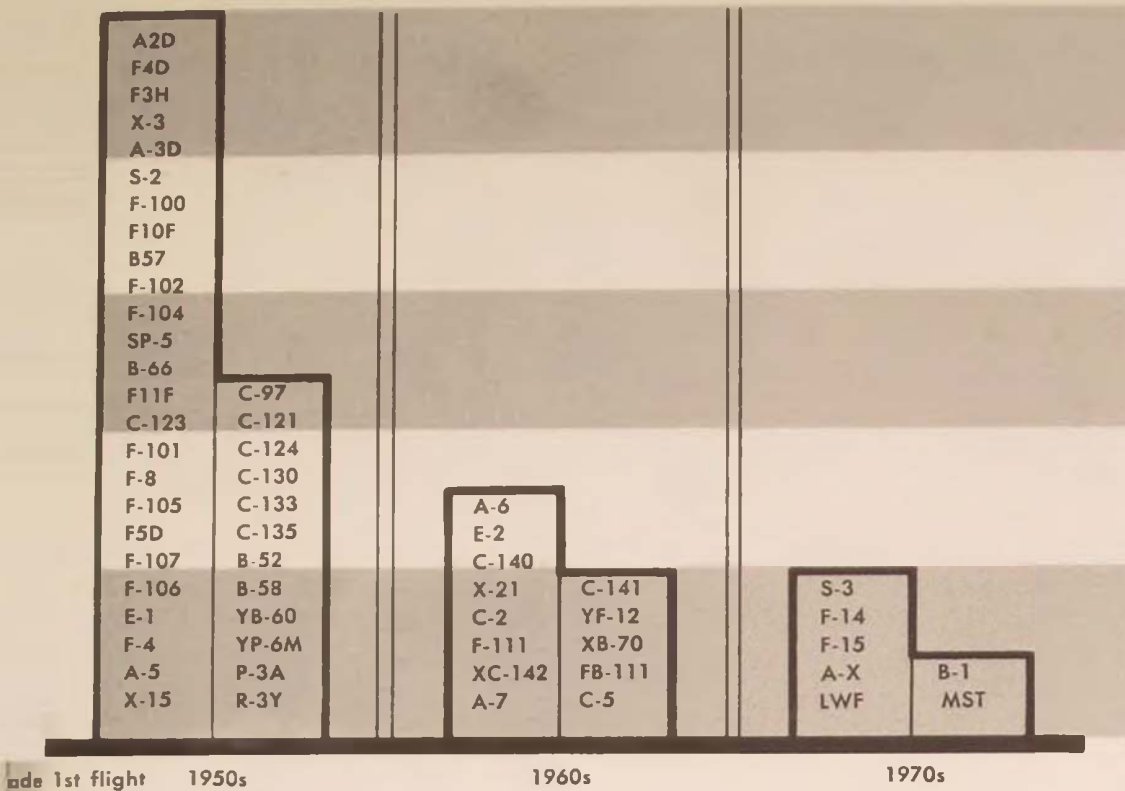
Department of Defense aircraft systems initiated in the 1950s–1970s provide graphic evidence of the fiscal pressure occasioned by the national policy of cutting down on military expenditures. (Left half of column, gross weight 25,000–100,000 lb; right half, greater than 100,000 lb)

categorical imperative. To that end, a number of promising steps are being taken. One is to curtail the management bureaucracy in order to alleviate the overlapping paper work and ease the compounding "people costs" problems. Another is to simplify procurement techniques, for the benefit of both the Air Force and the contractor. And we are also pursuing a variety of cost-reduction techniques.

streamlining management

Systems Command recognizes the importance of people and the role they play in acquisition management. Accordingly, the best personnel are being assigned to these jobs and given a clear mandate, flexibility to bring their own style of management into play, and longevity. Further, a "Blue Line" direct reporting chan-

nel exists from the System Program Director to the Commander of AFSC, to the USAF Chief of Staff, and to the Secretary of the Air Force in all matters that have a direct impact on his program.

Similarly, by shifting more responsibility to the contractor and backing it up by tight disciplinary measures, it should be possible to reduce the size of major SPO's significantly. The way has been shown by the advanced prototyping program, and, while by their very nature major SPO's cannot be that lean, there is unquestionably a middle ground that can reasonably be achieved.

Improvements in the procedures for controlling management systems are also under way. Emphasis is being placed on reducing the large number of documents and eliminating overlapping requirements used to specify conceptual
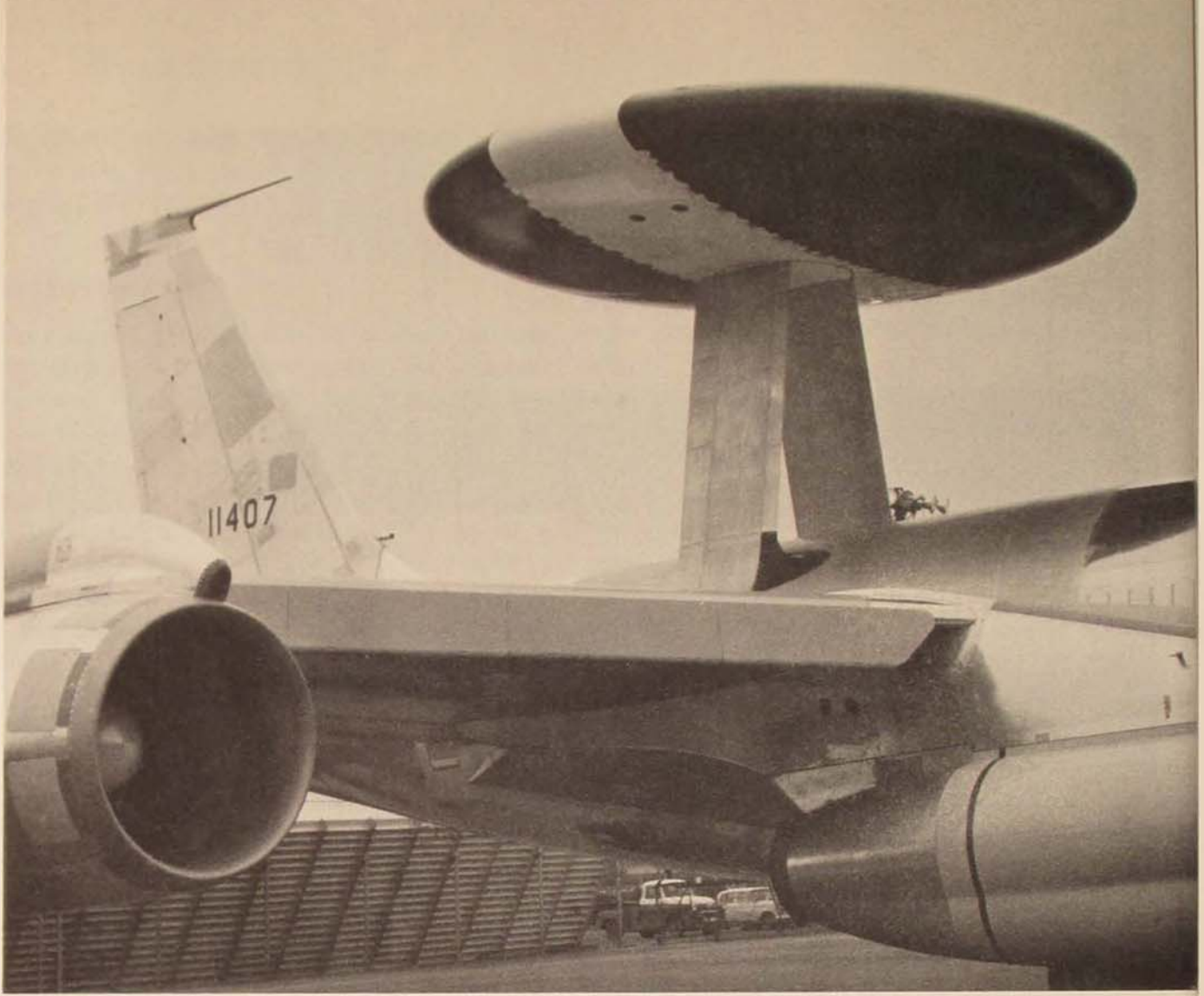
The Airborne Warning and Control System (AWACS), another product of AFSC development planning
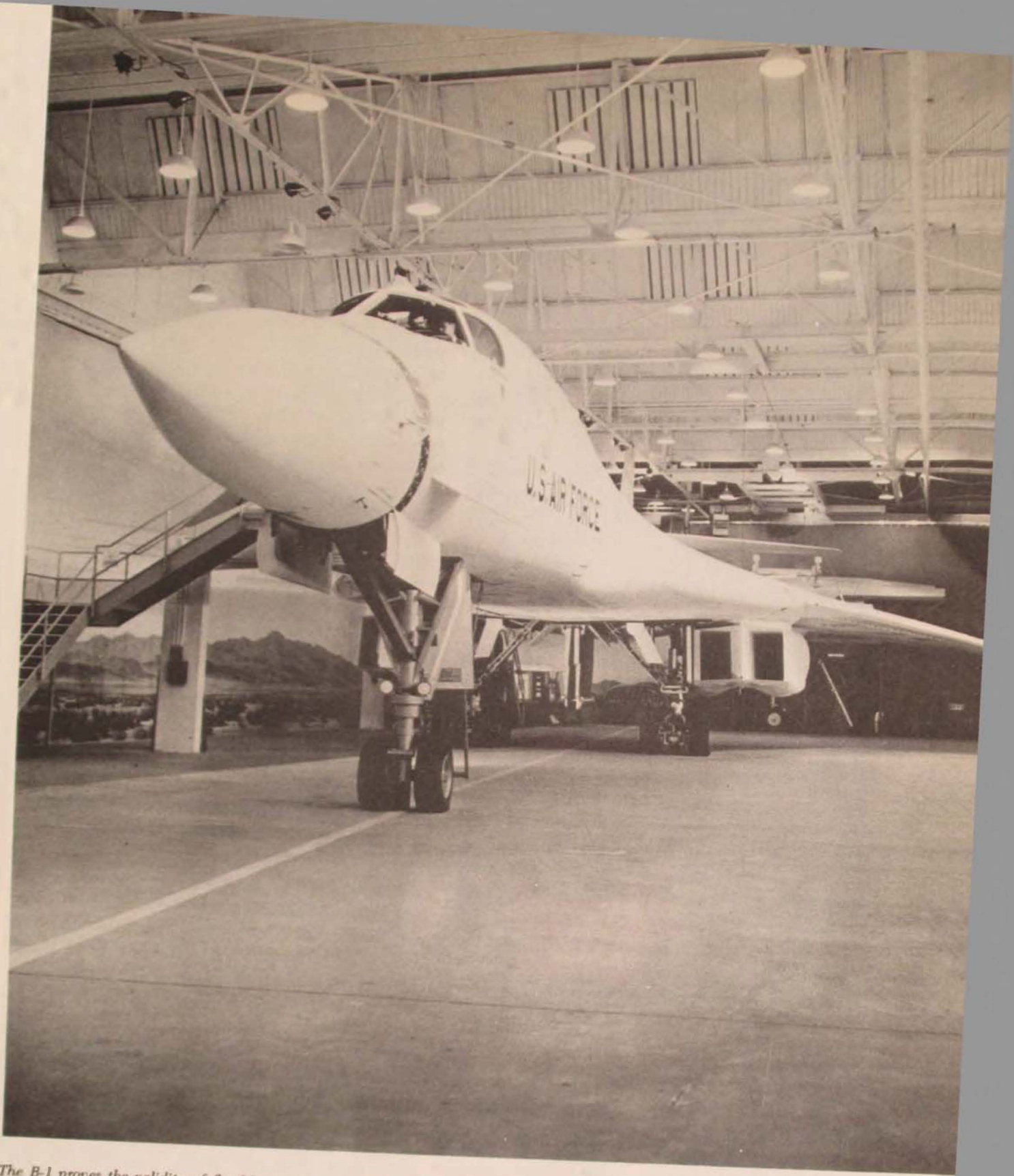
The B-1 proves the validity of flexible procurement techniques culminating in "fly before buy."

needs. The approach has been to establish first the requirements for management systems and then identify documents pertaining to them.

tightening procurement

At the heart of every weapon system acquisition program lurks a requirement for a Request for Proposal (RFP) and a Statement of Work (SOW). The mere simplification of RFP's and SOW's can substantially lower the cost of doing business, without sacrificing the program. Substantial progress has already been made in streamlining this mountain of paper.

Under older system-management concepts, a considerable amount of Air Force management and documentation was called for. The A-X was the first major program to depart from such practices by minimizing documentation. The A-X RFP totaled only 102 pages, as compared to the several hundred pages normally sent to the contractors. In the advanced prototyping program we have done even better; the RFP for the lightweight fighter was only 38 pages, including model contract. And while this is primarily a technology-oriented program, the intent is clear, and slimmed-down documentation will be the order of the day.

New approaches in the source selection process can also bring substantial gains. Here the idea is to narrow the base to those contractors who have been screened and found fully qualified to do the work in question. One of the factors used to determine eligibility is past performance. RFP's are then sent only to those selected by the screening process.

In the case of the lightweight fighter, RFP's were issued only to the firms already screened by the Prototype Program Office of Aeronautical Systems Division and known to be capable of performing in the fighter design area.

In another direction, a parts control program has been established to eliminate the proliferation of nonstandard parts during the design process. Here the prime contractor will be called upon to share more of the responsibility for supervising his subcontractors, and the latitude of the subs will have to be reduced. Program architects, development planners, and industry will have to break the habit of redesigning or reinventing every piece of equipment and subsystem that goes into each new weapon system. The system's development team and industry *must* be impelled to thinking in terms of designing around *proven* off-the-shelf equipment. The same applies to the use of government-furnished equipment (GFE).

Redevelopment practices are responsible for many increases in the cost of new weapon systems. Being technology-oriented, our engineers sometimes are too much inclined to use technology to improve performance rather than to reduce costs. An increase in performance, more often than not, means development of a new item. Thus, another item is added to the inventory, training time for maintenance personnel is increased, more data are generated, and so on down the line. Today, as a result of that sort of process, there are almost 1200 different cartridge and propellant-actuated devices, 104 different tires and tubes, and 56 different airborne radio sets in the inventory. So it is very clear that technology must be utilized to cut costs; components and subsystems must be standardized; GFE must be utilized to a greater extent; and the concept of modularity and digital avionics must be exploited to the maximum degree.

The concept of "should cost" reviews holds out great promise—indeed it has already been used in a number of programs with spectacular results. Should cost reviews are a special, coordinated, in-depth procurement cost analysis to determine the amount that the procurement ought to cost, given attainable efficiency and economy of operation. This technique gives negotiating teams an alternative to relying on contractors' historical cost patterns, which often are already inflated by previous inefficiencies. It develops a better quality of data than that normally made available to the contract negotiator. It provides longer-term
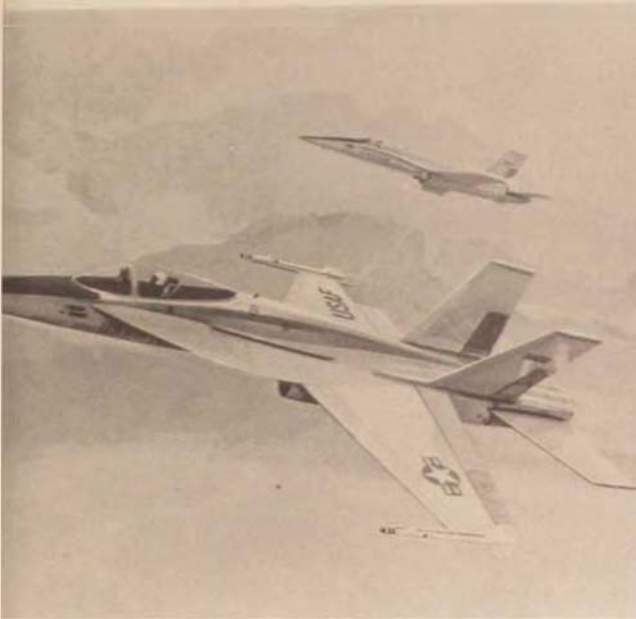
recommendations developed to correct—rather than perpetuate—contractor inefficiencies. And it provides a stimulus to motivate sole-source contractors to make improvements through better control and more aggressive management. Should cost review teams in the design and production areas are going to be expanded to force lower cost assembly.

reducing cost

Emphasis on life cycle cost (LCC) is a logical step in reducing operations, maintenance, and support costs. LCC encompasses the total cost to the Air Force of developing and acquiring a system, training crews to operate and maintain it, all the other costs associated with supporting the operations and maintenance structure, and,

at least in some cases, the cost of disposal. The real challenge is in how to project what the life cycle cost of a new or proposed development will be; or, more to the point, how to develop and acquire a system that will represent the lowest attainable life cycle cost for a given in-service performance.

Intuitively, one recognizes that any given system will have a "minimum" life cycle cost. It is always possible to spend more and more acquisition dollars to get more effective operation, reliability, and logistic support and thereby come up with a system that is less costly, in the long run, to operate and maintain. The theory is indisputable. In practice, however, it is far from being a nicely calculable mathematical science to know how many additional acquisition dollars to spend,

and where, and how many ownership dollars will be required to keep the system operational.

And yet, reality demands that the attempt be made. Both Air Force Systems Command and Air Force Logistics Command have made life cycle costing a fundamental way of doing business. A study has recently been completed to determine the long-term AFSC/AFLC life cycle cost objective, to identify the additional tools needed for LCC estimating relationships and models, to select meaningful data for expanding the data base, and to develop working-level expertise. The study recommendations have been approved and implemented by the Commanders of AFSC and AFLC.

The Air Force is also supporting the concept that price will often be the most important single specification for a new weapon system. "Design to Cost" levels have already been placed on the AMST ($5 million flyaway cost for the 300th production article) and the A-X ($1.4 million average flyaway cost per aircraft in a 600-aircraft buy). The A-X system target price was established on the basis of cost trade-off studies during the conceptual phase. Once the performance and the target unit prices were established, the design to a price ceiling focused the contractor's attention on cost during the design phase. Thus, through this method, contractors are encouraged to use low-cost design techniques and proven off-the-shelf equipment and components and to minimize manufacturing and tooling costs.

As REAFFIRMED HERE, planning for the development of a major weapon system is a complicated, demanding, and often frustrating business. Changes in technology, potential threat, and resources occur almost daily and impact on the process. This article could cover only a few of the ways being pursued by Systems Command to accommodate to these changes and provide options for the future of the Air Force. Necessarily, the emphasis has been on the way business is done, for the simple reason that the acquisition practices of the past have finally intersected with the realistic resource constraints on what the American people are willing and able to expend on military commitments.

If there is to *be* a future for the Air Force, new ways of doing business must be found and exploited. There will have to be a virtual revolution—of which the beginnings have already been undertaken—in the way we design, develop, acquire, operate, and maintain our weapon and support systems. USAF development planners are at work on an Air Force that will not only be effective against any threat it may face but also be an Air Force that the nation can afford.

Hq Air Force Systems Command

Note

1. Major General Donavon F. Smith, "Development Planning: A Link Between Requirements and Systems," *Air University Review,* XXII, 1 (November-December 1970), 11–18.

REALISTIC DOCTRINE

Basic Thinking Today

Captain Raymond S. Blunt

Captain Thomas O. Cason

Air Force doctrine is not a thing apart nor a code sufficient unto itself. The Air Force is a national instrument and evolves no doctrine, makes no plans, and makes no preparations other than those clearly and unmistakably called for or anticipated by the national policy.

GENERAL THOMAS D. WHITE[1]

T HE STUDY of economics has often half humorously been referred to as "the dismal science."[2] To those students puzzling over a confusing array of demand, supply, cost, and revenue curves, this might seem a rather apt label. The student of military affairs would perhaps likewise assign to military doctrine a similar epithet.

In fact, Dr. Robert Futrell, in his definitive study of the development of basic thought in the Air Force, identified the predilection of AF leaders for action rather than thinking and writing as a major reason for the slow development of a significant body of Air Force doctrine.[3] While the study of Air Force doctrine may not rank in excitement with the strapping of oneself to a jet engine or with seeing the bottom of one's in-basket, it is nevertheless a critical area for concern by those in the military profession. In fact, in any true profession, the study, understanding, and development of fundamental guiding principles is an essential for members of that profession.

In the military, intellectual fogginess or misunderstanding can be the precursor of loss of life, whether it be the lives of those whom we are sworn to protect or the lives of men in battle. In a similar vein, in a time of clarifying and redefining national priorities, our profession must be able to explain clearly and logically why *what we believe* is of importance to the security of our nation. This explanation is important both to ourselves and to those who must make the decisions on national priorities. Thus doctrine acts as a definitive and accepted guideline in times of peace and war for the development and employment of the force that is unique to our service.

In its most basic form, doctrine, to paraphrase General White, is a conduit of thought between the interests and objectives of our nation and the plans and preparations that involve our daily lives as military men. Between these two poles lie certain layers of abstracted thinking. This is not to say that doctrine ignores the lessons of history and experience, the principles of war, and other traditional sources of military thinking. Doctrine is still in essence what we believe. Yet doctrine should be viewed as a way to incorporate proven and sound ideas within the intellectual framework established by the people and leaders of our nation.

The year 1971 marked something of a milestone in military thinking in general and Air Force thinking in particular. The first key development was the issuance of Secretary of Defense Melvin R. Laird's budget statement to the House Armed Services Committee.[4] This defense report was to be the best defined and most widely distributed statement yet of the meshing of foreign policy and national security

policy and strategy. The second key event was the long-awaited publication of the new Air Force Manual 1–1, *United States Air Force Basic Doctrine.*[5] It had been seven years since this manual was updated, a period of some upheaval in military thought that had yet to be reflected in printed doctrinal change.

In this article, we will attempt to sketch briefly the general guidance offered in Secretary Laird's defense report, to show some of the more important changes in Air Force thought, to define the nature of the relationship between the two key documents mentioned, and, finally, to show some of the inconsistencies between the two and suggest some ways to relate Air Force doctrine more clearly to our evolving national security strategy.

S ECRETARY Laird's Fiscal Year 1972 Defense Budget message, entitled "Toward a National Security Strategy of Realistic Deterrence," was followed in February 1972 by his FY 73 Defense Budget message, entitled "National Security Strategy of Realistic Deterrence."[6] Together, these two published reports constitute a statement of the national security strategy of the Nixon Administration. Realistic deterrence has as its ultimate purpose to discourage (and ultimately eliminate) the use of military force as a means by which one country imposes its will on another. Although this purpose is not profoundly different from the purposes of previous national security strategies, the plans for implementing the strategy, as well as the *attitudes* of the planners, are different. To implement the realistic deterrence strategy, the United States seeks to deter conflict at all levels. Secretary Laird described this new strategy in these terms:

> The Strategy of Realistic Deterrence will provide through sufficient strength and full partnership the indispensable and realistic basis for effective free world negotiation. Most importantly, it was designed not to manage crisis but to prevent wars.[7]

This strategy is based on the Nixon Doctrine

and reinforces the three pillars of the Nixon foreign policy: strength, partnership, and willingness to negotiate. Secretary Laird set forth the basic criteria for national security planning, and it is from these criteria that the design and structure of the national security forces are molded. The translation of these criteria into forces necessitated some new thinking and new approaches.

In the strategy of realistic deterrence, two new concepts or emphases were introduced: net assessment and total force planning. Each of these concepts is an integral part of realistic deterrence and must be understood in order to appreciate fully the implementation of realistic deterrence.

Secretary Laird described net assessment as

> . . . a comparative analysis of those factors, military, technological, political, and economic which impede or have a potential to impede our national security objectives with those factors available or potentially available to enhance the accomplishment of those objectives. Through this process we are able to determine how to apply our resources most effectively in order to improve our total capability to accomplish our national security goals.[8]

The results of net assessment become the bases for force planning because it is in such analyses that deficiencies and surpluses in force levels are revealed. Net assessment is linked to four realities: strategic, political, fiscal, and manpower. These realities must be a part of any comprehensive analyses relating to national security planning.

Total force planning emphasizes burden-sharing and partnership as it applies to military forces for deterrence. Secretary Laird has described total force planning as meaning

> . . . to plan for optimum use of all military and related resources available to meet the requirements of Free World security. These Free World Military and related resources include both active and reserve components of the US forces, those of our allies, and additional military capabilities of our allies that will be made available through local efforts, or through provision of appropriate security assistance programs.[9]

Total force planning is primarily concerned

firepower

| subtheater conventional | theater conventional | theater nuclear | strategic nuclear |

crisis

The spectrum of potential international conflict
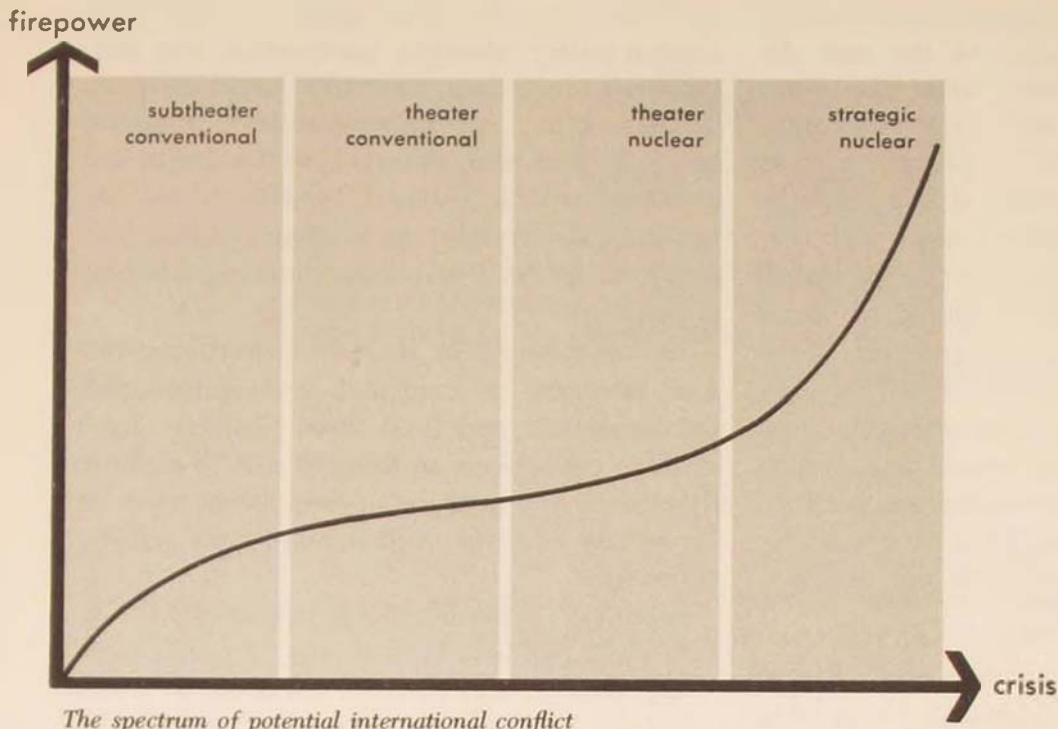
with conventional forces although some total force planning involves the nuclear forces of our allies. Secretary Laird lists a number of guidelines in force planning to achieve the total force concept and breaks the total force planning into four categories, each of which involves a different role and responsibility for U.S. forces. Total force planning must be based on the results of net assessment and must be in terms of both short-term and long-term requirements. These requirements must ultimately be translated into a force structure.

Secretary Laird views deterrence in terms of the entire spectrum of potential international conflict and has set forth four basic levels of potential warfare. (See chart.) The variables in this spectrum, firepower and crisis, depict a general relationship: as the intensity of the crisis increases, the potential amount of firepower applied to that crisis also increases. Although these warfare levels are somewhat artificial, they do differentiate between the

fundamental levels of U.S. interest, responsibility, and potential involvement. Forces adequate for simultaneously deterring conflict at each of these levels should provide a total capability for deterring conflict throughout the spectrum. Equally important, these forces must be adequate *to meet* the threat should deterrence fail. The role and responsibility of the U.S. military forces and the overall involvement of the U.S. vary within the spectrum. At this point a brief examination of each of these four levels of conflict is in order.

• Strategic nuclear warfare involves the use of nuclear weapons in a direct attack on the United States. The primary responsibility for deterring such warfare rests with U.S. strategic forces. President Nixon has labeled the U.S. nuclear strategy "nuclear sufficiency" and has described it in these terms:

. . . sufficiency means the maintenance of forces adequate to prevent us and our allies from being coerced. Thus the relationship between our strate-

gic forces and those of the Soviet Union must be such that our ability and resolve to protect our vital security interests will not be underestimated.[10]

* * *

Particularly significant is the absence of nuclear superiority and the emphasis on the relationship between U.S. and Soviet forces (i.e., net assessment). To implement nuclear sufficiency the U.S. must meet these four criteria:

1. Maintain an adequate second-strike capability to deter an all-out surprise attack on our strategic forces.

2. Provide no incentive for the Soviet Union to strike the U.S. first in a crisis.

3. Prevent the Soviet Union from gaining the ability to cause *considerably* greater urban/industrial destruction than the U.S. could inflict on the Soviet Union in a nuclear war.

4. Defend against small attacks or accidental launches from any source.

By developing and maintaining forces capable of satisfying these criteria, the U.S. can deter strategic nuclear warfare.

• Theater nuclear warfare involves the enemy use of nuclear weapons overseas without a direct attack on the United States. The U.S. has the primary role for deterring conflict at this level, but the nuclear forces of our allies do share the role. The critical requirement of our strategy at this level is that we have theater forces capable of *deterring* or meeting not only a theater nuclear attack but an all-out conventional attack by the Soviet Union on NATO Europe or by China on our Asian allies.

• Theater conventional warfare is a major *nonnuclear* war involving the Soviet Union or China; at this level of warfare the U.S. and its allies share the responsibility for deterring or meeting conflict. Secretary Laird has described U.S. strategy at this level as

. . . general purpose forces in peacetime to be adequate for simultaneously meeting together with our allies a major communist attack in either Europe or Asia, assisting allies against non-Chinese threats in Asia, and contending with a minor contingency elsewhere.[11]

It is at this level that total force planning based on net assessment seems most evident and most critical.

• Subtheater conventional warfare is nonnuclear warfare that does not involve a direct conflict with either the U.S.S.R. or China. It represents the most likely kind of conflict. Responsibility for deterring or meeting conflict at this level rests primarily with our allies, the U.S. providing both economic and military assistance (i.e., Security Assistance Program) where U.S. interests are involved. The U.S. maintains no special forces to deter conflict at this level; rather, it maintains the capability of employing general purpose forces to deter or meet a conflict should U.S. interests dictate.

Although Secretary Laird has presented only four levels of conflict and has described how the U.S. will deter conflict at each of these levels, one must remember that the U.S. objective is to deter conflict at all levels. The force structure and strategy of U.S. military forces, in conjunction with the forces of our allies, are designed to achieve deterrence across the entire spectrum and to meet any threat should deterrence fail. U.S. Air Force doctrine then must, first, provide options to achieve deterrence and, second, provide options to meet any threat should deterrence fail.

IN IDENTIFYING some of the major changes in Air Force doctrine, one may best begin by looking at the changes in overall philosophy. Basic doctrine can essentially be broken down into two categories: dynamic and static. Tasks, characteristics, and capabilities fall into the latter category. Dynamic doctrine, that which is subject to change, is essentially concerned with preventing conflict and, failing that, with pursuing conflict. It is in this area that the major philosophical changes have taken place. Preventing conflict is deterrence and constitutes one major philosophical idea that has evolved markedly. The pursuit of conflict entails what the Air Force is capable of doing should deterrence

fail: the options or capabilities that we offer to our national decision-makers. These options have also undergone change to some extent.

Probably the primary shift in the concept of deterrence lies in the condition upon which deterrence is based. Previously this basis was that of strategic superiority. In discussing deterrence, the 1964 manual stated:

> Of utmost importance, however, is that we maintain superior capabilities for the higher intensities of war. Such a posture makes it evident to an enemy that if conflict escalates the advantage will become more and more clearly ours.[12]

Such a status was to give a "clear advantage in the capability to destroy selectively the enemy's *military forces.*" [13] (Emphasis added.) The crux of the deterrence process was seen to be "dependent on a credible capability to raise the threshold of conflict to a level at which the United States and its allies can hold the advantage." [14] Thus deterrence was based not only on superior capabilities, particularly those at the upper end of the conflict spectrum, but also on a stated credibility of escalation.

How has this idea evolved in seven years? Today, the basis of deterrence is viewed not as superiority but as force sufficiency—a somewhat nebulous yet adequate term that describes the shift in doctrinal thinking. As defined in the new AFM 1–1, sufficiency is

> That degree of military power which can be expected to deter a potential enemy from attacking the United States and its allies. In addition it is that degree of military power which provides national leaders with the flexibility to exercise a wide range of political and military initiatives.[15]

It is, then, a level of force that will at once deter and provide options. Sufficiency is further broken down into two basic components: assured destruction and damage limitation. Assured destruction is the capability to survive an all-out surprise nuclear attack and respond with sufficient strength to destroy the enemy as a viable society. Damage limitation is the capability to limit, to some extent, the damage an aggressor can inflict on our nation. In addition,

sufficiency is presented as being best achieved through a mixed force of manned and unmanned offensive and defensive systems. However, force sufficiency is a concept applicable mainly to the strategic area. In discussing deterrence against hostilities initiated by small powers, *Basic Doctrine* refers to strategic force sufficiency as being possibly inadequate against small power threats and states:

> Deterrence of these threats comes from the maintenance of sufficient general purpose forces capable of rapid deployment and sustained operations combined with the national resolve to deploy and employ these forces.[16]

A sufficient combination, then, of strategic and general purpose forces is needed to ensure adequate deterrence.

The change involved is more than a matter of semantical substitution of *sufficiency* for *superiority.* While remaining a general term in keeping with the fundamental nature of doctrine, *sufficiency* nevertheless describes a rather profound philosophical break with past thinking. Strategic *superiority* called for clear-cut advantages: the capability for selective destruction of an enemy's military forces and a willingness to escalate to higher conflict levels where U.S. superiority would coerce enemy action. *Sufficiency*, on the other hand, emphasizes forces that are adequate to deter and forces that offer a wide flexibility in possible application. The new manual, when addressing deterrence, leaves out the previous discussion of the capability to selectively destroy the enemy's military forces and the capability to escalate to a higher level of conflict. This is a tacit admission of retaliatory force structuring focused on enemy urban/industrial areas. Large and small power threats are dealt with in the new manual in a discrete manner. The only real ambiguity lies in the discussion of damage limitation, which is an older concept not totally divorced from the need for clear-cut superiority. This ambiguity will be discussed later.

A second philosophical shift is evident in the discussion of the options and operations the Air

firepower

| subtheater conventional | theater conventional | theater nuclear | strategic nuclear |

| special operations | conventional operations | low-intensity nuclear operations | high-intensity nuclear operations |

crisis
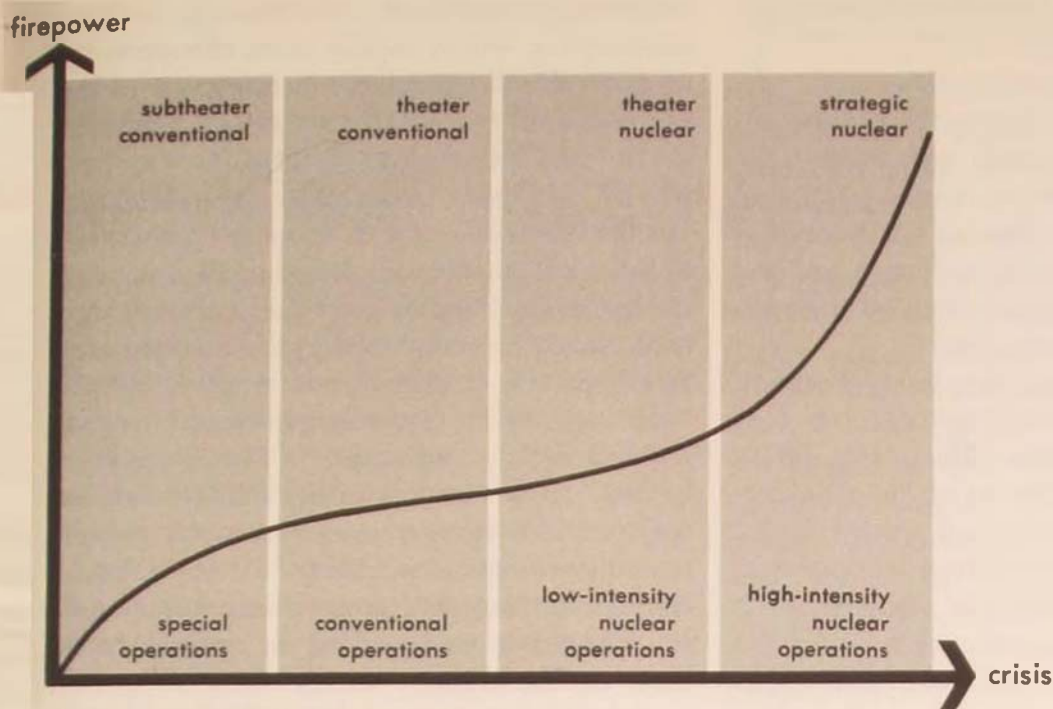
Aerospace operations in modern conflict

Force is capable of should deterrence fail. In the treatment of the role of the Air Force in conflict, the spectrum of potential international conflict is used in both the old and the new manuals to describe what is termed "the nature of modern conflict." The 1964 manual detailed some general levels of conflict ranging from counterinsurgency to general war. The 1971 manual indicated dissatisfaction with this categorizing and instead chose to group Air Force efforts under four separate rubrics, which outline four general options or operations the Air Force can offer national decision-makers throughout the spectrum of conflict. (See Aerospace Operations Chart.) A separate chapter is devoted to each of these operations. This is perhaps nothing more than a rearrangement, but it does serve to highlight the flexible nature of aerospace operations in dealing with conflict rather than prescribe courses of action in the conflict itself.

As to substantive changes in the general options themselves, there is apparently very little divergence from the thinking of seven years ago. Editorial and organizational changes seem to be the major extent of change, plus accommodation to various interests within the Air Force. However, some subtle but nonetheless profound changes exist in the options and operations presented in *Basic Doctrine*.

The lowest-level option offered by the Air Force at the lowest level of conflict is special operations. There is a definite change here. Even the switch of terminology, from *counterinsurgency* to *special operations*, tells a tale. It suggests a reduction from active effort to one emphasizing support, training, and assistance. The old manual, in contrast, detailed the use of direct air action against insurgents and interdiction of external support. Also joint service, multiagency, and indigenous involvement are stressed in the new version, while the old version seemed

to imply that unilateral Air Force effort might be effective.

Conventional operations continue to be divided into three distinct forms: the probing attack and the operations with and without the enemy having adjacent sanctuary. No real changes exist here other than an admission that conventional operations are no longer confined to tactical air operations but have been broadened to include strategic systems.

Low-intensity nuclear operations (formerly tactical nuclear operations) constitute an area of significant development. The major philosophical shift concerns the use of low-yield nuclear weapons and the limited use of larger nuclear weapons. Previously these were viewed to some extent as substitutes for manpower and resources, a point of view prominent during the Dulles era of massive retaliation. Also there was some tendency to treat the use of nuclear weapons as a natural progression of firepower to be used in almost any situation, such as against enemy aircraft and in interdiction and close air support. The new version is more cautious about the introduction of nuclear weapons in a conflict situation and ties them more to the achievement of specific objectives than to particular military advantages:

> Employment of nuclear weapons in any conflict requires special emphasis on command and control procedures to insure that weapons employment is in consonance with specified political-military objectives.[17]

By dividing low-intensity nuclear operations into two categories, namely tactical nuclear operations and operations against a major power, another distinct difference is recognized. Previously, the selected, precise usage of nuclear weapons against a major power was considered to be of such gravity as to be part of a general war situation; now, such operations are considered to be one step back from the abyss of unrestrained nuclear war.

The discussion of high-intensity nuclear operations, or, as previously stated, general war, contains an extension of the ideas developed under deterrence. Gone are old terms such as *counterforce,* which implies levels of superiority in general war. Also gone is discussion of the requirement for superiority and of U.S. first-strike considerations. In its place is treatment of the two components of force sufficiency—assured destruction and damage limitation—and their relation to nuclear operations against enemy military forces and enemy urban/industrial areas. Curiously, the approach in pursuing this type of conflict is to employ initially "only a military targeting philosophy regardless of relative strength."[18] The purpose is to hold an adversary's cities hostage. Retaliatory attacks against urban/industrial centers are viewed as most likely to come about through "miscalculation or misinterpretation of the magnitude or intent of an opponent's attacks against military forces."[19] This appears to be a counterforce strategy without calling for a counterforce capability. It also seems to conflict with the retaliatory countervalue approach outlined in the discussion on deterrence. More will be said about this later.

It should be evident by now that there has been a rather obvious influence of the thinking embodied in Secretary Laird's defense statements on the new AFM 1–1. This, of course, is not surprising. Defense thinking is an evolutionary process, and while *Basic Doctrine* may not have been derived from the thinking embodied in realistic deterrence, it was subject to the same contemporary influences.

This is evident particularly regarding the subject of deterrence. Both the Defense Reports and *Basic Doctrine* view deterrence at the upper levels as being based on the idea of a sufficiency of nuclear strength. Even though the terminology is somewhat different *(nuclear sufficiency* as opposed to *force sufficiency),* the basic concepts are somewhat similar. Both decry the need for superiority, and both view as key a retaliatory posture that can survive an all-out surprise attack while retaining the capability to destroy the enemy as a viable society. Both also view mobile, general purpose forces

as being important for deterrence at lower levels of conflict.

In the pursuit of conflict, similarities also exist. *Basic Doctrine* stresses flexibility and the possession of several viable options across the spectrum of conflict as being key to the effective prosecution of war. This need for options and flexibility is also strongly inherent in our evolving national security strategy. An example of this search for options and flexibility lies in the discussion of the role of the Air Force in special operations. *Basic Doctrine* places small emphasis on *active* U.S. involvement in such low-level crises, instead placing the main thrust on training, equipping, advising, and encouraging indigenous forces. This is the same approach as indicated in the Laird Defense Report concerning aspects of subtheater conventional conflict. Thus, prescription of military options at even the lowest level of conflict is consistent with policy guidance as stated in the Nixon Doctrine and the realistic deterrence strategy.

While similarities in basic doctrine and realistic deterrence abound, dissimilarities are nevertheless present. In describing changes in the current *Basic Doctrine* manual, one runs across an apparent inconsistency in what doctrine is supposed to be in the first place. To some, doctrine is literally what we believe, "we" meaning the corporate Air Force. The other view holds to the idea stated by General White, that doctrine must necessarily be linked to our national objectives and national policy. There is actually little inconsistency between these two positions, however. In regard to the tasks, capabilities, efforts, and characteristics of our unique force, we can with little contradiction state what we believe. Yet when we come to articulating our role in deterrence and our role in the pursuit of conflict, the Air Force must operate within the framework of national policy. As stated in AFM 1-1:

> Military power is an instrument of national policy directed by civilian authority, and employed in support of national objectives. As such military

force must be structured to meet the various objectives of national policy.[20]

For the civilian authority to view Air Force options as relevant and usable in conflict situations, we must structure our thinking, our plans, and our forces in accordance with national policy; and since thought precedes action, our basic guidance should be the first area to reflect change. It matters little that we prescribe a broad range of capabilities and options if they are outside the framework of our national security policy and strategy. This does not mean that doctrine needs to be completely tied to the language of one particular administration. Yet doctrine must necessarily be consistent with our evolving national security strategy and policy. In this light, certain recommendations for changes to basic doctrine become clear.

DETERRENCE, being the fundamental military task and the primary aim of our national security strategy, is a good beginning point. A start has already been made in basing the Air Force articulation of deterrence and our role in it on the idea of sufficiency. Two things remain to be done: first, remove the vestiges of an old philosophy that have somehow been tied to today's view of deterrence; and second, state more clearly what is embodied in the idea of sufficiency.

At present, the Air Force statement of deterrence contains reference to two basic components of force sufficiency: assured destruction and damage limitation. *Basic Doctrine* also indicates that the best way of implementing force sufficiency is through the mixed force. Assured destruction is a given: it is a necessary portion of our deterrent philosophy and probably will continue to be so for the foreseeable future. Nevertheless, as a specific term, it has lost a certain degree of usefulness because of its ties to an earlier nuclear policy: flexible response. Assured destruction called for the capability to destroy a *fixed* percentage of the enemy urban/

industrial areas. President Nixon rejected this somewhat restrictive policy plus the use of the term *assured destruction:*

> . . . A simple "assured destruction" doctrine does not meet our present requirements for a flexible range of strategic options. No President should be left with only one strategic course of action, particularly that of ordering the mass destruction of enemy civilians and facilities.[21]

In essence, President Nixon asks for a broader, more flexible strategic posture.

Likewise, the second basic component of force sufficiency, damage limitation, has ties to an earlier era. It is a term that implies some level of superiority—an ability to destroy enemy forces on the ground (and in the air) while having enough forces left to meet a second-strike requirement against enemy urban/industrial centers. This concept calls for a force level and an approach that is not acceptable under the new thinking as set forth in the recent Defense Report; Secretary Laird outlined a requirement for only a very low level of ballistic missile and bomber defense.

As an alternative, and more in keeping with the approach embodied in realistic deterrence, sufficiency should be outlined in AFM 1–1 in terms of criteria to be continuously met. One of these criteria is a reliable, survivable retaliatory force posture. In addition, a minimum level of defense is essential to defend against small missile attacks or accidental launches, and a posture that does not provide the Soviet Union with a first-strike incentive is essential also. By casting aside terminology that may no longer communicate clearly and by adopting clearer guidance for sufficiency through specific criteria, the Air Force can definitely improve the enunciation of deterrence in *Basic Doctrine* and better fulfill its contribution to realistic deterrence strategy.

Related to this is a need to develop the idea of sufficiency in *Basic Doctrine* more fully. At present, this manual defines deterrence at both the upper and lower ends of the spectrum of conflict. Much like the massive retaliation strategy, *Basic Doctrine* combines a pervasive strategic nuclear policy with an imprecise conventional force policy to deter war. What is lacking is a coherent expression of how deterrence is to be effected against minor nuclear powers, against a major nuclear power in a theater conflict, and against either in a conventional conflict. In short, *Basic Doctrine* talks flexibility through the idea of a mixed force but fails to define exactly what the mixed force means in relation to deterrence at all levels and how the idea of sufficiency relates to this. Realistic deterrence calls not only for flexible options but also for deterrent positions in support of our national interest throughout the conflict spectrum. *Basic Doctrine* needs further clarification and development to explain this role adequately.

The options we possess can be effectively integrated to develop more fully the ideas of sufficiency and deterrence. This must be done clearly and unambiguously to fulfill the basic military task—deterrence—that we have been assigned.

In addition to deterrence, a second area in which doctrine can be more closely related to national policies is in one level of the pursuit of conflict, nuclear operations. It is in these operations that a fundamental inconsistency exists between the current *Basic Doctrine* and the current national security strategy of realistic deterrence. This inconsistency is both stated and implied. We need to analyze two facets of nuclear operations and strategy: first, we must examine the statements on low-intensity nuclear operations and theater nuclear warfare; and second, we must probe into the statements on high-intensity nuclear operations and strategic nuclear warfare. However, when comparing *USAF Basic Doctrine* and the strategy of realistic deterrence, we must bear in mind the necessary relationship between the two. Realistic deterrence is designed to deter war and provide adequate forces to meet the threat should deterrence fail; *Basic Doctrine* offers options and capabilities. The actual force structure of the

military must be capable of supporting national objectives.

Where, then, are the inconsistencies? First, low-intensity nuclear operations, as described in AFM 1–1, are limited nuclear operations by the U.S. against nonnuclear or minor nuclear powers. They also include nuclear operations between the major nuclear powers in which highly selective and limited strikes are employed in an attempt to achieve national objectives at a conflict level below high-intensity nuclear warfare. The four objectives of low-intensity nuclear operations stated in the doctrine manual are limited in scope and reflect a noticeable change from the earlier editions of the manual. The key shortcoming of this treatment of low-intensity nuclear operations lies in the options offered. First of all, realistic deterrence calls for a very limited role for theater nuclear warfare: e.g., deterrence of a Soviet attack on NATO Europe or a Chinese attack on our Asian allies. The options offered by the doctrine manual to deal with nonnuclear or minor nuclear powers are too broad and do not relate to current policy. Part of this problem is no doubt the lack of parallelism between the *spectrum of potential conflict* as stated by Secretary Laird and *aerospace operations* used in the doctrine manual. The Secretary's analysis of nuclear warfare below the level of strategic nuclear war is closely linked with U.S. national interest and objectives; the USAF doctrine manual describes several options in low-intensity nuclear operations that are not closely linked to the national interest and objectives and thus not meaningful options for realistic deterrence.

This inconsistency is even more apparent when one examines *Basic Doctrine* concerning low-intensity nuclear operations involving two major powers. It is the implication and tone of the following statement that signals a contradiction between current doctrine and current national security strategy concerning theater nuclear warfare and strategic nuclear warfare:

When both adversaries possess survivable forces having recognizable retaliation capability, there may be strong incentives to limit initial nuclear action to attacks on selected targets which would cause grave concern, but not necessarily lead to the triggering of a massive exchange.[22]

This contradiction is further bolstered in *Basic Doctrine* by defining these nuclear attacks as possibly being against targets in the enemy homeland, such as oil refineries, nuclear plants, and hydroelectric facilities.

On the one hand, since both major powers have survivable retaliatory forces, and given that the U.S. will use its strategic nuclear forces against the Soviet homeland only in a second strike, the quoted statement can only be relevant to theater nuclear warfare. However, according to the section of realistic deterrence concerning theater nuclear warfare, low-intensity nuclear operations between the Soviet Union and the United States will likely occur only if there is an all-out attack against NATO Europe by the Soviet Union. And even then the limited U.S. nuclear response would be against the attacking Soviet/Warsaw Pact forces and not against the Soviet Union itself. Of what use, then, is this option offered by *Basic Doctrine?*

If, on the other hand, one uses the definition of strategic nuclear warfare as stated under "Realistic Deterrence," low-intensity nuclear operations between the two major powers would be part of strategic nuclear warfare.

But here again, what is stated in the doctrine manual about low-intensity nuclear operations between major powers does not correlate with our current strategic nuclear strategy. Our strategic nuclear strategy is fundamentally a second-strike strategy that emphasizes deterrence. It makes little sense to talk about limiting nuclear attacks when the overriding objective is to deter them. If deterrence fails, it will fail only because the Soviet Union chooses to initiate conflict. If that occurs, the United States offers *no* guarantee that its response will be limited to the intensity of the original attack, nor does it suggest any automatic escalation. Deterrence must be based on this uncertainty

of the U.S. response, or else there is little incentive for the Soviet Union to be deterred in its actions. Hence the options offered by *Basic Doctrine* concerning low-intensity nuclear operations are not consistent with our current national security strategy for deterring either theater nuclear or strategic nuclear warfare. Such inconsistencies must be corrected so that *Basic Doctrine* will offer U.S. leaders meaningful options.

A second inconsistency between current doctrine and current national security strategy lies in the area of strategic nuclear warfare and high-intensity nuclear operations. The U.S. strategic nuclear strategy is "nuclear sufficiency" and is based on the four criteria listed earlier. It is basically a second-strike strategy that emphasizes deterrence of high-level nuclear conflict. This emphasis is translated into a force structure primarily designed to be reliable and survivable, yet capable of wreaking such a level of urban/industrial destruction that the Soviet Union will be deterred from initiating a nuclear first strike. In addition, our current national security strategy makes no mention of an all-out damage-limiting effort. In contrast, however, the *Basic Doctrine* manual states:

> Nuclear warfare, initiated by an enemy surprise or as an outgrowth of ongoing conflict at a lower level, can assume various forms depending on the targeting and force employment options pursued by the adversaries. . . . Regardless of the form which the conflict takes, national leadership must be provided with a continuing credible capability to attack enemy military forces or his population and industry. At the same time, defensive forces must be postured to ensure a capability to limit damage to the US and its allies, and to preserve an assured destruction capability even after suffering a large-scale attack on the United States.[23]

The doctrine manual calls for certain offensive capabilities and options which the national leadership has rejected as criteria for nuclear sufficiency and which are fundamentally in opposition to Secretary Laird's criteria for deterrence. For example, "a continuing credible capability to attack enemy military forces or his population" does not fit the criteria of a second-strike capability. Instead, it hints of counterforce options that exceed the stated sufficiency criteria for deterrence and, in fact, may be destabilizing in the pursuit of a deterrent strategy.

A second criterion of nuclear sufficiency calls for providing no incentive for the Soviet Union to strike the U.S. first in a crisis. Two very clear incentives for such a first-strike would be

—that the Soviet Union believes its first-strike capability could cripple the U.S. retaliatory forces and that it is in the interest of the Soviet Union to do so;

—that the U.S. has a viable first-strike capability and the only chance the Soviet Union has in a conflict is a surprise first strike.

OUR CURRENT national security strategy is designed to ensure that the Soviet Union has no such incentives by, first, always having reliable, survivable retaliatory forces, and, second, by not posing a first-strike threat to the Soviet Union. The cited statement from the doctrine manual, as well as other statements therein, illustrates a failure of doctrine to reflect current national policy as expressed by our national security strategy. It is because doctrine must support the national policies and strategies which implement national objectives that these inconsistencies must be addressed and reconciled.

Realistic deterrence strategy and basic doctrine have both complementary and noncomplementary aspects. The complementary aspects need to be reinforced so that our national leaders can always know that the options offered by basic doctrine are appropriate and usable. The noncomplementary aspects, particularly the ones highlighted in this article, need to be addressed by the Air Force, and its *Basic Doctrine* should be revised accordingly. For as it is defined by General John C. Meyer in the Foreword to the current AFM 1–1, USAF basic doctrine is

. . . the fundamental principles and concepts for employing aerospace forces in support of United States objectives. . . . They are based on knowledge gained through experience, study, analysis, and tests and are designed to support the funda-

mental military employment policies expressed by national leadership.[24]

How can *Basic Doctrine* be otherwise?

Squadron Officer School

Notes

1. "USAF Doctrine and National Policy," speech delivered to the USAF Scientific Advisory Board as published in *Air Force Magazine*, January 1958.

2. Thomas Carlyle, *Latter Day Pamphlets*, No. 1 [1850].

3. Robert F. Futrell, *Ideas, Concepts, and Doctrine: A History of Basic Thinking in the United States Air Force, 1907–1964* (Maxwell AFB, Alabama: Aerospace Studies Institute, 1971).

4. "Toward a National Security Strategy of Realistic Deterrence," Statement of Secretary of Defense Melvin R. Laird on the Fiscal Year 1972–76 Defense Program and the 1972 Defense Budget before the House Armed Services Committee, March 9, 1971.

5. Air Force Manual 1–1, *United States Air Force Basic Doctrine*, 28 September 1971.

6. "National Security Strategy of Realistic Deterrence," Statement of Secretary of Defense Melvin R. Laird before the Senate Armed Services Committee on FY 73 Defense Budget and FY 1973–1977 Program, 15 February 1972.

7. FY 72 Defense Report, p. 2.

8. FY 73 Defense Report, p. 26.

9. FY 72 Defense Report, p. 21.

10. "US Foreign Policy for the 1970's, The Emerging Structure of Peace," A Report to the Congress by Richard M. Nixon, President of the United States, February 9, 1972, p. 154.

11. FY 72 Defense Report, p. 76.

12. Air Force Manual 1–1, *United States Air Force Basic Doctrine*, 14 August 1964, par 1–5.

13. *Ibid.*, par 3–7.

14. *Ibid.*

15. AFM 1–1 (1971), par 1–3.

16. *Ibid.*

17. *Ibid.*, par 4–3.

18. *Ibid.*, par 5–3.

19. *Ibid.*

20. *Ibid.*, par 1–2.

21. Nixon's 1972 Foreign Policy Report, p. 158.

22. AFM 1–1 (1971), par 4–5.

23. *Ibid.*, par 5–2.

24. *Ibid.*, Foreword.

OUTER SPACE AND AIR SPACE

The Difficulties in Definitions

Dr. Raymond J. Barrett
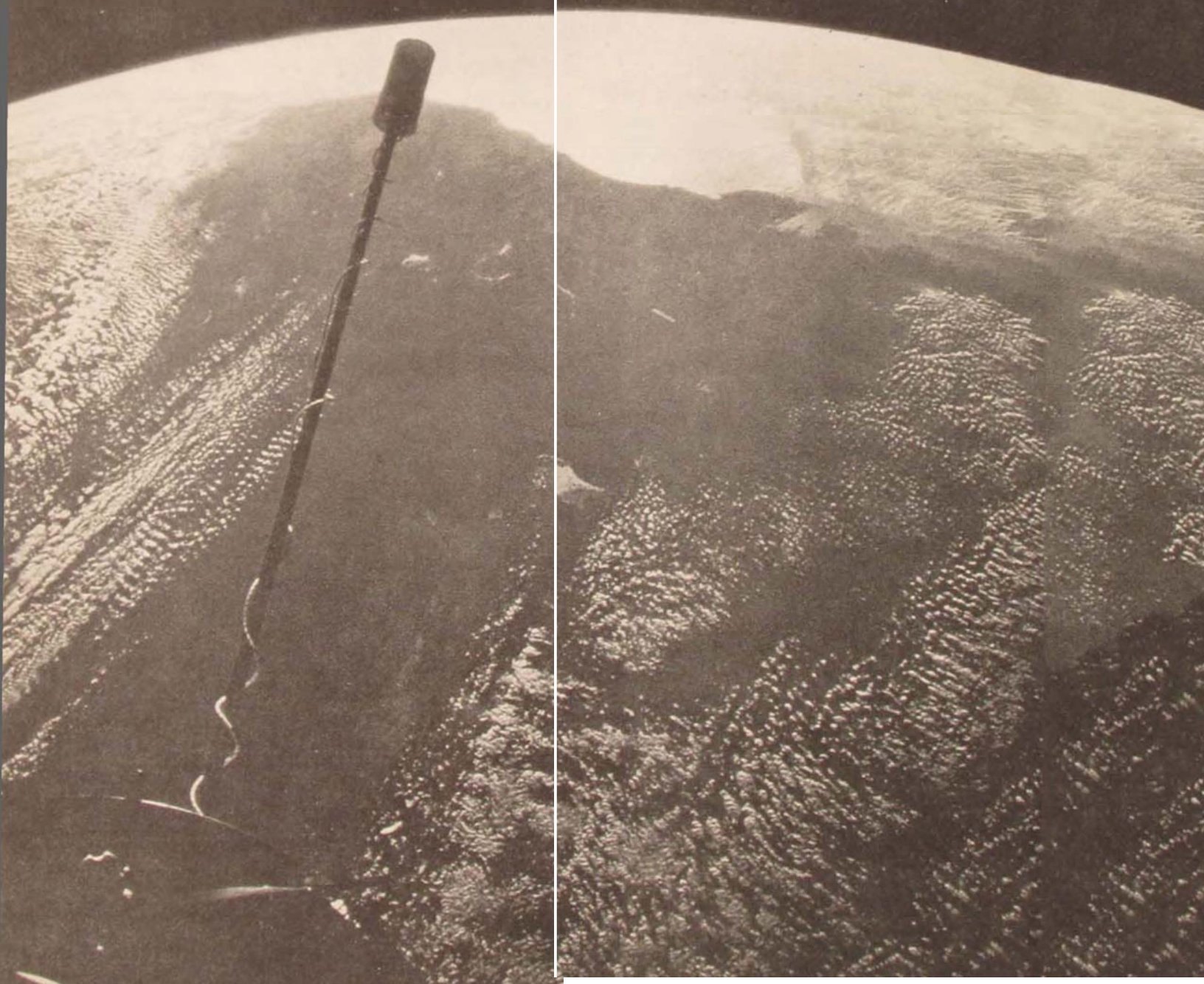
WHAT is the definition of outer space? Or, more specifically, what is the difference between national air space and outer space? The air space over each national territory is subject to that country's sovereign control. In outer space, claims of national sovereignty have been prohibited. How is one to be distinguished from the other? The question has received much attention in recent years, and many proposals on how it might be resolved have been put forward. A great deal has also been written on the subject, and several publications of the United Nations have discussed it at some length. As yet, no consensus has emerged. However, the progress of technology may make some solution more urgent in coming years. An arbitrary decision may be the only feasible answer.

National sovereignty over air space is a primary feature of the international agreements regarding aviation. The Convention on the Regulation of Aerial Navigation, signed in Paris on 13 October 1919, provided in Article I that ". . . every Power has complete and exclusive sovereignty over the air space above its territory." The basic agreement governing postwar civil aviation, namely, the Convention on International Civil Aviation, signed at Chicago on 7 December 1944, reiterates the same principle, in virtually identical language.

In direct contrast, claims of exclusive national sovereignty in outer space are prohibited by international agreement. The Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, was concluded in 1967 under the aegis of the United Nations. Article II provides that:

> Outer space, including the Moon and other celestial bodies, is not subject to national appropriation by claim of sovereignty, by means of use or occupation or by any other means.

International agreements are also developing rules of law for outer space. The Outer Space Treaty itself (Article IV, paragraph 1) pledges the signatories "not to place in orbit around the Earth any objects carrying nuclear weapons or any other kinds of weapons of mass destruction, install such weapons on celestial bodies, or station weapons in outer space in any other manner." It also bans military bases, weapons testing, and military maneuvers from celestial bodies. The 1963 limited test-ban treaty prohibited nuclear explosions in outer space, as well as in the atmosphere and under water. In 1968, the Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched in Outer Space was concluded. A convention dealing with liability for damage caused by objects launched into outer space is also being negotiated.

The actual practice of nations also indicates a difference between national air space and outer space. Hundreds of objects have now been launched into orbit around the earth; in recent years no nation has protested such passage over its territory as violating its sovereignty. In fact, no nation has explicitly reserved its position concerning the passage over its territory of a space object of another country. On the other hand, no nation has been willing to limit its air space to a specific height; to do so would define the upward extent of its sovereignty and, implicitly or explicitly, the lower limit of what it considered to be outer space.

There are two general schools of thought regarding the need for and desirability of arriving soon at a clear line of demarcation between air space and outer space. One approach cites the need to delimit the legally binding obligations regarding the activities and authority of nations in outer space and air space, respectively. Without such a demarcation, it is contended, there will arise, as technology advances, disputes regarding the extent and nature of the obligations nations have assumed in the international agreements related to outer space. Similarly, without agreed definitions, a nation could assert claims of sovereignty that would interfere with space activities desired by many other countries.

The other approach argues that there is no

evidence that a demarcation line is needed and that to set one now would be premature and possibly counterproductive. The proponents of this point of view call attention to the rapid pace of space technology and the practical uncertainties regarding the characteristics of feasible and desirable space activities. Trying to set a boundary now, they feel, would risk getting it too high or defined in a way that might turn out to be detrimental to future space activities. (Implicit in this viewpoint, there seems to be the expectation that the later agreement is reached, the more likely the boundary is to be set lower than it would be at present.) Those who endorse a cautious approach note that the lack of specific agreement has not led to any international difficulties and does not seem likely to. They also suggest that the effort to establish a definitive boundary could, itself, lead to controversy and confusion, as has happened in regard to the demarcation between territorial waters and the high seas.

Why not simply set the dividing line between air and outer space at the upper limit of the atmosphere? That would probably be one of the first questions by a layman. Furthermore, the international conventions that regulate aircraft seem to suggest this concept in their use of such terms as "air," "atmosphere," and "atmospheric" space. The practical difficulty, however, is that the earth's atmosphere does not end abruptly; it gradually transforms into outer space. Some estimates place the altitude at which air space ceases well beyond the orbits of some existing earth satellites. In fact, there is no scientific agreement on the altitude at which air space ceases.

A scientifically more sophisticated proposal might be to use the characteristics of the atmosphere to determine an appropriate dividing line between air and outer space. Suggestions have been made to establish the demarcation on the basis of differentiation between the several layers into which scientists divide the atmosphere.

The troposphere, the layer nearest the surface of the earth, extends up to about 9 to 10½ miles at the equator and 6 to 7 miles at the poles. It is the layer in which weather phenomena occur, and it is the field of operation for conventional aviation. The troposphere contains three-fourths of all the air surrounding the earth.

Most of the rest of the air in the atmosphere is contained in the next layer, called the stratosphere. It is above the weather and is reached only by the most advanced aircraft and research balloons. Its upper limit is about 25 miles. The troposphere and stratosphere contain about 99.7 percent of the air.

A third layer, called the mesosphere, extends to about 50 miles, and beyond that is the ionosphere. The latter is sparsely occupied by gas particles, less dense than the most complete vacuum that can be achieved on earth. The upper limit of the ionosphere is not defined.

The major difficulty in trying to define a boundary by utilizing the characteristics of the atmosphere is the lack of uniform criteria. The physical characteristics of the atmosphere and of the various layers can be judged by a variety of criteria, such as the composition of the gases, their densities and their temperatures. These properties are not uniform at a certain altitude. They can also vary with solar activity, time of day, season, region, and other circumstances. The boundaries between the layers of the atmosphere are thus not precise, uniform in height above the earth, or constant. Nor is it possible, because of the variance in the properties of the atmosphere, to arrive at any other boundary between air and outer space that would be precise, uniform, and constant.

The layman, faced with these scientific difficulties, might suggest using the characteristics of aircraft flight to arrive at an adequate boundary. Surely, he might think, we can define the height at which aircraft can actually fly, and everything above that could be considered outer space. The Council of the International Civil Aviation Organization (ICAO) defines an aircraft as "any machine that can

derive support in the atmosphere from the reactions of the air other than the reactions of the air against the earth's surface." The maximum altitude at which a machine can derive support from the reactions of the air is presently estimated at about twenty one miles by the ICAO Secretariat.

One of the most widely discussed proposals for a demarcation between air space and outer space is that it be established at the altitude where aerodynamic lift yields to centrifugal force, what is known as the "Von Kármán line." To accomplish aerial flight, weight equals aerodynamic lift plus centrifugal force. Aerodynamic lift decreases with altitude because of the decreasing density of the air. Beyond zero airlift, centrifugal force takes over.

This approach also involves several difficulties that seem to preclude a uniform and constant boundary. The theoretical limit of the height of air flight may increase as the result of such developments as improved cooling techniques or more heat-resistant materials. The aerodynamical forces also vary with the character and speed of the specific object involved. Moreover, the density of the atmosphere itself is not constant but is subject to a variety of fluctuations, as already noted.

IF AN APPROACH based on the characteristics of the atmosphere and aircraft is not adequate, how about tackling the problem from the other side, that of outer space? For instance, could not outer space be defined as everything beyond the lowest point (perigee) of an orbiting satellite? At a certain altitude, the earth's atmosphere is too dense for an artificial satellite to stay in orbit. The lowest perigee approach would have the advantages of being in accord with existing practices in orbiting satellites and with the attitudes of countries toward objects in earth orbit.

The International Law Association (not an intergovernmental body) did adopt in 1968 a definition of outer space as the space beyond the lowest perigee reached by any satellite placed in orbit before 27 January 1967, the date on which the Outer Space Treaty was opened for signature. The Association, however, added that this definition was without prejudice to the possibility of including later any part of the space below that perigee.

The association's added qualification indicates one of the difficulties in this approach. The perigee of a durable satellite orbit at present is about 95 to 100 miles. However, improvements in space flight technology, such as orbiting with continuing rocket thrust, may lower this perigee to 70–75 miles. That large an element of legal uncertainty would hardly be compatible with a definition seeking to determine national sovereignty over air space. Another problem with this definition involved the practical questions of who determined precisely the lowest perigee of a satellite before 27 January 1967 and whether it was an active satellite or a piece of space debris.

More generally, this approach also fails to provide a precise and continuing boundary because, scientifically speaking, no precise altitude can be determined as the single lowest possible perigee of any artificial satellite. Such a determination would depend on the characteristics of the object and the atmosphere; and these vary, as already noted in connection with aircraft.

To try to meet these difficulties, a number of other approaches have been suggested. All, however, seem to involve shortcomings of their own or do not solve all the problems that we have noted. One suggestion has been to set the boundary at the point where the gravitational pull of the earth ceases, this approach deriving from the idea that a nation's sovereignty need only extend to the height from which an object can be dropped on its territory. However, gravity ceases very gradually at remote heights; it is not possible to indicate an exact altitude where a boundary could be drawn based on the earth's attraction. And, even if one were feasible, it would probably be much too high; one

calculation, for instance, indicates that the earth's attraction in relation to the moon is dominant up to some 205,000 miles, and much farther in relation to the sun. A further practical difficulty is that the gravitational effect of the earth depends on the escape velocity of the object, which, of course, can vary.

Another approach tries to overcome the difficulties in defining the outer limit of the atmosphere by proposing an intermediate zone between air space and outer space. It has been noted that, as a practical matter, there exists a buffer zone between, on the one hand, the highest altitudes reached by balloons and aircraft and, on the other hand, the lowest altitude at which satellites remain in orbit without any means of propulsion. Details vary, but generally this proposal suggests an appropriate international regime in this area, between the national sovereignty of air space and the freedom of outer space. One immediate difficulty with this approach is that the present intermediate zone is likely to narrow with technological developments and may well disappear entirely. More basically, the proposal still does not solve the difficulties we have noted above in finding uniform and constant criteria that would make possible precise dividing lines between the zones.

An effort has been made to get around all these problems of scientific definition by proposing that the exclusive sovereignty of an underlying country should extend as high as it could effectively apply its authority. This principle has often been asserted in efforts to analyze the scope and effects of the international agreements governing civil aviation. However, it has equally been challenged on the grounds it would produce unacceptable disparities, conflicts, and uncertainties. Since nations are at widely different levels of scientific and technical development, their air spaces would vary greatly. If each country were allowed to project its sovereignty upward and sideward in accord with its effective power, conflicting claims would seem highly likely to occur; and

there would be no way to resolve them except naked power. The criterion of effective power would also create marked uncertainties because sovereignty would vary with the development of technology.

Another attempt to avoid the difficulties of spatial definitions proposes that a distinction be made between aeronautical and astronautical activities, rather than trying to decide on a demarcation between air space and outer space. The proponents of this approach argue that a legal definition is usually needed to permit certain activities and prohibit others. Accordingly, they feel that in regard to outer space activities, it would be better to seek this objective, not by trying to set boundaries but by defining objectives and missions for space vehicles. Their thought is that the important interests of all countries can be protected more effectively, not by putting territorial limits to national sovereignty but by legally prohibiting those actions in the course of space activities that would endanger these interests.

This approach proposes that astronautical activities should be subject to one and the same legal regulation, irrespective of the altitude at which they are carried out. It would apply to them the moment they leave the earth, in order to avoid a complicated determination of their passing from one legal status to another. This concept stems from the belief that, as the scope of international space law gradually extends, international regulation will have to approach the launching pads. The only way to preserve the logical unity of legal regulation, it is contended, is by dispensing with a demarcation in space and adopting a functional criterion.

However, there are difficulties with this approach, too. It is not always possible to distinguish precisely between space activities and other activities. Using the purpose of each activity as the criterion has been suggested; but often this could be ambiguous (e.g., an aircraft equipped with scientific instruments to observe an eclipse, or balloons bearing instruments for space observations). Moreover, the prospects of

scientific and technical progress in the development of aircraft and space vehicles make the practical problem of distinguishing between them ever more complicated. Another intricate problem of potentially great scope is how nations could differentiate between space activities at low altitudes and air activities, so as to regulate each effectively and discretely.

Aʙᴏᴜᴛ the only sound conclusion from a review of the various approaches to differentiating between air space and outer space is that no fully satisfactory answer is in sight. In fact, each of the approaches seems to have at least one serious defect. The problem has not been a pressing one. Indeed, the many uncertainties and potential developments in space activities have even suggested some wisdom in waiting until man's abilities and needs in space are much better defined.

However, technology is moving on. In the not too distant future, machines capable of flying along a ballistic trajectory are expected to orbit the earth, fly in outer space and air space, and make soft landings on the earth. The space shuttle, which ɴᴀsᴀ hopes to make a fol-low-on program to the projected Apollo and Skylab series, apparently will be such a vehicle. Aeronautical researchers are reported to be thinking about a hypersonic transport (ʜsᴛ) as a next step after the supersonic transport, for about the year 2000. Some of the features being considered are described as "rocket-assisted take-offs" and "space vehicle-like bursts beyond the atmosphere followed by semi-orbital 'free fall' until descent." [1]

Developments such as these are bringing closer the day when some formula will be needed, as a practical matter, to accommodate the differences between air space and outer space. The difficulties involved in all the approaches that have been suggested indicate that the decision may well have to be an arbitrary one. The goal obviously should be to select a boundary that seems to balance best the varying difficulties, advantages, and other pertinent considerations. Some demarcation line in the 50- to 75-mile altitude range may be the most satisfactory—or least unsatisfactory.

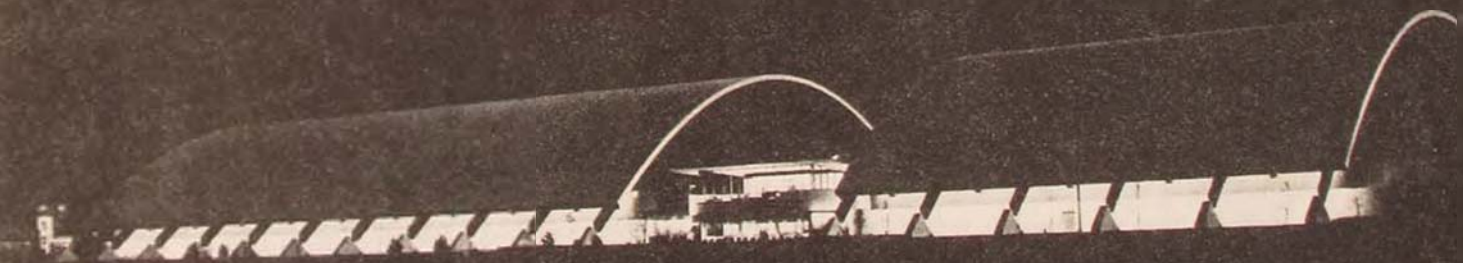*Fort Bragg, North Carolina*

Note
1. Albert R. Karr, "The SST Is a Turtle Compared to the HST, Which May Be on the Way," *Wall Street Journal,* 4 January 1971, p. 1.

The Air Force Museum

William J. DePaola   Lieutenant Colonel Philip M. Flammer

MILITARY activities that use the land and sea as their "arenas" took centuries, if not millennia, to mature. Air power, on the other hand, has come of age in less than three generations. The era of the Wright brothers is still part of human recollection, and there are men among us yet who flew combat in World War I. By comparison with the usual time frame of a military arena development, talking with one of these men is like conversing with a knight out of the middle ages or, more appropriate, one of the Spartan elite in the Peloponnesian War.

However, after the next decades, personal contact with military aviation's first great eras will have to come through the machines and relics left by those who used them. That is why institutions such as the huge Air Force Museum at Wright-Patterson AFB, Ohio, will continually grow in importance. They are not only a major link with the past but also, in a very real sense, part of the past inasmuch as these exhibits "were there."

The Air Force's new Museum is the most complete of its kind in the world. Dedicated by President Nixon on 3 September 1971, it
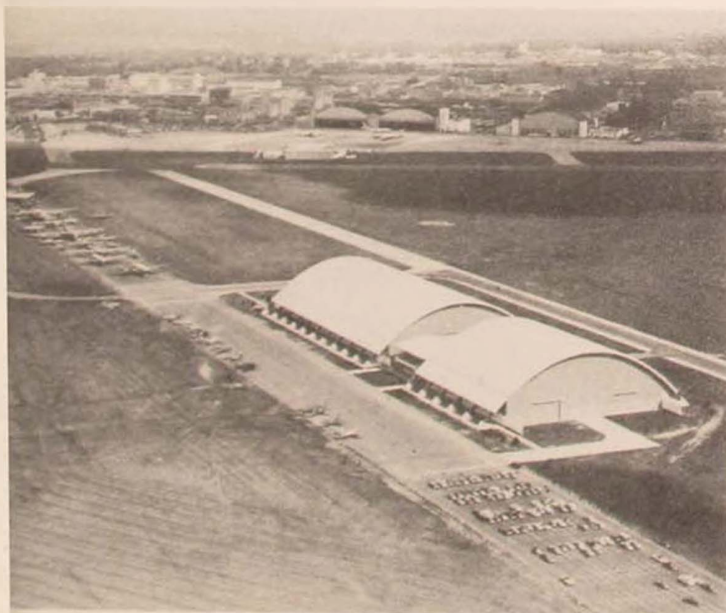
occupies a 400-acre site, with ample space for exterior display, upkeep and repair facilities, and, most impressive of all, a striking display building that has some 160,000 square feet of exhibition area. More than 100 aircraft are housed inside, ranging from a replica of the Wright Model A, the first military aircraft in history, to the giant B-36, which was on the drawing boards less than 40 years after the Wrights' first flight, yet has a wingspan more than double the distance covered on that epic venture.

The interior displays are carefully arranged so that the visitor has a chronological tour. It is only a few short steps from the Wright Model A to the World War I area, where several machines are displayed from that era, when planes and pilots caught the imagination of the world. The period between the wars is dominated by such craft as the sleek Curtiss R3C-2 racer, in which Lieutenant Jimmy Doolittle won the Schneider Trophy Race in 1925, and the P-26, a rare fighter plane that marks the changeover from the liquid-cooled, fabric-covered biplane to the air-cooled, metal-skinned, low-wing monoplane.

World War II dominates much of the display, if only because there are so many important airplanes, and people are better acquainted with them than perhaps any other group. The work horses—the B-17 Flying Fortress, B-24 Liberator, and B-29 Superfortress—are there, as are the P-51 Mustang, P-47 Thunderbolt, and P-38 Lightning, which helped wrest control of the skies from the Germans and the Japanese. There are also sleek post-World War II craft, ranging from jet fighters of the Korean War to more recent experimental aircraft.

Some of these exhibits, such as the cobra-like B-70, the only one of its kind in the world, are simply overwhelming. Yet there is also something awesome about the little A-1 in which Major Bernie Fisher won the Medal of Honor in Vietnam. The A-37, looking like a toy near the B-36, enjoys the distinction of having left the Museum to fly a tour in Vietnam and then returned to its place of honor.

Some of the most memorable stories from the Air Force Museum relate to activities few visitors get to see. These are the acquisition and restoration programs, which range from the seemingly simple, such as getting certain World War II aircraft out of Europe, to something as romantic and adventurous as recovering a Japanese Zero that had nestled for years in the jungles of New Guinea or a pre-World War II observation plane from the desolate wastes of Alaska.

People who recall World War II in the Pacific may well imagine that Zeros still exist in substantial numbers. But the one that now rests outside an old hangar near the Museum was a real find. Shot up by the Americans and abandoned by the Japanese, it remained in the rotting jungles of New Guinea until it became the property of the Papuan and New Guinea War Memorial Trust. From there it went to Tom King, an Australian, who traded an old Wirraway for it. But King, who couldn't afford to restore the machine, sold it to the Air Force Museum for $3000 through the Museum Foundation

Flying this Curtiss R3C-2, Lieutenant James H. Doolittle won the Schneider Cup in 1925 at 232.57 miles per hour and two weeks later set a world speed record for seaplanes at 245.7 mph. Though designed for racing, the plane contributed most by probing the frontiers of aviation technology.

Like a toy beside the giant B-36 of post-World War II days, the Cessna YAT-37A had the distinction of being recalled to active duty from the floor of the Air Force Museum, flown in Vietnam, and returned to another honorable retirement at the Museum.
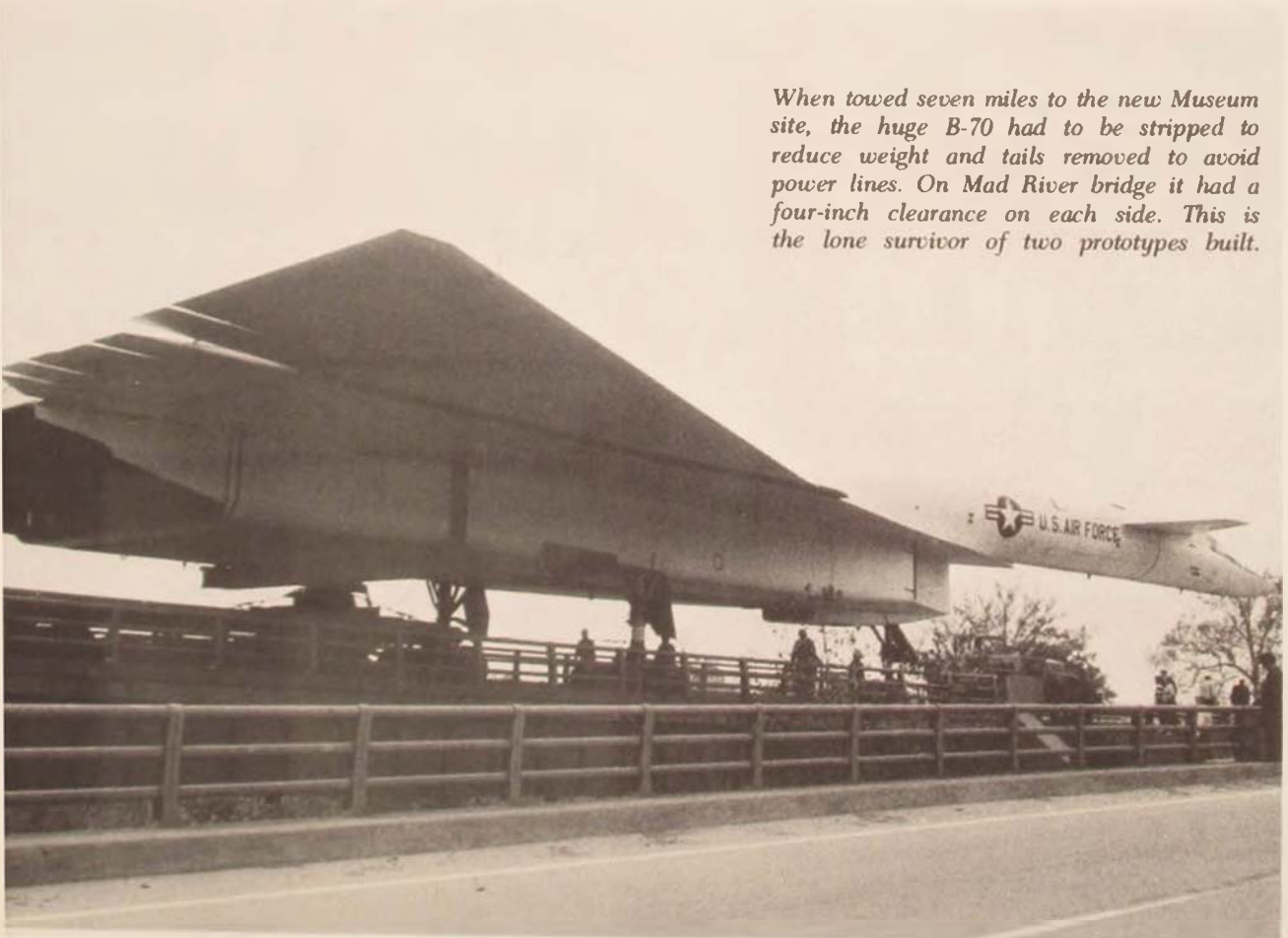
When towed seven miles to the new Museum site, the huge B-70 had to be stripped to reduce weight and tails removed to avoid power lines. On Mad River bridge it had a four-inch clearance on each side. This is the lone survivor of two prototypes built.
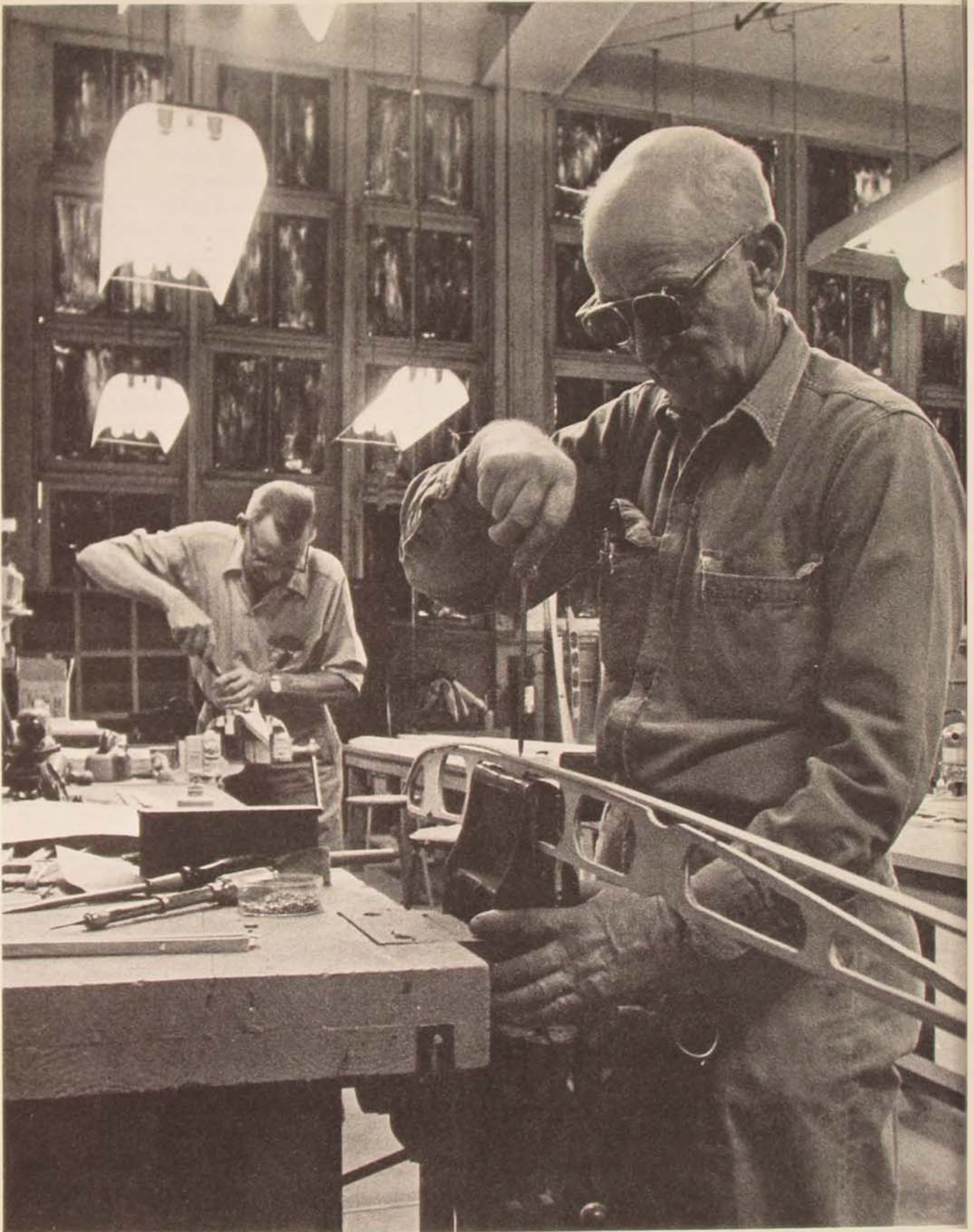
(the Museum has no funds of its own for such purchases).

This Zero still shows the scars of battle. Indeed it looks as if it had been in a disastrous accident. Yet when it appears on the Museum floor at some future date, visitors will no doubt remark how incredibly well preserved it is and that the Museum must have been very fortunate to find one in such beautiful condition.

The secret between the now and the then will be the structural and cosmetic skill of master craftsmen at the Museum and the thousands of man-hours spent in renewing the old. Old plans will be studied, dents hammered out, new pieces manufactured, and vital parts restored. When the workmen are through, the difficulty will be remembering what the machine looked like in its derelict state.
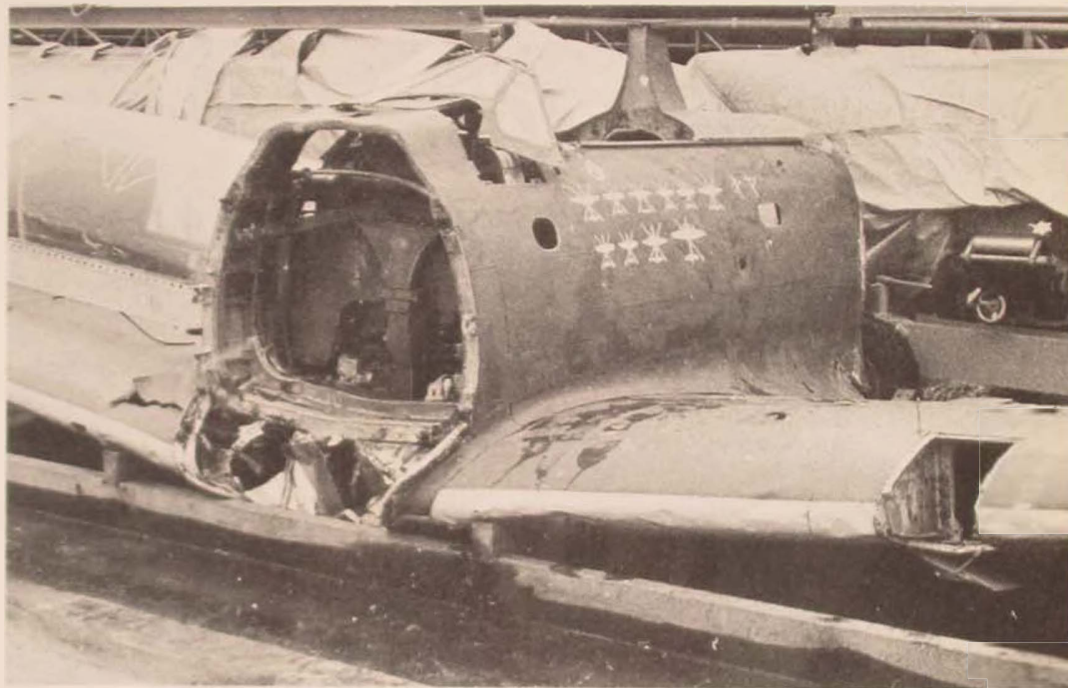
Skilled craftsmen restore damaged aircraft, manufacturing needed parts according to authentic specifications . . . . A shattered Japanese Zero, after many years in a New Guinea jungle, will look none the worse for its odyssey when it goes on exhibit. . . . The Zero's engine, one of many aircraft components awaiting restoration in the Museum shops, will be reunited with its fuselage and then displayed with other trophies of World War II.
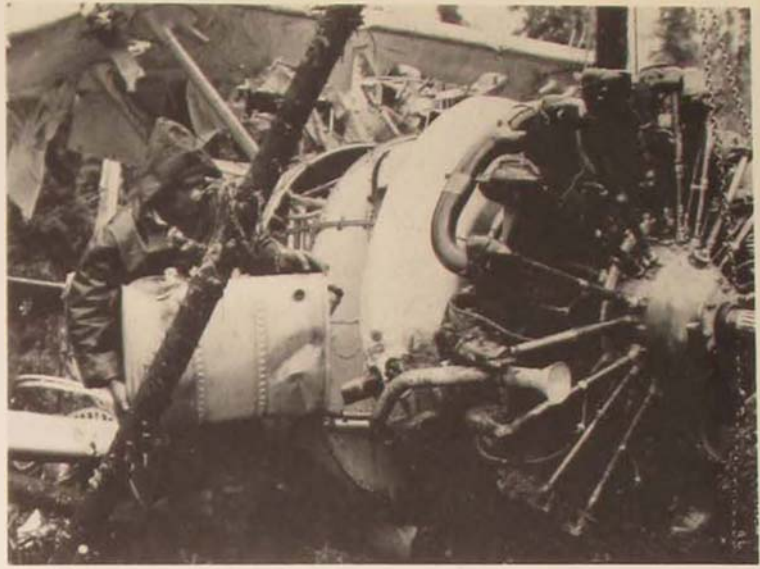
O-38 Recovery

Barely surviving a controlled crash landing in 1941, an ancient O-38 observation plane lay forgotten in the Alaskan wilds, 70 miles north of Fairbanks, until brought to the attention of Museum personnel. A closer look from the ground found it to be worth recovering, but salvage could be effected only by helicopter. Work began in earnest in June 1968. Shifting its position for pickup required many hands (below).

The engine was removed from the fuselage, and each was separately secured and lifted out by Army CH-47 Chinook and sent on to the Museum. Despite more than a quarter century of arctic exposure, the skeleton was sound, and the rudder fabric did not have to be replaced. When restoration is complete, the old veteran rescued from Alaska will be all but indistinguishable from O-38s of an earlier day (lower right).
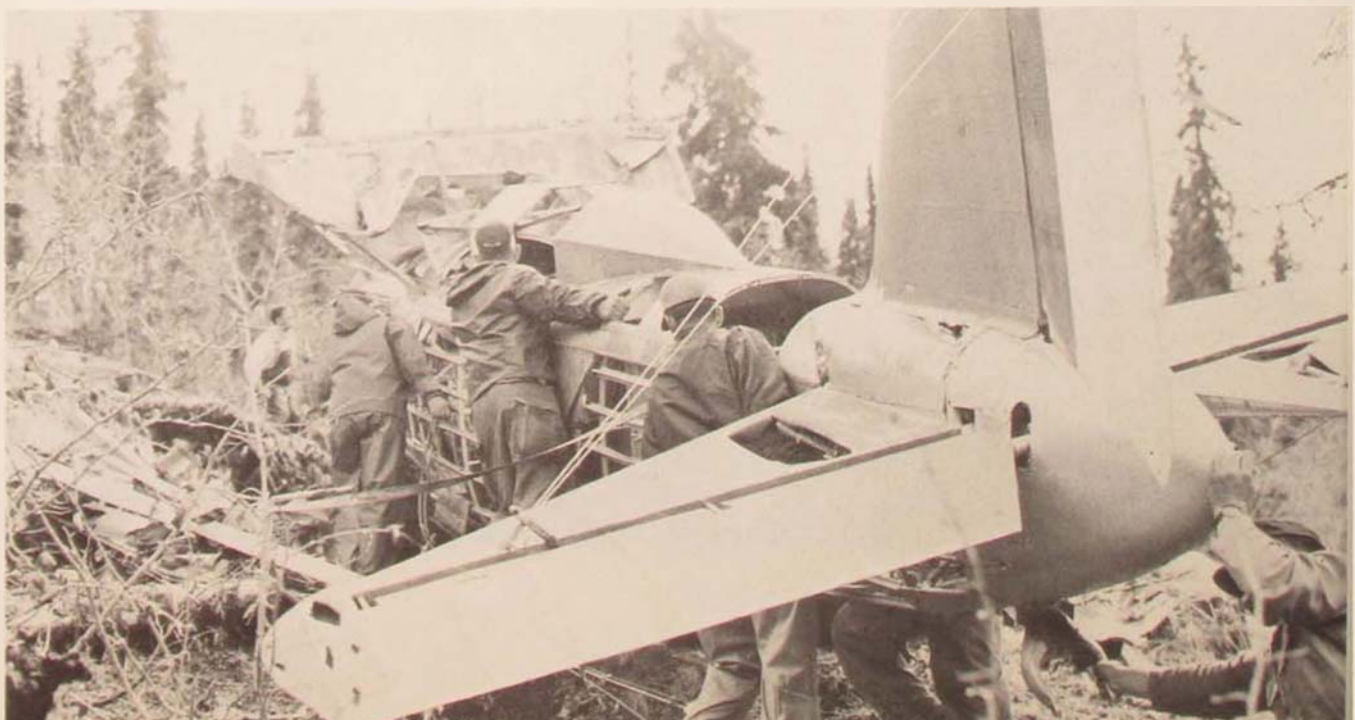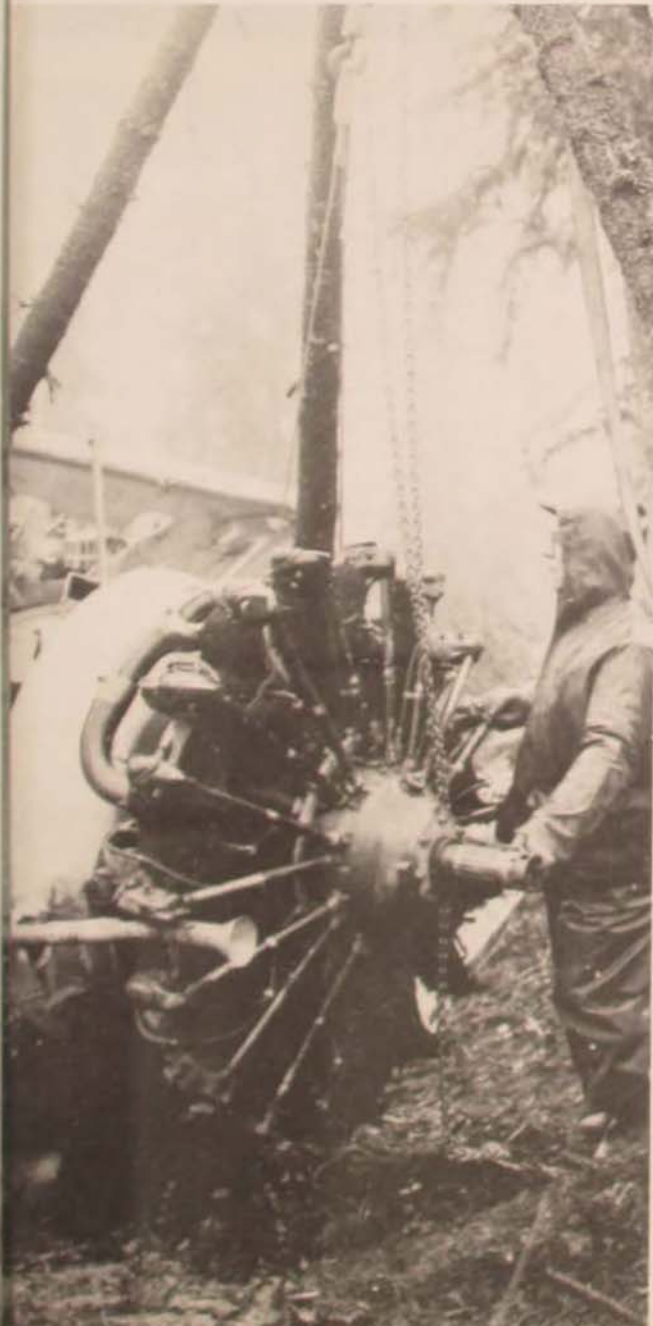
Building a Sopwith Camel from original World War I plans involves matching the rotary engine to the airframe, the cylinders revolving around a stationary crankshaft (right). Genuine World War I machine guns will find a place on the finished airplane. . . . In the Museum restoration hangar, specialists ply their skills on the Camel (left), O-38 (right).

Perhaps no story of acquisition and restoration is more dramatic than that of the O–38 observation plane that was rescued from the Alaskan wilds and is now undergoing extensive rebuilding. The pilot, a lieutenant who later became a gen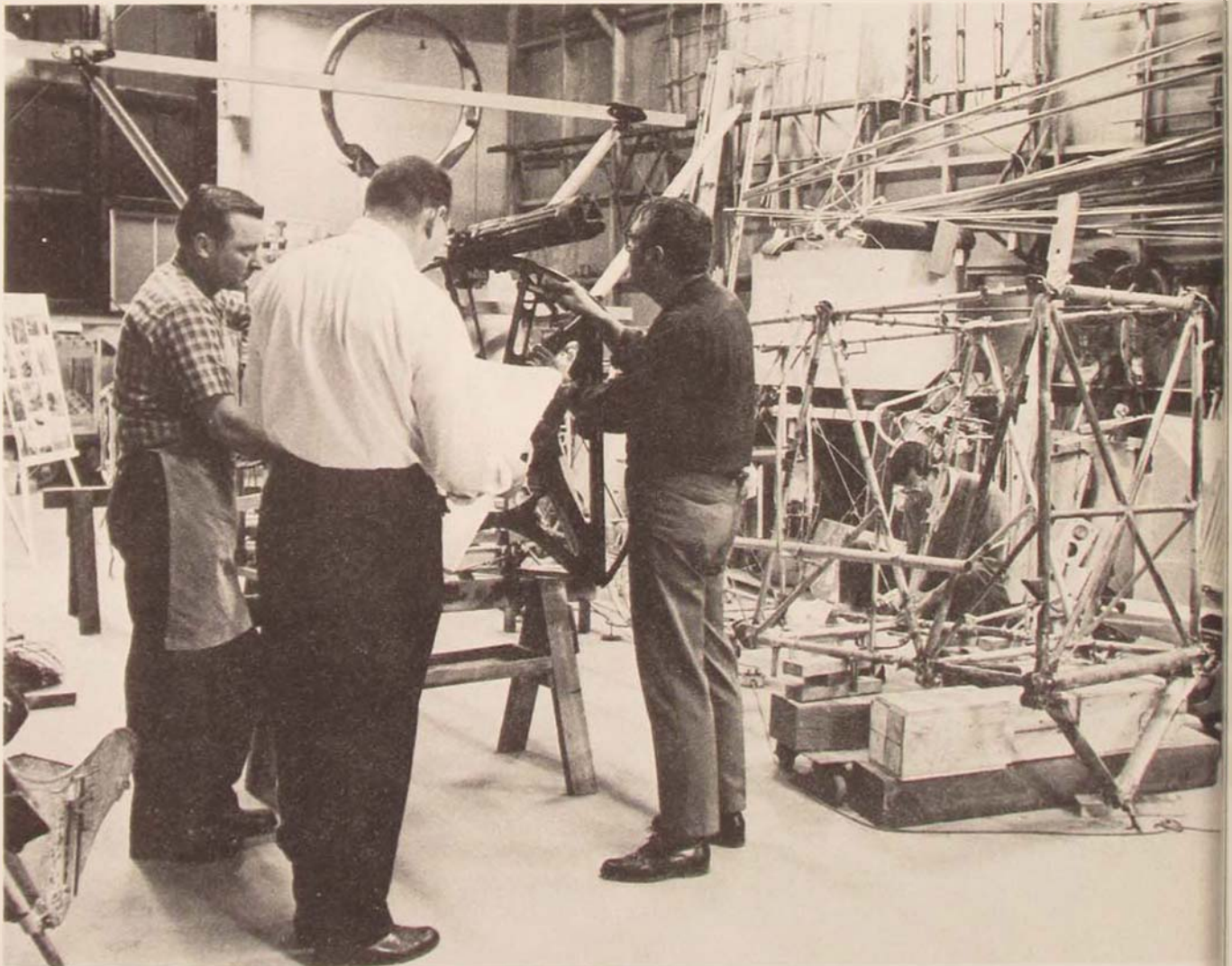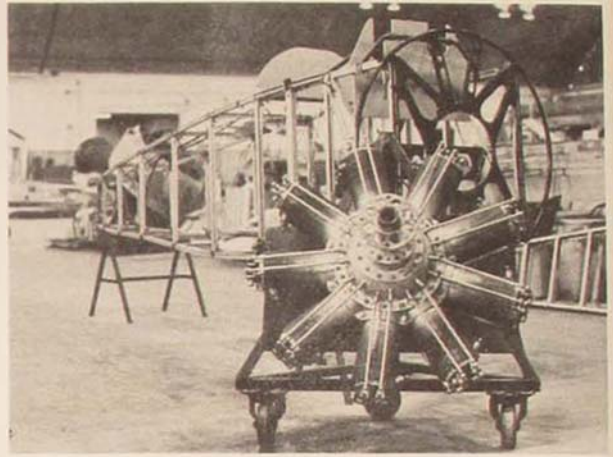eral, mushed the stricken plane into a controlled crash in 1941. Damage was so extensive that no salvage was attempted, and Air Corps officials soon forgot about the wreckage. Then in the late 1950s a prospector came in to inquire about salvage rights. Officials recognized the plane for the rare old bird it was, and a recovery operation was put in motion.

A surprise greeted the rescuers when they arrived by helicopter. Sturdy spruce had grown up through the fuselage, moose had eaten much of the fabric, and that which remained on the wings carried unmistakable traces of marauding bears. Yet there was almost no corrosion. The frail craft had survived more than a score of arctic winters with as much ease as the celebrated *Lady Be Good* had survived the African desert. The propeller still turned, the framework was as bright and sturdy as the day it began its cold confinement, and the fabric on the rudder remained so well preserved and tight that it will be left as is.

Airplanes, like animals, are usually not the subject of great interest or concern when they exist in large numbers, and thus they can too easily become extinct through simple neglect. Thousands of B-17s flew combat during World War II, yet only three of them are known to remain. One, which went by the name *Shoo-Shoo Baby*, wandered around western Europe for a quarter of a century before its recent acquisition by the Museum. (See William G. Holder, "The Return of *Shoo-Shoo Baby*," *Air University Review*, XXIV, 2 [January-February 1973], 22–31.) Other B-17s may still exist, but the Museum does not know of them. A recent "want list" specifies more than fifty aircraft, plus "any World War I aircraft, (U.S. and foreign)" that the Museum would like to add to its inventory.

But what if a much-desired plane is simply not available? If it falls within the capabilities of the restoration and repair crews, the answer is simple: they build one. The Museum has long wanted a British Sopwith Camel of the World War I era, but only a set of plans, still marked "Confidential," was available. The framework of a brand new Camel now sits on the hangar floor, the metal and wood pieces cut to exact specifications. Nearby sits a rotary engine—one in which the crankshaft is stationary and the cylinders rotate—in perfect condition. Eventually it will be matched to the frame, and another treasure from the history of flight will be wheeled to the Museum floor.

No doubt the new Museum will never be as complete as its directors would wish. Perhaps, too, the present cavernous display area will someday be as crowded as the building recently vacated. Such thoughts will hardly disturb the visitor. Already there is enough to give dramatic evidence of the history of military aviation. Many if not most of the items on display are themselves impressive milestones in an almost overwhelming epic.

HERE RESTS IN
HONORED GLORY
AN AMERICAN
SOLDIER
KNOWN BUT TO GOD

LOYALTY, HONOR, AND THE MODERN MILITARY

Captain Michael O. Wheeler

LIKE many other abstractions, loyalty is an often confusing, much abused concept. It has been employed by different people in different ages to mean a host of different things. For instance, author Hannah Arendt has written in her highly acclaimed work *The Origins of Totalitarianism* that "Himmler's ingenious watchword for his ss-men [was] 'My honor is my loyalty.' " [1] Himmler's use of "loyalty" was intended to convey a certain idea to his listeners. Unfortunately, one finds much the same distorted idea in contemporary American society—the notion of the dedicated military professional as one who gives his unthinking consent to all orders issued to him, whose very honor is a function of his unquestioning obedience.

Upon examination, it becomes apparent that this view of the military man is troubling to professional military officers as well as to civilian critics of the stereotyped "military mind." To quote Colonel Malham M. Wakin of the United States Air Force Academy faculty: "We are concerned, all of us, about a picture of a profession that leaves us feeling that a man must give up his rationality, his very creativeness, the source of his dignity as a man, in order to play his role as a soldier." [2] What should especially concern the contemporary American in this view of the man of loyalty is, I would suggest, a twofold sort of thing. First, when soldiers have in fact wrapped themselves up in their jobs and obeyed orders unthinkingly, they have aided in perpetrating some of the gravest crimes in human history. An example that comes to mind is that of the German officer insuring the timely arrival of trainloads of Jews bound for concentration camps. [3] Surely this and any similar instance of aiding in the commission of a clearly immoral act would be vigorously condemned by the American military tradition, the tradition of a Robert E. Lee, a 'Hap' Arnold, or a George Marshall. But second, even given the evils which unquestioning obedience has helped produce, there is still a certain reluctance on the part of any thoughtful man to condemn a soldier *categorically* for sincerely following orders and remaining loyal to his superiors. In the military environment, a set of related virtues—such as loyalty, obedience, and discipline—is necessary for the successful employment of military forces in the pursuit of politico-military goals. If wars are to be with us for the foreseeable future, as most students of human behavior reluctantly agree is the case, then how are we to strike a balance between the necessary virtue of loyalty in the military, on the one hand, and on the other the democratic social goal of having every citizen become a morally sensitive human being? That is the question to which my article is addressed.

Giving and Obeying Orders

To get into this question, let us first examine the sorts of situations in which a soldier gives or obeys an order. In combat situations, orders are frequently given where life or death depends on instant obedience. For example, the infantry platoon leader upon seeing a suspicious movement out of the corner of his eye yells, "Hit the dirt!" Or the flight leader, spotting a missile rising through the clouds to meet his flight of aircraft, shouts "Break left!" or "Break right!" These are instances where unthinking, instant obedience is necessary to preserve lives.

I would suggest that these sorts of instances are often taken as the paradigm when one sets out to defend the thesis of unthinking obedience to orders, despite the fact that the instances cited are themselves the exception and not the rule where the activities of the modern military are concerned. Most orders are given in peacetime, not in combat. And even in combat environments, there is usually some reasonable delay between the giving and the carrying out of an order. This interval allows time for reflection upon the order, and reflection may produce a concern for the rationale of the order. Why was the order given? What purpose does the order seek to obtain?

Those operating under the suggested paradigm tend to question whether such reflection ever has any place at all in the military. Is it not true, they might point out, that the military runs on discipline, and is not discipline acquired by strict compliance with orders? The mistake in their reasoning is that they tend to reduce all instances of 'discipline' to the model of the life-and-death combat situation, either consciously or unconsciously. If they are conscious of what they are doing, they may employ the Aristotelian argument that the soldier acquires the habit of instant obedience in combat by practicing instant obedience in peacetime. But even with this seemingly sound argument before him, one might still raise a question as to which is the proper goal of the military, blind obedience or reflective obedience. That is the question to which I shall now turn.

It is interesting first to note that some of the most effective military leaders in modern history have been sympathetic to the combat needs of the soldier and have nevertheless stressed training the military in intelligent rather than blind obedience. General George C. Marshall provides an excellent instance. I shall frequently be citing him in this article, but let us first turn to Dr. Forrest C. Pogue, Marshall's respected official biographer, to find Marshall's views on the matter. In the Tenth Harmon Memorial Lecture in Military History at the United States Air Force Academy in 1968, Dr. Pogue said of Marshall:

> While he would not coddle soldiers, he would not attempt to kill their spirit. "Theirs not to reason why—theirs but to do or die" did not fit a citizen army, he said. He believed in a discipline based on respect rather than fear; 'on the effect of good example given by officers; on the intelligent comprehension by all ranks of why an order has to be and why it must be carried out; on a sense of duty, on *esprit de corps.*' [4]

In the first volume of his biography of Marshall, Pogue writes that "it had always been Marshall's style to lead by commanding assent rather than mere formal obedience." [5] One can note that this style of leadership is certainly not unique to Marshall. Intelligent commanders have recognized the effectiveness of such leadership for centuries. But what makes Marshall important for our purpose is that he is close to the temper of our times. The problems that Marshall faced—in raising and equipping an army in a time of austerity, in maintaining the morale of the military in a society that was largely antimilitary, in developing discipline in men from all walks of life, in coordinating national military aims with the aims of allies—are not far different from the problems faced by the American military today.[6] Perhaps, then, Marshall's approach to these kinds of matters has lessons for the present.

Three recurring aspects of Marshall's military experience are especially valuable here. First, Marshall valued loyalty. Second, he was recognized by friend and foe alike as a man of imposing moral integrity. And third, in the major war of this century, Marshall passed the ultimate military test of the commander: he brought his nation victory. These three things are important, and I shall spend much of the remainder of this article arguing that, given the proper view of loyalty, there need be no incompatibility between loyalty, honor (in the sense of preserving one's moral integrity), and military success, even in today's world.

A Perspective on Loyalty

Whenever we speak of loyalty, we are speaking of a two-object context: a context in which one gives loyalty and another receives loyalty. Now, given this rather simple conceptual picture, what we might focus our attention on is neither the giving nor the receiving of loyalty but instead is the *inspiring* of loyalty. That is to say, put yourself in a commander's position and ask, "What inspires men to be loyal to me?" Once the semantical issues are sifted through, there will remain, I would suggest, a single theme which forms the answer to that question. The theme is "trust." If a commander can in-

spire trust, he will at the same time inspire loyalty. Without trust, he may be able momentarily to *compel* compliance with his orders, but this compliance will not be the same as loyalty. Loyalty is not compelled; it is inspired. Where loyalty exists, obedience to orders is characterized by a certain kind of superior-subordinate relationship. Colonel Truman Smith, one of Marshall's subordinates at the Infantry School, Fort Benning, Georgia, before World War II, put this in words: "He would tell you what he wanted and then you would do it. There was something about him that made you do it, and of course you wanted to do it the way he wanted—which is the trait of a commanding officer."[7]

Now why, one might ask, did men respond to Marshall in this way? What was it about Marshall that inspired trust? This is a complex question, but of all Marshall's character traits, there is one that shines through and perhaps suggests the main part of the answer to that question. Marshall's acquaintances, in commenting on the man, invariably come around to a discussion of his personal integrity. For example, General Omar N. Bradley, in his foreword to the first volume of Pogue's biography of Marshall, immediately stresses the integrity of the man.[8] Pogue himself in writing of Marshall says, "Born in an era which spoke often of responsibility, duty, character, integrity, he was marked by these so-called 'Victorian' virtues."[9] Dean Acheson, who served with Marshall in the postwar period, speaks of "the immensity of his integrity, the loftiness and beauty of his character."[10] And Sir Winston Churchill, in a tribute paid Marshall shortly before his death, said: "During my long and close association with successive American Administrators, there are few men whose qualities of mind and character have impressed me so deeply as those of General Marshall."[11]

Integrity, I would suggest, was the crucial factor in inspiring men to trust George C. Marshall. Marshall was a competent man, but competence did not account for the trust he received. Many other competent men of his era were unable to inspire the same sense of trust. Marshall was a powerful man, a man in a position of authority, but the authority alone did not explain the sense in which he was trusted, for he had inspired trust long before he attained the heights of power. It was, quite simply, the moral integrity of the man, an unmistakable hallmark, that inspired the trust and—in turn—the loyalty which characterized Marshall's public service.

The thesis which I have proposed is that loyalty is primarily a function of trust, and that trust is usually given if integrity is perceived in the object of one's trust. To evaluate this thesis, let us consider it in two parts. The first part concerns loyalty, with ancient lineage in the Western tradition. In his classic treatise on leadership in the sixteenth century, Machiavelli advised the Prince that he need not be loved by his subordinates in order to lead them. He need only be feared, Machiavelli suggested.[12] But Machiavelli's analysis of leadership was defective, as Rousseau was to demonstrate two and a half centuries later. A man may obey you if he is afraid of you, but his obedience is a weak and fleeting thing. Remove the immediate grounds of his fear and you have removed his sole reason for obeying. But if that same man is *loyal* to you, his obedience will have been insured in a much more lasting way, for the attitude of loyalty is a stronger stimulus than the attitude of fear. Rousseau wrote: "The strongest is never strong enough to be always the master unless he transforms strength into right, and obedience into duty."[13]

Now, a danger still lurks in this kind of loyalty, inasmuch as the demagogue can inspire blind, unthinking loyalty to himself and his programs simply through his personal charisma. The danger is precisely that this view of loyalty is compatible with Himmler's dictate to his troops, that their honor was their loyalty. What I now shall turn to, however, is a different view of how loyalty can be inspired, in a manner such that the military goal of discipline can be

achieved along with the social goal of having soldiers who are also reflective, morally sensitive men. This conception of loyalty is one of loyalty inspired by trust, where that trust resides in the moral integrity of the commander.

Trust and Personal Integrity

The *Oxford English Dictionary* defines trust as "confidence in or reliance on some quality or attribute of a person or thing." The attribute that we shall focus on is moral integrity. Now, the minimum content of moral integrity is being a morally sensitive person, and to see what this means, we shall turn to the respected British social philosopher H. L. A. Hart. Professor Hart writes:

> In moral relationships with others the individual sees questions of conduct from an impersonal point of view and applies general rules impartially to himself and to others; he is made aware of and takes account of the wants, expectations, and reactions of others; he exerts self-discipline and control in adapting his conduct to a system of reciprocal claims. These are universal virtues and indeed constitute the specifically moral attitude to conduct.[14]

Hart's important points are three: an impartial point of view, an active concern for others, and a disciplined attempt to meet the claims made on one's behavior. These are the marks of the morally sensitive man, and they constitute a large part of what we ordinarily mean when we speak of personal integrity. These qualities are found in great leaders in any age, and they are exemplified by George C. Marshall. He paid strict attention to the notion of impartial behavior, so as not to use his position to benefit himself or his friends unfairly. For example, Pogue writes:

> Marshall applied the same rigid standards to himself that he set for others. During the war, he told his Secretary, General Staff, that if he received any decorations, honorary degrees, or had a book written about him, he would transfer out of the Pentagon. Only at the President's personal direction did he waive the first prohibition.[15]

Even when he agreed, at the President's insistence, to accept personal decorations, he held them to a minimum, saying: "I thought for me to be receiving any decorations while our men were in the jungles of New Guinea or the islands of the Pacific especially or anywhere else there was heavy fighting . . . would not appear at all well." [16] This statement was made with an attitude of humility, indicating the strict command Marshall had over his own ambitions as well as his true concern for his soldiers.

This concern for his soldiers had characterized his entire career. While he was assigned to the Infantry School, for instance, he was responsible for training several groups of Air Corps National Guardsmen and reservists. In one group were two black officers. Given the prejudices of the times and the location of the training base (Fort Benning, Georgia), it was not surprising when some of the students circulated a petition demanding that the blacks withdraw from the school. When Marshall learned of the petition, he exercised his moral leadership and defeated the petition. One of the two blacks involved was to write Marshall many years later: "Your quiet and courageous firmness, in this case, has served to hold my belief in the eventual solution of problems which have beset my people in their ofttimes pathetic attempts to be Americans." [17]

Marshall could fire subordinates, but he never became hardened to the needs and concerns of his men. He had, one must conclude, a notable moral attitude toward his military duty, and this attitude merely reflected his integrity as a man. He directed one of the most difficult wars in history, without surrendering that integrity to the needs of the moment. He was, in the highest sense, the truly moral military leader.

Loyalty and the Needs of a Democracy

Thus, in George C. Marshall a reasonable blend of loyalty, honor, and military success

was achieved. The question remaining is whether the perspective on loyalty that I have proposed is the proper perspective for today's military.

In America today, the young officer or enlisted man who is beginning his military service comes from a society whose values do not support the rigidly conceived notion of discipline. That is to say, discipline is not valued for discipline's sake. The young American is attuned to questions concerning morality and war. He expects to be given a reason when told to do something. He does not always accept established traditions without question. He is often suspicious of bureaucracy and its ways.[18] He is, in short, the type of person who leads respected military writers to say that "the gap between the values held by a large percentage of American youth and those required for effective military service is probably larger today than ever before."[19]

There remains, however, at least one thing that such a young man (or woman) responds to, today as in the past. He recognizes a man of integrity and can be inspired to trust such a man. This trust can serve to close the gap between the values of the soldier and his commander, for trust creates a sympathetic attitude and a propensity to obey. If you trust someone, you give him the benefit of the doubt when it comes to doing what he tells you to. Thus, the soldier of a democracy can remain a moral agent, ultimately responsible for his actions, and can at the same time obey the orders of a person he trusts, on the presumption that the orders are legally and morally correct. This is a presumption that all Americans would like to be able to make about the military commander, and it is one which they are justified in making if the commander is a man of integrity.

THIS PICTURE of the military places a heavy responsibility (some would say burden) on all those in positions of command, commissioned and noncommissioned officers alike. But this is no more than ought to be expected of those in such positions in the military service of a democracy. The military life has long been considered a life of sacrifice, not a life of personal gain. It is essential that the emphasis remain on the former in developing a professional soldier. Given this perspective, and with the humility and wisdom characteristic of the soldier-scholar of Plato's *Republic*, the modern American soldier can revise Himmler's phrase and write his own epitaph: "My loyalty is my honor"—my loyalty resides in a man of integrity, to whom I give my trust.

United States Air Force Academy

Notes

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3. This example was suggested by a *Denver Post* article of 12 April 1972, entitled "Ex-Nazi Given Life in Prison," which concerned the conviction of Friedrich Bosshammer, an SS officer on Eichmann's staff, who had been responsible for transporting four trainloads of Italian Jews from Italy to Auschwitz in 1944.

4. Forrest C. Pogue, *George C. Marshall: Global Commander,* The Harmon Memorial Lectures in Military History, Number Ten, United States Air Force Academy, Colorado, 1968, p. 18.

5. Forrest C. Pogue, *George C. Marshall,* Vol. I: *Education of a General* (New York: Viking Press, 1963), p. 249.

6. The many excellent studies dealing with contemporary problems of the military include Colonel Robert G. Gard, Jr., "The Military and American Society," *Foreign Affairs,* 49 (July 1971), pp. 698–710; Haynes Johnson *et al., The Washington Post National Report: Army in Anguish* (New York: Pocket Books, 1972); Morris Janowitz, "Volunteer Armed Forces and Military Purpose," *Foreign Affairs,* 50 (April 1972), pp. 427–43; and Herman S. Wolk, "Antimilitarism in America," *Air University Review,* 23 (May-June 1972), pp. 20–25.

7. Pogue, Vol. I, pp. 259–60.

8. *Ibid.,* p. ix.

9. *Ibid.,* p. xv.

10. Pogue, Harmon Memorial Lecture, p. 13.

11. *Ibid.,* p. 20.

12. Machiavelli, *The Prince* (1513).

13. Jean Jacques Rousseau, *The Social Contract,* Book I, Chapter 3 (1762).

14. H. L. A. Hart, *Law, Liberty and Morality* (New York: Vintage Books, 1963), p. 71.

15. Pogue, Harmon Memorial Lecture, p. 16.

16. *Ibid.*

17. Pogue, Vol. I, p. 280.

18. The many studies available on American youth include Paul Goodman, *Growing Up Absurd: Problems of Youth in the Organized Society* (New York: 1956); Theodore Roszak, *The Making of a Counter Culture: Reflections on the Technocratic Society and Its Youthful Opposition* (New York: 1968); Charles A. Reich, *The Greening of America* (New York: 1970).

19. Gard, p. 705.

Air Force Review

LETHALITY/VULNERABILITY

The Touchstone for Progress

GEORGE C. CREWS

THE TIME-HONORED way to evaluate the performance of a weapon design has been to try it. When the idea for a munition design has progressed through exploratory and advanced development phases, a quantity of the items are fabricated and tested by aircraft delivery of the munition against a predetermined target array. Target arrays might be anything—trucks, artillery pieces, tanks, or perhaps just cloth or paper silhouettes. At times the targets are quite complex; for example, an array of forty trucks carefully positioned in rows and columns has been used, measured off at accurately spaced intervals like a checkerboard. Once the munition has been delivered, resultant damage is assessed by careful inspection of each target. Holes in sheet metal, tires, windshields, etc., are carefully noted, and photographic records made
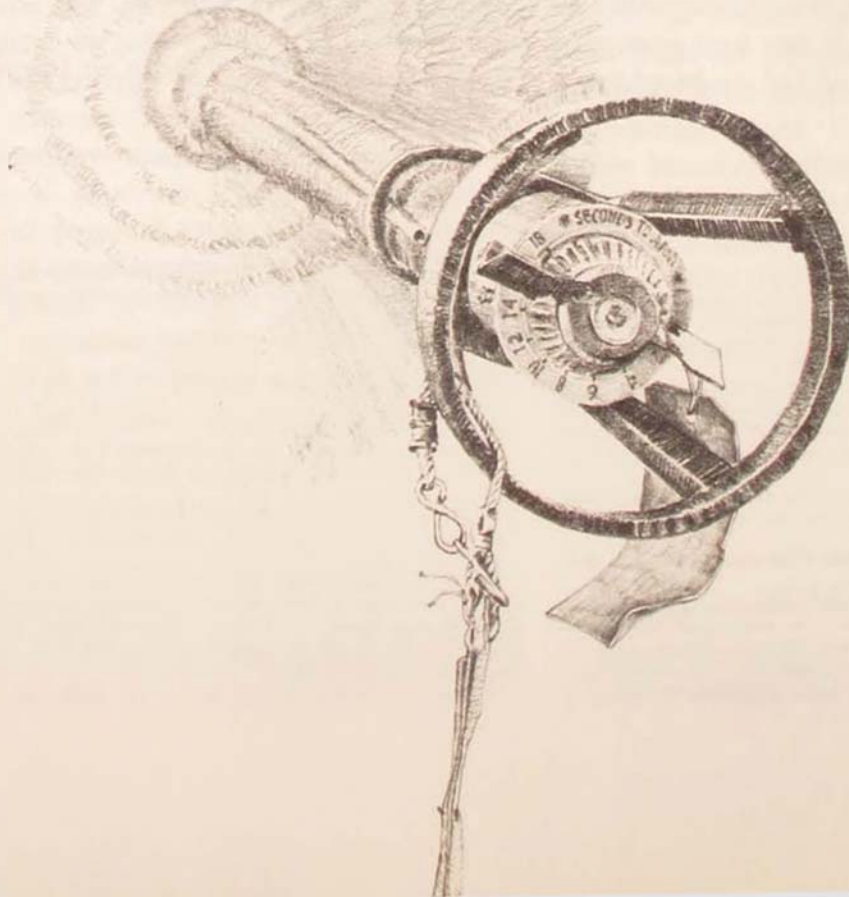
of significant visual changes. This evidence is coupled with individual submunition impact points, dud rates, and delivery conditions to formulate an official operational test and evaluation. This, then, established the worth of the design.

These procedures are indeed useful in the evaluation of a new munition system. They are inadequate, however, to establish statistically significant differences in the effectiveness of the system compared with other systems. In order to gather enough test data to build such a statistical case for or against a new design, many repeated tests would be necessary, at far too great an expense. As an alternative, the Air Force Armament Laboratory is using high-speed computational techniques to evaluate new munition designs. These techniques combine the results of a few selected tests with a computer simulation of the entire munition/target interaction, to produce a representative measure of the munition's effectiveness.

This article briefly reviews the technology areas considered in an evaluation of a typical encounter between a target and a munition system. Although they are directed towards evaluation of cluster munitions, they are applicable to unitary munitions as well.

delivery

When cluster munitions are airdropped, their individual impact points are contained within certain pattern sizes on the ground. The aircraft delivery conditions establish both the delivery accuracy (CEP) of the pattern center and the pattern size. They determine the probability of covering the target with the munitions. A small pattern (with small spacings between munitions) will produce a high target kill probability should the target be covered. However, the probability of covering the target with a small pattern is low. Conversely, a large pattern has a high probability of coverage but a low associated probability of target kill (due to the large spacings between munitions). Ob-

viously a trade-off must be made between pattern size and probability of coverage for optimal kill probability of a selected target.

Once munition pattern sizes are correlated with delivery conditions, distances can be computed between individual munitions and targets positioned within the pattern. In many cases, especially where high munition spatial densities exist, damage may be generated on one target by many different munitions. High-speed computers can accurately simulate the intereactions between these separate munitions and any number of targets within the pattern. Actual field tests cannot evaluate this overlap. Furthermore, any distribution of munitions within a pattern can be duplicated in the computer simulation. Generally, a random unbiased distribution is used, but any desired distribution is possible, such as the doughnut-shaped pattern from certain bomblets.

Munition orientations, velocities, and fuze functioning times at impact are required for a complete munition effectiveness analysis, especially where the munition's effects are biased in certain directions. The orientation will affect whether or not the munition damages the target. Impact velocities onto the ground surface must be added vectorially with fragment velocities to establish striking velocities on the target. Fuze function times (relative to the ground surface) must be established to assess the degradation of the kill mechanism by the surrounding terrain. For example, should the impacting munition bury itself in the ground prior to detonation, the fragments may be degraded significantly.

munition effects

Munition effects are established through carefully controlled and instrumented characterization tests. These tests, standard in all Air Force munition development efforts, establish the physical and functional characteristics of the munition kill mechanisms, including the following:

(1) Fragment velocities, masses, and spatial distributions

(2) Blast overpressures and impulses

(3) Shaped-charge jet penetration characteristics

(4) Thermal effects.

All these factors are considered in an overall munition effectiveness evaluation. Once the performance data are accumulated, the results may be used in an accurate and realistic evaluation against many targets, under any selected set of delivery conditions, pattern sizes, accuracies, aircraft load-outs, and sorties.

The characteristics of fragmenting munitions are determined from arena tests. An item to be tested is statically detonated on the ground, so that some of the fragments produced are captured in a soft, wall board recovery material, from which the fragment weights and spatial distributions are determined. Other fragments, not captured, are permitted to perforate thin electronic plates. These plates send electronic signals to chronographs, which measure the time taken for the fragments to travel the distance to the plates. These arenas may also be equipped with electronic pressure gauges for measuring blast overpressures and impulses, or blast effects can be computed analytically

based upon the amount of explosive contained in the munition.

Shaped-charge jet penetrator capabilities are determined by measuring the penetration into semi-infinite steel targets. The profile of the cavity produced in the steel target, as a function of depth of penetration, can be extrapolated to damage effects against armored vehicle targets. This extrapolation is based upon the number of steel spall particles emanating from hull armor into the interior of armored targets. The number of particles is directly related to the size of the cavity produced.

Munition thermal effects are also established through arena tests, but in this case the arena consists of flammable fuels, such as gasoline, diesel oil, and jet fuel. These flammables are spaced on the ground at intervals about the munition, which is then statically detonated. The number of flammable targets ignited determines the range of thermal effects for the particular design. Careful control must be maintained of the ambient conditions under which these tests are performed, to ensure uniformity between sets of results.

targets

Methods used for evaluating munition effects

Before the days of high-speed computation, the principal means of evaluating a new munition was by actual test, as on trucks positioned in a target array, with inspection of damage afterward. But tests enough to be conclusive were too expensive, so computers now supplement the test data.

against battlefield targets have improved significantly over the past years. These methods have been made possible through the use of high-speed electronic computers, which permit storage and ultrafast manipulation of target physical and functional characteristics. Basically, for computerized munition lethality evaluations, targets are represented by one of two different methods: (1) a series of triangular surfaces, sized by the complexity of the target being described, and interconnected so that no surface discontinuities, or voids, exist; and (2) a series of basic geometric figures interconnected and combined to form a mathematical replica of the actual target.

Either of these techniques may be used to describe a target, no matter how complex or intricate, by merely increasing the number of triangular surfaces or geometric figures used. The descriptions must, as a minimum, include all components critical to the total target system operation and some degree of component shielding from skin or exterior sheet metal. Metal types, thicknesses, and spacings are critical to sensitivity analyses from penetration and blast kill mechanisms, and they must be recorded exactly. All foreign target descriptions depend upon accurate and thorough intelligence data and exploitation results to provide this exact input information. Given this information, the computerized target description can be completed with precision for subsequent vulnerability assessments.

Once target components have been identified, described, and positioned correctly within the overall target system, they must be defined in terms of sensitivity to damage. Effects on the target system, should damage occur, must be known. Sensitivity to damage is usually determined from field tests, using actual components and a variety of kill mechanisms. These usually include fragment impacts for different fragment sizes and impact velocities, also bullet impacts for various caliber weapons and weapon standoff distances. Knowing these component damage functions, one can deter-

Night photography clearly illustrates the numerous interactions among various beamlets and individual targets. Sophisticated computers accurately simulate the complex beamlet-target interactions.
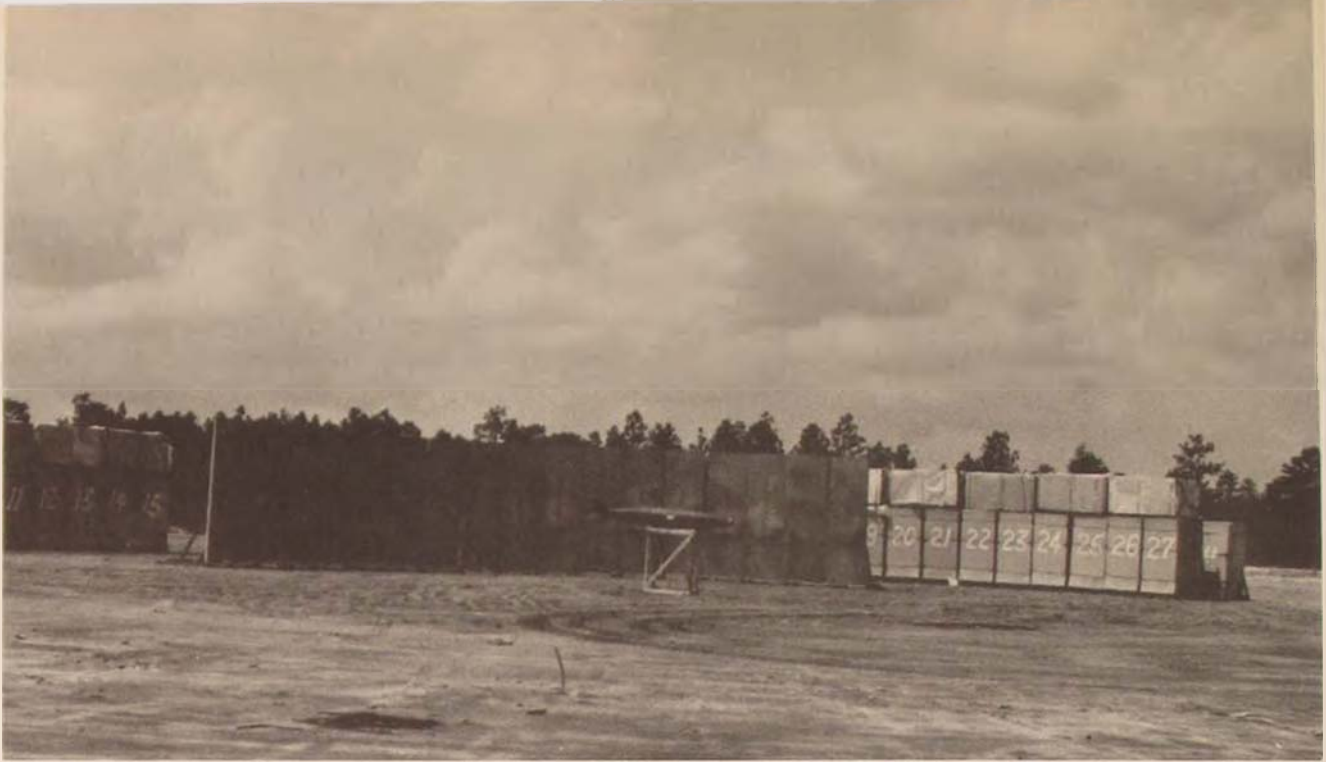
A typical bomb fragmentation arena tests munitions that are statically detonated on the ground. Metal flash panels measure explosive time and impact, and numbered wallboard recovery bundles capture bomb fragments for weight and distribution determinations.

mine the effects of damage to the target from a Fault Tree analysis. This analysis maps out the entire target operation, from input commands, through functional controls, to output performance. Interruption of any vital component will degrade the system performance. The extent to which the system is degraded is determined by an assessment of those components that are damaged. Once a target has been described in computer format, it may be used over and over again. Vulnerability evaluations may be made for a large number of attack aspects—elevation and azimuth angles—and for a large number of replications. In this way, target soft spots or sensitivities to particular threats may be readily identified. This advantage is extremely difficult to discover from full-scale field demonstrations.

vulnerability assessments

Procedures followed in computerized vulnerability assessments usually start with the super-positioning of a grid system over the target profile so that selected portions of the target can be studied independently. The grid cells, of a size commensurate with the degree of complexity of the target being assessed, are coplanar and oriented normally to the attack direction. In this way the target outline is projected onto the grid as the munition threat views it, thereby exposing all portions of the target that would occur during a real encounter.

When the target orientation and grid system are set, the assessments proceed by the generation of rays, or shot lines, through the individual grid cells and target positioned beneath the grid. The rays may be parallel to one another, or they may emanate from a point source. A single ray is generated randomly through all the cells, and each ray penetrates completely through the target. As the ray encounters sheet metal, airspaces, components, fuel tanks, etc., the information is tabulated for subsequent use. It represents what a fragment or bullet would encounter should it strike the target. Predictive

methods are used to assess penetration performance of fragments and bullets that strike target plate and sheet materials. The capability of the projectile to perforate the target completely is predicted and also the residual qualities of the impacting threat. These include residual mass, velocity loss due to momentum transfer to the target, and spatial distributions of target and projectile fragments resulting from the interactions. Each of these fragments has subsequent damage potential, and each must be assessed for effects on critical internal components. For these effects, the component damage functions referred to earlier are consulted. As these components are struck by particles whose size and velocity are known, possible component kill is predicted. Should a kill be probable, the incremental cell area is added to all other cells in which kill components are encountered. Their sum then represents the target vulnerable area, that is, the target area which is sensitive to the damaging effects of bullets and fragments.

A target may be vulnerable to kill mechanisms other than bullets and fragments, such as blast, high-explosive ammunition direct hits, shaped-charge jets, and thermal effects. These vulnerable areas are computed for each of the munition kill mechanisms, so that they may all be considered in an overall effectiveness evaluation.

kill criteria

It is just as important to define the target kill criteria used in a weapon system effectiveness evaluation as it is to define the munitions evaluated or the targets attacked. Target kill criteria are defined in accordance with either the
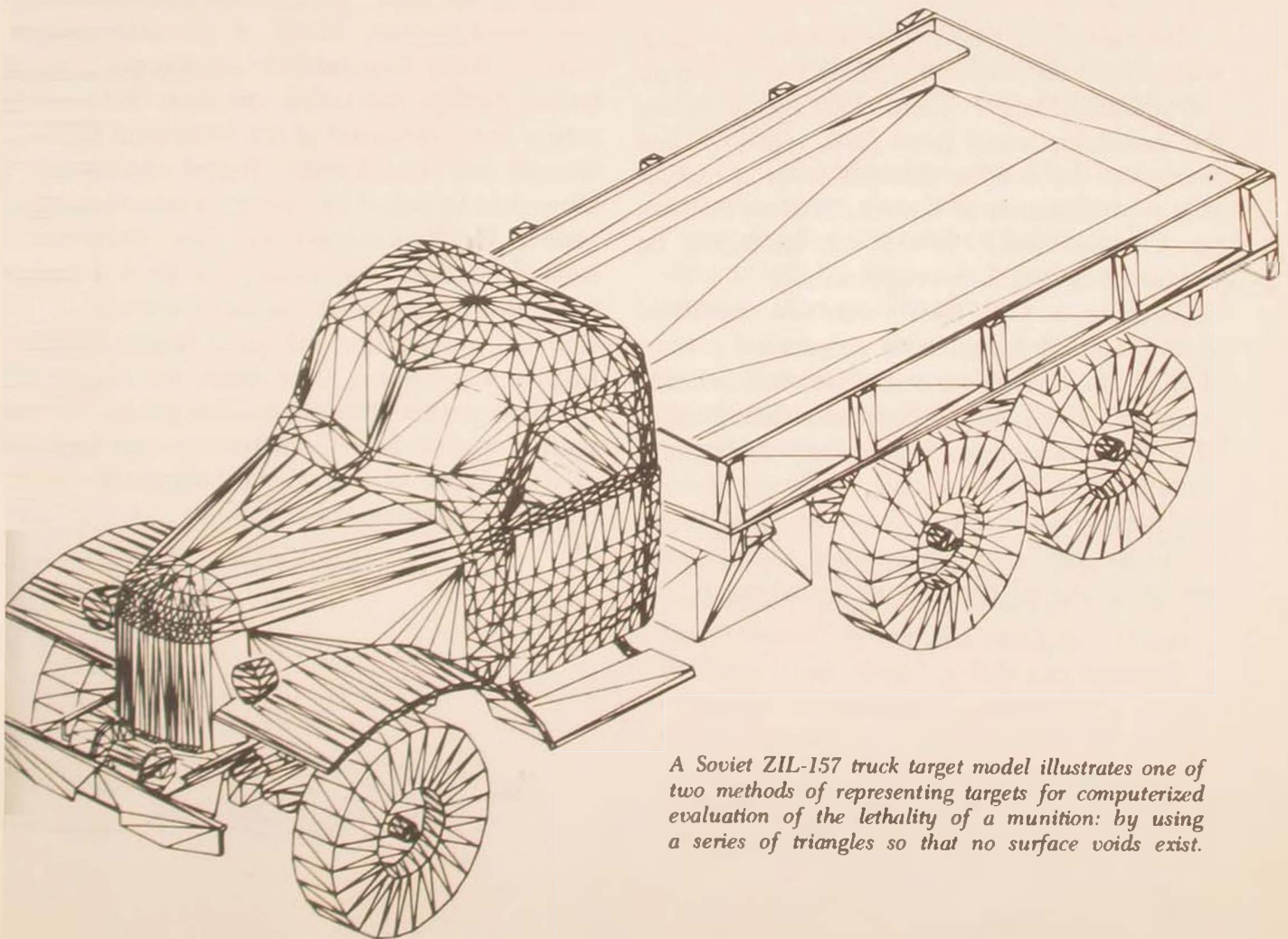
A Soviet ZIL-157 truck target model illustrates one of two methods of representing targets for computerized evaluation of the lethality of a munition: by using a series of triangles so that no surface voids exist.

extent of damage produced, from an encounter with a weapon system, or the time it takes for the target to cease to function. Following are examples of these criteria:

(1) K-Kill: Total catastrophic destruction of the target, rendering it suitable only for salvage.

(2) Mobility *A* Kill: A target vehicle will cease to operate within 5 minutes after being damaged.

(3) Mobility *B* Kill: A target vehicle will cease to operate within 20 minutes after being damaged.

Other criteria presently in use consider the time it takes to place a damaged target back in operation. These criteria are termed "interdiction" kills, and they are used for special applications, such as attrition analysis. It is important, then, to carefully select the kill criteria most applicable to the requirements of the study, since the sensitivity of any target varies according to the criteria chosen.

Knowledge of these five technology areas will permit the statistical simulation of a typical munition/target interaction. By repeating the simulation many times (200, typically) and averaging the results, one can infer a reasonable representation of the results of an encounter. The significance of this statement may be illustrated by the following example.

Consider a CBU-24/B munition delivered against a truck target with a specified pattern of BLU-26/B bomblets and a specified delivery accuracy. The CBU-24/B system contains 660 BLU-26/B bomblets; the BLU-26/B bomblet contains over 300 steel balls uniformly distributed over the surface of the bomblet. A single computer simulation will position each of these 660 bomblets on the ground, according to the delivery accuracy relative to the truck (the aim point). The pattern center may fall at an infinite number of positions, but one-half the time this center will be within the delivery CEP. Once each bomblet impact point has been generated, the probability of truck damage from all bomblets in the pattern is computed. This entire computational procedure is repeated and averaged, until the variation in the average is small, usually less than one percent. At this point it may be presumed that the computer simulation has predicted a reasonable representation of an average interaction of the munition system with the target. Many simulated engagements led to the results obtained, far more than could have been collected through actual field tests. As a result, we have an answer to the question, "How good is that munition?"

The Air Force Armament Laboratory has the sole USAF resources for vulnerability assessments of foreign targets to conventional munition developments. Much of the information used in these vulnerability assessments is obtained through controlled munition characterization tests conducted at the Armament Development and Test Center. Target descriptions, using data furnished by Foreign Technology Division, Wright-Patterson AFB, are often contracted to firms specializing in work of this type. But the basic interactions between munition kill mechanisms and these targets depend upon a select group of scientists and engineers for their proper definitions. This group, representing wide areas of expertise, completes the vital network of knowledge necessary to a complete munition evaluation.

Air Force Armament Laboratory,
Eglin AFB, Florida

A LITTLE THOUGHT PREVENTS BIG WASTE*

Some Suggestions for Clear Writing

Major James Conely

W E ALL KNOW that clear writing is important. We also know that the Air Force makes a continuing demand on us to improve our writing. But despite our knowing all that, we still generate too much prose with peculiar, if not in fact confusing, problems. Consider the following examples; in some of them, emphasis has been added:

• A base newspaper recently told about a certain re-enlistment and reported, "Sgt. Smith was given a *guilt* edged three-day pass." Move over, inmates—this pass wasn't the one Sergeant Smith expected.

• A USAF message began, "It is *desirous* for officers to establish direct communication with. . . ." Let your dictionary tackle that one, and don't be surprised by what you find.

• A wing bulletin announced an "Aircraft Accident Investigation Board Training Session." Now then, what session was that?

• An instructor in an Air Force survival course directed each student to "compare the rattlesnake's tail to the structure of his fingernail." Snakes are stranger than we thought.

• Another USAF instructor asked his students to "place a piece of paper on the table in front of you that is free of any folds," not, apparently, on a folded table.

And so on. Dr. Vincent McGuire of the University of Florida estimates that 75 percent of the common errors in writing are "thought" errors. For example, "When barking, I hate dogs." A rule can be cited to correct this faulty reference, but if the writer *thinks* about what he says, he doesn't need a rule either to recognize the mistake or to correct it. The same is true

for inaccurate or unnecessary words, sentences that are too long or too awkward, confusing sentence or paragraph organization, and many other problems.

Consequently most of the problems we have are the ones easiest to correct, namely, errors of thought. Notice that of all the examples just given, only one is strictly a rule mistake: "gilt" in the first example is misspelled. The others could have been corrected, or at least significantly improved, if each writer had thought carefully about what he wanted to say.

Only 25 percent of the more common mistakes, says Dr. McGuire, are caused by "rule" errors. For example, "The boys is present." In this example the problem is simply that the rule says, "Use a plural verb with a plural subject." The only way to correct rule errors is to learn the rules and apply them. This is easy to say but not always easy to do.

But back to errors of thought.

Why are these mistakes so common? Certainly we would expect that problems so easy to recognize and so easy to solve would in fact be both recognized and solved. Unfortunately, this doesn't happen often enough. If it did, the Air Force would not have the continual need to admonish its people to write more clearly.

No one can say for sure, but there are probably five reasons why thought errors go uncorrected:

(1) People don't read what they write. Perhaps they see the words they wrote, but that isn't the same as reading. As their eyes glide over the page, they unconsciously overlook anything extra or omitted or inaccurate. Their meaning is too firmly in mind to see that it isn't on the page. The answer to this is simple: proofread carefully and critically. Better yet, let somebody else proofread, or let a few days pass before you proofread yourself.

(2) People don't think they have problems. They may consider themselves too intelligent or too simple or too average to have problems. We will allow for a few people having no problems, but the thought mistake is no respecter of persons;

we are all susceptible. For example, USAF Academy cadets have written such gems as these:

> The purpose of Mr. Moore's speech was to convince and inspire the college editors he was talking to that they should attempt to maximize satisfaction to themselves and to others while in the pursuit of excellence.

> °   °   °

> The cuisine is excellently prepared by qualified chefs ranging from tasty Maine lobster to corn-fed beef from Colorado.

Highly educated, professional writers can also have problems, as in these examples from the *Sociological Inquiry:*

> Without predicament and perplexity, the plausible and the absurd, vicissitudes remain unshared, intelligence goes unchallenged, and wisdom cannot grow.

> °   °   °

> Having said which, it should be noted with emphasis, this entire discussion—even if fully comprehended—constitutes nothing more than a bare beginning to a full understanding of that which has been discussed.

Commissioned officers are not immune, either. An officers open mess administration wrote the membership: "It is requested that each member return the enclosed ballot as soon as possible." The first six words could be deleted without changing the meaning or tone, but the USAF behest both to omit deadwood and avoid passive voice was no more complied with by this club than it is by most other organizations. The problem here is not serious; after all, it won't make a discernible difference in the nation's defense. But compound these wasted words by the length of the whole letter, the number of letters sent by that club, the number of times such waste commonly occurs elsewhere, and the problem no longer seems small.

In other words, it makes no difference what degrees we have, what rank we wear, what positions we hold, or how much experience we have: the basic problems of writing are problems for us all. The answer is simply to recognize this fact.

(3) People don't want to insult their readers.

Some people actually believe that readers who have above-average intelligence will be offended if the writing is too simple. Even if this were true, it doesn't show proper consideration for less fortunate readers. However, no one has ever been offended by writing that is easy to understand. The answer to this? Write to express, not to impress.

(4) People don't think clearly about what to write. Not long ago an instructor in one of the most important schools in the Air Force sat at his desk, apparently occupied, as he stared at the wall for about half an hour. A colleague came in and asked what was going on. The instructor replied, "I have to write a letter to all instructors for the boss's signature. It's about a new lesson procedure, and I don't know how to write it."

His colleague then asked, "What do you want to say?" The instructor told him. "Well, why don't you write what you just said?" It never occurred to the instructor that it could be so easy.

We all tend to speak more fluently than we write. It is much easier, for example, to give a lecture (hard as that may be) than to write the same lecture as a paper for people to read. For some unknown reason, writing seems to tie up our thinking. The usual result is either wasted time or writing that is too vague, too general, too awkward, and too wordy.

Therefore, if the written words don't come easily, say aloud whatever it is you want the reader to know. Then write what you just said and polish as necessary.

(5) The fifth reason for uncorrected writing is the most critical: people are often too lazy or too busy to revise what they have written. These are the people who either don't proofread at all or else look back over their letters, handouts, or whatever and say, "My reader will know what I mean."

This kind of thinking resulted in the following incident: Recently a captain got a letter from his CBPO notifying him of a projected reassignment at a future date. The letter also explained that if the officer wished to apply for separation instead of accepting the assignment, he should do so within a specified time after "notification of end assignment." The captain did indeed want to be separated.

Some time later he got another letter which named a specific assignment. He then contacted the CBPO within the specified time to make application for separation. But shortly thereafter, PCS orders arrived. Furious, the officer returned to the CBPO and learned that "notification of end assignment" apparently meant the letter that projected reassignment, thereby ending his present assignment—not the letter giving the assignment he would have in the end.

Finally, after a great deal of time wasted in researching records, making long-distance phone calls, rescinding and rewriting paperwork, the problem was resolved. The person who had been "too busy" to think about and revise what he had written in that first letter ended up being even busier making other changes.

There is no more excuse for laziness in writing than in anything else. And there simply is no such thing as being too busy to rewrite.

Why is it that we so rarely assume that these problems could apply to us? Even as you read this article, you are probably thinking about similar problems that someone else has. It is easy to spot *their* problems:

> In addition to the fine work done by the Irish regiments he assured them that many a warm Irish heart beat under a Scottish kilt. (From a London daily paper)
>
> °   °   °
>
> Maternity wear for the modern miss. (Sign in a London store)
>
> °   °   °
>
> Split and warmed and served with our cheese, you will be the envy of your guests. (From a catalog of a store in Sugar Hill, N.Y.)

But spotting similar problems in our own writing is not so easy. Most of us take a jealous pride in what we write. Once the words are written, we resent the suggestion that something could be wrong with them. We don't like to check and change the words, the organization,

the limits of the subject, spelling, punctuation, or anything else. And even when we admit the advisability of change, we are often unwilling to take the time to do so. Few of us challenge our own writing.

The real problem, then, is self-evaluation. Numerous guides and checklists tell how to do this, such as in this list of five reasons for problems. The basic suggestion of all these guides is *think clearly about what you want to say.* Then write simply, write directly, and proofread carefully.

If we develop the habit of critical self-evaluation, all the problems cited here will be eliminated. Otherwise, they will continue to occur as often and as severely as they have in the past.

Academic Instructor & Allied Officer School

THE USAAF IN CHINA, 1946–47

Lieutenant Colonel Gordon K. Pickler

P RESIDENT NIXON's visit to China and its spectacular TV coverage have dramatically rekindled American interest in things Chinese. Capitalizing on this heightened interest, journalists, scholars, retired foreign service officers, and others with experience in China are offering up a spate of articles and books. Many of the writers are delving into the American government's deep involvement in Chinese affairs during the decade of the forties and are producing a varied abundance of surveys, vivid descriptions of Chinese life, memoirs, and new insights and vignettes concerning American policy toward the Chinese Communists during that era.[1] This literature is arousing a great deal of attention and causing some controversy. For example, a most interesting and well-written article by Barbara W. Tuchman appeared in a recent issue of the prestigious journal *Foreign Affairs*.[2]

Mrs. Tuchman uses recently declassified material to serve up a speculative essay

about what might have occurred had Mao Tse-tung and Chou En-lai come to Washington. This hypothetical proposition was prompted by a message in 1945 from an American military representative in Yenan, relaying Mao and Chou's expression of interest in visiting President Roosevelt in order to develop a working relationship with the American government. However, Mrs. Tuchman nimbly refocuses her emphasis: instead of making suppositions about what might have been, she launches into a tirade against Generalissimo Chiang Kai-shek and Patrick J. Hurley, FDR's personal representative in China in 1944–45. The main sources of her support material seem to be information supplied by Colonel David D. Barrett, Chief of the American Mission to Yenan, and John S. Service, a career State Department officer, neither of whom can be considered an unbiased source because their careers were injured by Hurley's vindictiveness. Her main contention is that Hurley was one of the primary obstacles— if not *the* primary obstacle—in blocking Mao and Chou from having direct parleys with Washington. Accordingly, the U.S. lost the opportunity to preserve viable contacts and establish amicable relations with the Chinese Communist leaders.

Mrs. Tuchman gives the impression that this failure to communicate American friendliness to the Communist leadership represented the end of any serious attempt to have meaningful contacts with them. She overlooks the efforts of General George C. Marshall, President Truman's special envoy, who tried for over a year to bring about a lasting truce—even coalition— between the Chinese Nationalists and Communists (fighting had broken out between them in late July 1946). By the end of 1946 Marshall had quit in disgust, but his departure still did not end all American contacts or friendly gestures toward the Chinese Communists.

There were additional meetings between Americans and the Chinese Communists, other than the ones highlighted by Mrs. Tuchman's article and Marshall's conciliatory endeavors.

Had the Communists desired talks with American officials, channels were open for making the arrangements, and indeed there *were* some contacts. An instance, perhaps one of the last friendly contacts, took place between the Communists and American airmen.

In March 1947 the U.S. Army Air Forces used its aircraft and crews to evacuate Chinese Communist officials, their staffs, and their families from Nanking and other Nationalist cities to the Communist capital of Yenan in Shensi province.[3] The airlift was prompted by termination of Communist-Nationalist discussions that had been held mainly in Nanking. Having no transportation of their own, the Communists were faced with having to trek the 600 miles through Nationalist territory before reaching a sanctuary in the north. Because of the distance and the danger of "bandits" or *agents provocateurs* waylaying them, the Communists requested transportation from their compound in the city to the Nanking airport, where they could board American aircraft. The Air Force, by providing the means of safe passage across hundreds of miles of Nationalist-held territory, probably saved the lives of most of the Communist group, the most notable among them being the present Premier of the Chinese People's Republic, Chou En-lai.

The American aircraft and crews that carried out this evacuation belonged to the Air Force section of the Army Advisory Group in China. The Air Division, as it was called, had been established in early 1946. It was headquartered in Nanking, comprised of about 250 officers and men, and commanded by Brigadier General John P. McConnell (later to become USAF Chief of Staff). This activity was designated Operation Catfish and occupied the Air Division's staff and facilities in early March 1947.

The operation began on the morning of March 9. The Communists and their families, with their luggage, arrived at Tai Chiao Chan Airfield, Nanking, aboard American trucks. The lower-ranking functionaries boarded C-47 transports, while Chou En-lai and the more

Chinese Communists prepare to board a USAAF C-47 at Tai Chiao Chan Airfield, Nanking, after breakdown of Communist–Nationalist discussions in March of 1947.

Six hundred miles away at Yenan, the caves (actually tunnels) in the hills bordering the landing strip served as offices and homes for Chinese Communist leaders.

On completion of the evacuation, perhaps the last friendly association of our Air Force and Chinese Communists for a quarter century, Chou En-lai had coffee at Yenan with USAAF officers.

important delegates were flown to Yenan in the more comfortable C-54. General McConnell, who had earlier landed a C-54 carrying Mao Tse-tung to Yenan, briefed his crews that the Communists had laid out an airfield in a canyon along a Yellow River tributary, which their austere capital overlooked. A sheer wall at the end of the runway ruled out the likelihood of a successful go-around in case of an emergency.[4] Since there were no navigational aids at the field, the Americans had earlier flown in a spe-

cially equipped C-47 containing complete radio facilities—including a homing station, air-ground communications, and an instrument approach system. The American pilots completed the passenger shuttle in one day without mishap. The Communists seemed extremely appreciative and hosted the American airmen with coffee and sandwiches before they took off for the return flight to Nanking.

Just after our planes were airborne, the Communists surprised the Americans, who

were circling to gain altitude, by blowing up portions of the runway, thus making it impossible for planes to return for an emergency landing. In retrospect, this gesture indicated quite dramatically that the Communists wanted to end all contacts and future parleys. Within a week, their troops had dug deep trenches—possibly to conserve explosives—across the remainder of the strip, so as to render it totally useless.

THIS gesture of goodwill by American airmen in 1947 was probably the last friendly meeting between the Chinese Communists and members of the U.S. Air Force for almost a quarter of a century. Despite the time lapse, mainland China's indefatigable Premier would probably recall this instance of friendliness and perhaps might even consider that the Air Force on that day had saved his life.

Air Command and Staff College

Notes

1. Two such books are John Paton Davies, Jr., *Dragon by the Tail* (New York: W. W. Norton & Co., 1970) and Seymour Topping, *Journey Between Two Chinas* (New York: Harper and Row, 1972).

2. "If Mao Had Come to Washington: An Essay in Alternatives," *Foreign Affairs*, Vol. 51 (October 1972), pp. 44–64.

3. The description of the evacuation and the accompanying photos were taken from "History of Air Division, Army Advisory Group. March 1947," 861.01, Albert F. Simpson Historical Research Center, Maxwell AFB, Alabama.

4. Interview with General John P. McConnell, former Chief of Staff, U.S. Air Force, Washington, D.C., 9 February 1971.

THE organizational structure of the Soviet Air Force is a useful vehicle for an understanding of the fundamental military concepts and doctrine that support the *raison d'-être* of the military organization. This is especially true of Soviet armed forces because of their acute general awareness of the necessity that organizational form follow doctrinal underpinnings. The Soviet armed forces in general and Air Force in particular have departed radically from the Western form of military organization to meet their specific and unique requirements.

All branches of the Soviet armed forces are subordinate to a single Minister of Defense, a key element of the post-Stalin reorganization of the Soviet armed forces in 1953.

THE SOVIET AIR FORCE HIGH COMMAND

ALEXANDER O. GHEBHARDT
DR. WILLIAM SCHNEIDER, JR.

The Defense Ministry itself is one of several ministries within the governmental apparatus known as the Council of Ministries. There is an elaborate parallel structure for the political control of the armed forces through the Military Committee of the Central Committee of the Communist Party. This control extends throughout the armed forces through the political directorates for each of the respective branches. This aspect of Soviet Air Force organization will not be discussed here, to facilitate a sharper focus on the purely military aspects of the Soviet Air Force High Command.

Directly subordinate to the Minister of Defense are three First Deputy Ministers, one of whom is the Chief of the General Staff, while another is Commander in Chief (CINC) of the Warsaw Pact forces. In addition there are ten Deputy Ministers of Defense, who are the CINC's of their respective branches.[1] The group of Deputy Ministers forms the Military Council, a parallel advisory body to the Defense Minister, along with the General Staff. The High Command of the Soviet armed forces is currently in a process of revitalization. More youthful officers are being placed in senior positions to replace aging incumbents, with at least a limited expansion of the Military Council. (Average age within the Soviet High Command until recently exceeded that of U.S. counterparts by nearly ten years.) In addition to the creation of a Deputy Minister for Civil Defense, it appears likely that the Soviets will reinstate the position of Deputy Minister for Combat Training, which was abolished in 1968.

The Soviet Union is divided into sixteen Military Districts, four Groups of Soviet Forces in Eastern Europe, four Fleet Commands analogous to Military Districts, and two autonomous Naval Flotillas.[2] The most important districts are Moscow, Leningrad, and Kiev, and the Northern Fleet is the most important naval element.

As is already apparent, the mission, and consequently the organizational structure, differ substantially from their American counterparts.

The Soviet Air Force CINC has largely administrative rather than operational control over the most important elements of the Air Force, reflecting broader Soviet organizational framework and preferences predating World War II. There are eleven Deputy Air Force CINC's, five of whom are in charge of semiautonomous commands that are under the operational control of other branches. These five are the Long Range Aviation (the strategic bombing component of Soviet forces), which is subordinate to the Minister of Defense; the Aviation (manned interceptor) branch of the Soviet Air Defense forces (PVO), which is operationally subordinate to the Air Defense Forces CINC; Naval Aviation, which is subordinate to the Navy CINC; and the Tactical Air Force (or "Frontal Aviation" in Soviet parlance) and Airborne forces, which are operationally controlled by the Ground Forces CINC.

The remaining Deputies perform key administrative and support functions, including Rear Services, Engineering, The Chief Inspector, Training, Finance, and the inevitable Chief of the Political Directorate.[3]

leading personalities

At each turn in the history of the Soviet Air Force, changes in organization and doctrine have been accompanied by changes in personnel in senior positions. Thus, in 1949, just before the start of the Korean War, Stalin replaced Chief Aviation Marshal Konstantin Vershinin with Chief Aviation Marshal Pavel F. Zhigarev. In 1957 the reverse move took place when Vershinin replaced Zhigarev, this time for a period lasting until 1969. At that time Aviation Marshal Pavel Stepanovich Kutakhov, the First Deputy Commander in Chief of the Air Force, 49 years of age, became the youngest CINC of a service in the Soviet High Command.

Kutakhov's career up to that point had been marked by rapid promotions as a result of his combat experience in World War II, when he was credited with having destroyed 13 German

military aircraft. After the war Kutakhov held various staff positions in several Soviet military districts, including Odessa, to which he was appointed Air Force Commander in 1965. In 1967 he was transferred to the Air Force Headquarters in Moscow. His involvement in politics paid off when he was elected a delegate to the 23d and 24th Congresses of the cpsu, where he was selected as a member of the Central Committee by virtue of heading a branch of the armed forces. His replacement of 65-year-old Marshal Sergey Rudenko as Vershinin's First Deputy in March 1968 was apparently in preparation for the invasion of Czechoslovakia. Kutakhov's promotion was almost completely overshadowed by the events in Czechoslovakia and the replacement of Army General Kazakov by Sergey Shtemenko as Chief of Staff of the Warsaw Pact forces. Kutakhov's appointment therefore should be interpreted as having resulted from a combination of political acceptability, relative youth, and favorable circumstances within the High Command brought about by the invasion of Czechoslovakia.

On 7 November 1972 Kutakhov was promoted to Chief Marshal of Aviation, the highest rank achieved by an Air Force officer and equivalent to Marshal of the Soviet Union. Thus he attained the same rank as his predecessors Novikov, Zhigarev, and Vershinin. His promotion may indicate satisfaction with his performance, length of tenure as the Air Force cinc, or an attempt to appease the Air Force officers for a series of advantages given to the Navy.

On the whole, since he was appointed, Kutakhov has maintained a low level of visibility. He is believed to lean toward an offensive strategy in contrast to the defensive orientation of most Soviet generals. One of his first moves was to reshape the Air Force High Command by replacing the aging Marshal Agaltsov with the then Lieutenant-General Vasilii Reshetnikov as Commander of the Long Range Aviation.

Also in 1969 Kutakhov appointed a new First Deputy, Colonel-General A. N. Efimov. Efimov is a World War II bomber pilot credited with flying 200 missions against German positions. After the war he attended the Soviet Air Force Academy and subsequently held various command posts in military districts. In 1970 the Air Force cinc replaced the Chief of Staff, Colonel-General Braiko, who had held the post since 1963, with Colonel-General A. P. Silantyev. Silantyev appears to share his Chief's predilection for offensive operations. His selection of a young Deputy, Ivan F. Modiavev, a one-star major general, is further confirmation that the new generation of Russian airmen is likely to differ substantially from those who were in command during World War II or even during the Korean War. Another influential position was filled in 1967, following the death of Colonel-General A. G. Rytov, when Colonel-General I. M. Moroz became Chief of the Political Directorate.

The shake-up of the Air Force High Command was apparently carried out for two different reasons: first, because of the advanced age of the incumbents, the average age of the top four officers before 1969 being 66. Second, in advance of an apparent shift from a defensive to an offensive strategy, possibly caused by the realization that the growth prospects of the Moscow (Galosh) abm system were not such as to give the Soviet High Command the confidence necessary to deploy a nationwide active defense system against ballistic missiles comparable to the existing system against aerodynamic threats, as well as decisions to move heavily into new areas of weapons development including slbm's, surface Naval combatants, and icbm's.[4]

One interesting aspect of the command change is to understand to what extent this has influenced the positions of the Air Force cinc within the Ministry of Defense and the Soviet Air Force as a whole in comparison to the other branches of the armed forces. As is well known, Soviet military strategy has been domi-

nated by officers whose experience was in the tank and artillery forces. The present composition of the Soviet High Command reflects this fact. Today it continues to be dominated by Army officers, as demonstrated by the fact that despite his title of Deputy Minister of Defense Kutakhov ranks tenth in the overall High Command. The following list provides a better idea of the rank-ordering of the specialized services within the Soviet military hierarchy:

Marshal Andrei A. Grechko
> Minister of Defense, Army

Marshal Ivan I. Yakubovskii
> First Deputy Minister of Defense, CINC Warsaw Pact, Army

Army General Viktor G. Kulikov
> First Deputy Minister of Defense, Chief of the General Staff, Army

Army General A. A. Epishev
> Chief, Main Political Directorate of the Soviet Army and Navy, Army. (He is not listed as a First Deputy but obviously ranks as one.)

Army General S. L. Sokolov
> First Deputy Minister of Defense without specified duties but presumably in charge of coordination and administration, Army.

The service chiefs are then listed in the order of importance of their respective services regardless of their actual rank. They all hold the position of Deputy Minister of Defense, which is roughly equivalent to the U.S. Assistant Secretaries.

Army General Vladimir F. Tolubko
> Deputy Minister of Defense, CINC Strategic Rocket Troops, Army

Army General Ivan G. Pavlovskii
> Deputy Minister of Defense, CINC Ground Forces, Army

Marshal Pavel F. Batitskii
> Deputy Minister of Defense, CINC Air Defense Troops, Army (Artillery). (Previously he was First Deputy Chief of the General Staff.)

Admiral of the Fleet of the Soviet Union Sergey G. Gorshkov
> Deputy Minister of Defense, CINC Navy

Chief Aviation Marshal Pavel S. Kutakhov[5]
> Deputy Minister of Defense, CINC *Air Force*

Army General Semyon K. Kurkotkin[5]
> Deputy Minister of Defense, CINC Rear Services (Logistics), Army

Colonel-General Aleksandr T. Altunin
> Deputy Minister of Defense, Head Civil Defense, Army

Marshal Kiril S. Moskalenko
> Deputy Minister of Defense, Chief Inspectorate, Army

Engineer-Army-General Aleksandr N. Komarovskii[5]
> Deputy Minister of Defense, CINC Construction and Billeting of Troops, Army

Engineer-Colonel-General N. N. Alekseyev
> Deputy Minister of Defense, Head Weapons Development (R&D), Army

The same is true about the position of Air Force officers within the General Staff. Neither the Chief nor any of his Deputies is an Air Force officer. The Navy was in the same position as the Air Force until recently, when General Kulikov, as part of his program of restructuring the General Staff, decided to appoint an Assistant Chief of Staff for Naval Operations—a move long overdue in view of the growing role of the Soviet Navy. The appointment went to Admiral of the Fleet S. M. Lobov, until recently Commander of the Northern Fleet.[6] It is interesting to note that in 1960 when Khrushchev split the aerodynamic and missile forces by creating a separate Strategic Rocket Troops service no similar move was undertaken in respect to the General Staff. If the Air Force is given the same importance as the Navy, the effect will be that in the near future an Assistant Chief of Staff for Air Operations will also be appointed. This in turn may lead to a fragmentation of the centralized Soviet High Command, with corresponding effects for Soviet strategy, tactics, and organization. Technology seems, however, to make such appointments desirable in view of the increasing complexity

of operations and management. Currently the Air Force has a three-star general representing it on the General Staff in the person of Colonel-General N. P. Dagayev and a two-star general in Lieutenant-General V. Minakov. Since the appointment of Admiral of the Fleet S. M. Lobov as Kulikov's Assistant Chief, the General Staff has the following structure:

Army-General Viktor G. Kulikov
    Chief, Army
Colonel-General Nikolai V. Ogarkov
    First Deputy Chief, Army
Colonel-General Mikhail M. Kozlov
    Deputy Chief for Operations, Army
Army General P. I. Ivashutin
    Deputy Chief for Intelligence, Army (KGB background)
Colonel-General V. V. Druzhinin
    Deputy Chief, unspecified duties. (Former Chief Radio Engineering Forces Air Defense Command 1961–1967.)
Admiral of the Fleet S. M. Lobov
    Assistant Chief for Naval Operations, Navy

The Air Force officers' inability to become Chiefs, or at least Deputy or Assistant Chiefs, of the General Staff is probably one reason for unhappiness among their ranks. Traditional Soviet military doctrine has relegated Air Force and Naval officers to "specialists" in a particular field and as lacking general knowledge and expertise to assume the duties of the Chief of the General Staff of what was and continues to be mainly a continental military force. The interservice rivalry, up to this point, has not been comparable to that in the U.S., and although it should not be completely ignored, it is not as sharp or as important as among our services. As a result the Soviet High Command is among the best integrated in the world, a fact illustrated not only by the position and role of different services in the overall strategy, or the concept that all services and branches will play an equal role in a future war, but also by operational characteristics. The flying of Air Force medium and long-range bombers with the Soviet Navy in naval exercises is one example.

The subordination of the Fighter Forces Command-Air Defense Command (IA-PVO) both to the Air Defense CINC and the Air Force CINC enables the Front Commander in time of war to shift fighter units from defensive to offensive operations. They may also be transferred to support a different army or front as battle conditions may require.

The impossibility of a Kutakhov or Vershinin to achieve the high position that General Twining achieved in the U.S. as Chairman of the Joint Chiefs of Staff is quite clear at the present time. Technological developments and the growing complexity of operations and coordination will, however, probably persuade the Soviets to appoint a Deputy Chief of Staff for Air Operations and one for Naval Operations. The enhanced role of both the Soviet Navy and the Air Force, highly visible in recent Soviet maneuvers, makes it a future likelihood.

Air Defense Command

Since positions on the General Staff are hard to attain, Soviet Air Force generals appear to direct their ambitions in other directions. The Air Defense Forces or PVO *Stranny* (for *Protivo Vozdushnaya Oborona*) are a separate command staffed by both Air Force and artillery officers, the latter holding all four top positions at the present time. In 1966 the present Commander in Chief, Marshal Batitskii, replaced Aviation Marshal Sudets, and another artillery officer, Army General A. F. Shcheglov, took over as PVO First Deputy from Colonel-General of the Air Force G. V. Zimin. This left Colonel-General Alexei I. Pokryshkin, the famous World War II Red flying ace credited with the destruction of 59 Nazi planes, as the most senior Air Force officer in the PVO. In 1972 Pokryshkin was appointed Chairman of the paramilitary Volunteer Organization for the Support of Army, Navy, and Air Force (DOSAAF), replacing Army General Getman. Pokryshkin has recently been promoted to aviation marshal, as has also Colonel-General I. Borzov, Commander of Naval Aviation.

Pokryshkin's departure left two other Air Force officers in contention for Batitskii's and Shcheglov's jobs when one or both of them are retired. The Commander of the Fighter Forces, Colonel-General A. Borovykh, may be helped by both his command ability and political connections should one or both jobs be given to the Air Force. A more probable candidate for a command position (barring some unforeseen circumstances) appears to be Colonel-General A. I. Koldunov, whose military career in the past few years has been surprisingly successful. In 1968 Koldunov was Deputy Commander of the Baku Air Defense District. One year later he was moved to the Ministry of Defense for a brief tour of duty, and in 1970 he succeeded Colonel-General Vasilii V. Okunev as CINC of the important Moscow Air Defense District. Okunev was made Chief of the Soviet SAM Expeditionary Corps in Egypt, where he stayed until the Russian units were expelled in June 1972. Koldunov's rapid promotion, current position, and age (49) make him an obvious contender for one of the two senior positions in the PVO Command. Politically he is also well placed, as demonstrated by his election as a Candidate Member of the Central Committee at the 24th CPSU Congress held in 1971.

The appointment of an Air Force officer would increase both the prestige and power of the service and may have wider doctrinal implications, especially on whether the role of the air defense artillery against low-flying targets will increase when the B-1 bomber enters service. An Air Force officer in charge of air defense is also bound to play an important part in the reshaping of strategy and procurement policy for the next generation of interceptors and tactical aircraft, which will probably be heavily influenced by advanced technology.

other channels of promotion

Another important current avenue of promotion for both Air Force and Navy officers is through political channels. In 1970 a Colonel Larionov of the Army headed a subsection of the Ministry of Defense responsible for relations with foreign military attachés assigned to Moscow. This subsection has subsequently been upgraded into a section similar to the Foreign Ministry Protocol Service and an Air Force Major-General, S. N. Sokolov, put in charge. Sokolov's appointment appears to be a plum for the Air Force, although only the future will tell whether this position will be filled in rotation of the three major services.

Other young Air Force generals have achieved status via the Political Directorate. Major-General F. Ishchenko, who has recently become Head of the Political Directorate and Member of the Military Council of the Southern Group of Forces in Hungary, began his career as a Komsomol organizer and rose rapidly until 1970, when he was appointed Deputy Chief of the Political Directorate in the Far Eastern Military District. In Hungary he replaced an Army officer, Lieutenant-General P. Petrenko. Currently Ishchenko is the only Air Force officer heading the Political Directorate in a Military District. However, the former exclusive Army domination is changing rapidly as young one-star Air Force generals are now holding the positions of First Deputy or Deputy Head of the Political Directorate in a number of services and districts and are probably earmarked to take over when the present incumbents are transferred or retired. The Air Force major-generals in such positions include the following: Major-General N. Kozlov, Deputy Head of the Political Directorate, Air Defense Forces; Major-General V. Semenov, Chief, Political Directorate, Air Force Staff and Administration; Major-General F. Kletskin, First Deputy Head in the Belorussian Military District; Major-General N. Tsymbal, Head of the Air Force Political unit, Far Eastern Military District. Kozlov and Kletskin are in the best positions to be made head of a Political Directorate in a Military District when a vacancy occurs. Nevertheless, despite all these steps forward, the Air Force is still behind the Army in the number and importance of political ap-

pointments held. Technological development combined with the process of rejuvenation of the entire Soviet High Command will undoubtedly help the careers of a number of Air Force officers. Both politically and professionally they are likely to play a greater role in the future.

Despite the fact that only one man is in a position to become CINC of the Air Force at any one time and that, once appointed, that person is usually kept on the job for a long period (as the careers of Novikov, Zhigarev, or Vershinin attest), the rejuvenation process begun by Kutakhov brought to the forefront a number of offense-oriented young generals who fit better into the overall changes in the Soviet Ministry of Defense and the General Staff that are now taking place under the personal supervision of the Chief of the General Staff, Army General Viktor G. Kulikov. By Soviet standards, Kutakhov at 52 could be in charge for the next 15 years. Konstantin Vershinin held the job for a longer period, and during his time the prog-

ress in development has barely been noticed in the West because the Missile Forces and the Navy caught the public eye. Kutakhov took over at a time when technological developments were beginning to exert a considerable influence on the shape of numerous changes in Soviet Air Force strategy, tactics, weapons development, and rapid growth.

It is too early to conclude on the basis of existing evidence that a major shift in Soviet strategy is clearly on the horizon. Nevertheless, a strong case can be made for a hypothesis which holds that the coincidence of a number of evolutionary changes, including shifts in the High Command of the Soviet Forces, a shifting strategic balance move in the Soviet's favor, and an apparent Soviet decision to develop Naval forces capable of projecting Soviet power beyond her borders—all these might be the result of a change in strategy. Developments over the next few years will likely repay careful attention.

The Soviet Air Force (vvs) High Command
(year of appointment in parentheses)

Commander in Chief Aviation Marshal P. S. Kutakhov (1969)

Head Political Directorate Col.-Gen. I. M. Moroz (1967)

Deputy Commander, Combat Training Col.-Gen. I. Pstygo

Deputy Chief of Staff Maj.-Gen. I. F. Modiaev (1972)

Chief Rear Services Col.-Gen. F. Polynin

First Deputy CINC Col.-Gen. A. Efimov (1970)

Chief of Staff Col.-Gen. A. P. Silantyev (1970)

Commander, Long Range Aviation *(Dalnaia Aviatsya)* Col.-Gen. Vasilii Reshetnikov (1969)

Chief Engineer Maj.-Gen. V. Z. Skubilin

Air Force Officers attached to the General Staff:

Col.-Gen. N. P. Dagayev

Col.-Gen. Ivan Kozhedub, also Chairman of the Aero-Sports Federation

Col.-Gen. V. Davidkov, specialist in combat training

Lt.-Gen. V. Minakov

The Soviet Air Defense (PVO *Stranny*) High Command

Commander in Chief Marshal of the Soviet Union (Artillery) P. F. Batitskii (1966)

Head, Political Directorate Col.-Gen. I. F. Khalipov (1958)

Deputy Commander, Air Defense Command Avn. Marshal E. Savitsky (1972)

Deputy Commander, Combat Training Lt.-Gen. (Avn) N. Grishkov

Commander, SAM Forces Lt.-Gen. (Artillery) F. M. Bondarenko (1968)

Deputy Head, PD Maj.-Gen. (Avn) N. Kozlov

First Deputy CINC Army General (Artillery) A. F. Shcheglov (1966)

Chief of Staff Lt.-Gen. (Artillery) V. Sozinov (1968)

Commander, Fighter Forces Col.-Gen. A. Borovykh (1969)

Chief Rear Services Lt.-Gen. (Avn) V. Shevchuk

Air Force Commanders in Military Districts

Group of Soviet Forces in Germany Col.-Gen. (Avn) A. N. Katrich

Carpathian MD Lt.-Gen. (Avn) S. Gorelov

Moscow MD Lt.-Gen. (Avn) M. Odintsov

Siberian MD Lt.-Gen. (Avn) I. Kulichev

Baltic MD AF Chief of Staff Maj.-Gen. (Avn) M. M. Kapustin

Northern Group of Forces (Poland) Lt.-Gen. (Avn) V. Golichenko (1972)

Leningrad MD Lt.-Gen. (Avn) A. I. Babayev

Kiev MD Lt.-Gen. (Avn) N. M. Skomorokhov

Urals MD Maj.-Gen. (Avn) A. Demchenko

Far Eastern MD Maj.-Gen. (Avn) P. Bazanov (1973)

Air Defense Districts

Moscow
Commander
Col.-Gen. (Avn) A. I. Koldunov (1970)
Chief of Staff
Lt.-Gen. (Artillery) N. A. Asriev (1969)
Chief, PD
Col.-Gen. (Avn) N. Petukhov (1962)

Baku
Commander
Col.-Gen. F. A. Olifirov (1966)
First Deputy
Lt.-Gen. (Avn) A. Konstantinov (1969)
Chief, PD
Lt.-Gen. V. I. Bychenko

Other positions held by Air Force Officers:

Chairman, DOSAAF (Volunteer Organization for the Support of Army, Navy and Air Force) Avn. Marshal A. I. Pokryshkin (1972)

Head, Foreign Relations Section, Ministry of Defense Maj.-Gen. (Avn) S. N. Sokolov (1971)

Political positions in Military Districts:

Southern Group of Forces (Hungary), Chief, PD Maj.-Gen. (Avn) F. Ishchenko (1972)

Belorussian MD, Deputy Chief, PD

Maj.-Gen. (Avn) F. Kletskin (1971)

Far Eastern MD, Chief PD, Air Force

Maj.-Gen. (Avn) N. Tsymbal

Trans-Baikal MD, Chief PD, Air Force

Maj.-Gen. (Avn) I. Timoshevskii

Military Academies

Gagarin Air Force Academy Head Aviation Marshal Sergey I. Rudenko (1968)

Zhukovsky Engineering Academy

Lt.-Gen. (ITS) N. Fediayev

Air Defense Command-Staff Academy

Head, Col.-Gen. (Avn) G. V. Zimin (1966)

Air Defense Academy

Marshal (Artillery) Yu. P. Bazhanov

Minister of Civil Aviation

Lt.-Gen. P. B. Bugayev

New York—Washington

Notes

1. The functional distribution of the Soviet service branches is a major departure from traditional Western practice. The branches are Navy, Strategic Rocket Forces, Construction, Air Defense, Inspectorate, Ground Forces, Rear Services, Air Force, Weapons Development, and a recently upgraded branch, Civil Defense.

2. *Military Districts*

Baltic	Kiev	Siberian
Belorussia	Leningrad	Trans-Baikal
Carpathian	Moscow	Trans-Caucasus
Central Asian	Northern Caucasus	Turkestan
Far Eastern	Odessa	Urals
		Volga

Groups of Soviet Forces	*Fleet Commands*	*Flotillas*
Germany (GSFG)	Northern	Caspian
Northern (Poland)	Baltic	Kamchatka
Southern (Hungary)	Black Sea	
Central (Czechoslovakia)	Pacific	

3. The Soviet Tactical Air Force consists of 12 Frontal Air Armies composed of approximately 4000 fighters, light bombers, and reconnaissance and transport aircraft. Long Range Aviation consists of 140 heavy Bison and Bear bombers and 700 medium Badger and Blinder bombers. The PVO aviation component consists of some 3200 interceptor aircraft. The Military Transport element consists of some 500 regular military aircraft and an additional 2000 aircraft normally in civilian service. Approximately 1000 aircraft of light, medium, and heavy types are assigned to Naval Aviation.

4. As indications of a possible shift, see Colonel A. A. Sidorenko, *Nastuplenye* ("The Offensive"), Moscow, Military Publishing House, 1970; Lt.-General I. G. Zavyalov, "Weapons and Military Art," *Soviet Military Review*, nr 8, August 1971, p. 2; also Marshal Grechko's Red Army Day article "Born in Battles," *Red Star*, 23 February 1970, in which he lavishly praised the performance of the Galosh ABM system. However, not a single word on this subject was said by the Soviet Defense Chief in 1971 and 1972.

5. Besides Kutakhov, Kurkotkin, and Komarovskii, two others were promoted from colonel-generals to Army generals on 7 November 1972: Evgeny F. Ivanovskii, CINC GSFG, and Aleksandr I. Radzievskii, Chief, Frunze Military Academy; *see Krasnaya Zvezda*, 7 November 1972, p. 1. For each of them promotion will, however, mean a different thing. Kurkotkin and Ivanovskii at 55 and 54, respectively, are part of the rejuvenated High Command and as such can look forward to a long period of tenure or in the latter's case to a higher position in the Ministry of Defense in Moscow. For Komarovskii at 66 and Radzievskii the promotion appears to be the signal that they are on their way out and will soon be retired and replaced by younger generals. It is also possible that the posts of Deputy Ministers of Defense and service heads will from now on be given to Army generals either by direct appointment or through subsequent promotion. In this case Alekseyev and Altunin, the only colonel-generals holding these positions, will probably be soon promoted.

6. *Krasnaya Zvezda*, 3 November 1972, p. 1.

Books and Ideas

OUTSIDE INVOLVEMENT IN LATIN AMERICA

LIEUTENANT COLONEL LAUN C. SMITH, JR.,
USAF (RET)

TO MOST United States citizens, Latin America is a Catholic land of *mañana*, where all people speak Spanish; where the military controls the governments; where poverty, graft, and corruption are a way of life; and where the United States has tried its best to "give" a suitable way of life to the people of the poor, unfortunate small republics.

Most people do not know that the "tiny" republic of Chile, if superimposed on a map of the United States, would stretch in a 100-mile-wide strip from New York to San Francisco. Nor are they aware that Argentina is as large as that portion of the United States east of the Mississippi River plus Kansas and Nebraska. And continental United States could fit into Brazil, where Portuguese has been spoken since the days of the conquest, and have room to spare. In fact, it is doubtful even that all U.S. statesmen

understand the relative sizes of the Latin American countries.

Yet another popular misunderstanding concerns the degree of United States impact on Latin America. To most people Latin America is a convenient pool for exclusive United States political influence and economic investment. The United States *is* the largest foreign investor in Latin America and *has had* a relatively high degree of political influence there; but it is *not* true that Latin America is the exclusive domain of the United States. Other foreign governments have always been active in Latin American affairs, and their influence is increasing.

Herbert Goldhamer has written a book, *The Foreign Powers in Latin America*,† which contains a wealth of information. Originally a RAND Corporation Study, his book is the result of much research and analysis, and some would say that he has tried to pack too much information into its three hundred pages. The book is, in places, difficult reading, and to most Latin American specialists much of the data therein is well known. However, our military officers, when assigned to a post in Latin America, will find a study of Goldhamer's book helpful in doing a good job there.

While the main focus of the book is on United States/Soviet competition in the area, the author contends that our preoccupation with the role of the United States in Latin American affairs has obscured the important part played there by other countries. Within the time frame of the Alliance for Progress, 1961–71, Goldhamer examines the activities of other foreign powers—the West European states, the U.S.S.R., Great Britain, Japan, Canada, Israel—their Latin American objectives and the methods and resources used to attain them.

Goldhamer quotes President Giuseppe Saragat of Italy as saying that South America is the continent where Europe's future lies and that South America's destiny is the destiny not only of the Continent but of the world. This is probably an overstatement, but Saragat's conclusions have been shared by Sir George Bolton of England, Paul Martin, former Canadian Secretary of State, the late General Charles de Gaulle of France, and former U.S. Assistant Secretary of State for Inter-American Affairs, Covey T. Oliver. This line of thinking has led to considerable inroads into the affairs of Latin America by other foreign powers.

Goldhamer notes that Great Britain, seemingly in a hurry to divest herself of most of her possessions in the western hemisphere, has been in conflict with several Latin American states over her territories. In spite of the fact that she is the second-largest investor in Latin America (after the United States) and despite substantial sales of military equipment to Latin American states, Great Britain has suffered losses in political prestige as well as in the economic market in Latin America.

France, on the other hand, has no intention of relinquishing control over her possessions in the Caribbean. Although she has had no increase in her own influence in Latin America, her broad interest in reducing Latin America's dependence on the United States has been somewhat gratified. In spite of considerable military sales to Latin America in the form of the Mirage jet aircraft and tanks, France has had problems in Latin America, and the future does not promise anything better.

West Germany's drive to re-establish her pre-World War II economic position in Latin America has not succeeded fully but has made

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† Herbert Goldhamer, *The Foreign Powers in Latin America* (Princeton, N.J.: Princeton University Press, 1972, $10.00), 302 pages.

substantial progress. As the third-largest investor in Latin America, Germany is also the second-largest provisioner there, next to the United States. Since she does not depend upon Latin America for imports, her balance of trade with the region is favorable. So the future for Germany in Latin America looks bright, favored by the cultural and economic impact of the great number of Germans who have settled there since World War II.

Japanese emigrants have also flocked to Latin America since World War II, giving their homeland a nucleus of economic and cultural influence in the region. In great need of raw materials, Japan has taken the initiative in Latin America economically and has avoided political problems by "sticking to business." No other industrial nation can show so much gain in Latin America at so little cost.

Latin America has also been a haven for Italian immigrants since World War II. Ranking fifth as a trading partner with Latin America, Italy has remained free from tensions with the republics. She will probably continue to get her share of Latin American trade, but her present policy does not constitute a threat to other nations.

Unlike Italy, Spain has had almost insurmountable political problems, stemming from her old colonial ties with the Latin Americans and from the politics of her 1936 revolution. Both Mexico and Argentina have been highly critical of Spain, but Spain has nevertheless been able to increase its share of the Latin American market. Spain will always have cultural ties with Spanish America but will be hampered in its New World policy until some changes are made in the political picture in Madrid.

Other smaller countries are beginning to trade with and invest in Latin America, too.

Various nations' foreign policies toward Latin America have been widely divergent. On the one hand there is the long-term policy of the United States that spawned the Alliance for Progress. On the other there is the "No policy

is the best policy" approach that has been successful for such powers as Japan and more recently the Soviet Union. This approach is characterized for the most part by short-term or ad hoc actions. "The Soviet Union often operates in the West by individual offers at strategic moments and places. For instance, on the day that the United States ambassador visited Brazil's President Arturo Costa e Silva to inform him officially that Washington was reducing its military aid program, the Soviet ambassador appeared and offered Brazil credits for a subway and bridge for Rio de Janeiro." (pp. 183–84)

Sir George Bolton early had exceptionally accurate insight to the major weakness of the Alliance for Progress when he said, ". . . my personal view is that Washington has made a mistake in imposing on potential beneficiaries standards of behaviour both political and economic." (p. 205) That the Alliance for Progress failed, there is no doubt. One must assume, of course, that the premise of the Alliance was wrong. But there are other reasons why it failed. Specialists in Latin American affairs are generally little content with the Latin American policies of their own governments. They find them to be unclear, vacillating, and indifferent to Latin America and *executed by officials insufficiently trained and informed on Latin American affairs."* (p. 71, emphasis added) In this respect the United States is no different from the other powers.

Soviet policy in recent years, however, has been different from that of the other nations. There is no public debate about foreign policy in Russia, nor does the Soviet press publish distorted articles that divulge Soviet planning "in the interest of the people." Soviet diplomats are well trained, and their instructions are specific. They know why they are sent to Latin America and what they are expected to do—and they do it.

In contrast, private groups in the United States "solicit and often receive special advantages from the United States government." But

this does not mean that "they shape the main lines of its policy in that region [Latin America]. The principal directions of that policy were, in the decade of the Alliance for Progress, affected more by the cold war, by the advent of Castro and sporadic guerrilla outbursts, by the political importance of the military in Latin American affairs, by strategic considerations, and not least by the almost inextinguishable faith that the United States responsibilities and capabilities extend to the moral and practical guidance of the Latin American states." (p. 75)

This does not alter the fact that not only do private interests in the United States seek favors and criticize U.S. policy, but so do congressmen and other state officials, as well as that self-styled equalizer of all wrongs, the United States press. The Latin Americans realize—long before a measure is passed into law by the United States government—pretty nearly what they can expect to gain or lose by the law. Thus, they know what they can get, and they will not be satisfied with less.

Distance alone made Latin America the backyard of the United States politically, but many factors are changing this picture. Included is the more aggressive approach to Latin American affairs by France, Japan, Germany and Italy. The fact that the Latin Americans are no longer deeply concerned about the feeling and reaction of the United States to their relations with other powers certainly is a potent cause. Instead, many of the Latin American nations have made clear their interest in economic and diplomatic relations with Europe, Japan, and the Soviet bloc countries. Distance today seems to make the Soviets seem less dangerous in the eyes of the Latinos.

However, the Soviet Union does pose the greatest threat to United States leadership in Latin American trade and investment today. In varying degrees, the Western-oriented countries shared political objectives in Latin America associated both with the containment of Communism and the Soviet Union and with the

pursuit of economic relations with the Latin republics. The author points out that the Soviet Union, in turn, has political interests in Latin America related to its conflict with the West generally and with the United States more particularly. Recent Soviet behavior in Latin America represents "some shift toward pursuing political influence . . . where political power largely resides, that is, in the government of the Latin American states." (p. 53)

The author is particularly critical of two of the Alliance's programs: the Peace Corps and Military Civic Action. Regarding the former, he contrasts what he considers (and I agree) the ineffectiveness of the exuberant young college recruits of the Peace Corps with the mature judgment and specialized skills of the people who compose the German Development Service (GDS). After a while the Latin American republics refused to request help from the Peace Corps. They would rather rely on the older and more skilled people of the GDS, who could offer them what they needed. By 1970 this led to about sixty percent of the new recruits of the U.S. Peace Corps being older, skilled people. (pp. 170–71)

Goldhamer's treatment of the U.S. military presence in Latin America is generally good, but he tends to lump military civic action with aid programs administered by other agencies. As a consequence, the value of the programs does not, in his opinion, measure up to the costs. The armed forces can put up a convincing argument to the contrary. The author does acknowledge that "United States military observers had a more accurate appreciation [than members of Congress, the State Department, or the press] of the futility of the United States attempts to prevent South American military establishments from acquiring advanced weapons." (p. 268)

However, in writing about relations between the U.S. military and that of the host countries, Goldhamer states, ". . . the training and advisory relations between the United States and several of the Latin militaries led to such a

close identification of the Latin American military with the United States that it weakened the position of the military vis-à-vis their own people and often was a source of embarrassment to them."° (p. 264)

The Soviets, claims the author, have made mistakes that have led to repeated breaches of relations with Latin American governments. But they have some advantages over other powers. The Latin Americans expect them to resort to propaganda and subversion. It is part of their way of life. Thus, Soviet officials in Latin America are not expected to observe the same degree of discretion and restraint required of others.

Goldhamer does not credit the Soviets for the failures of the United States in Latin America. "Fortunately," he writes, "failures of major programs are not always as disastrous as they well might be." (p. 302) Failure forces a review of the means employed to implement a program. Goals should not have to change. Planners should beware of a multiplicity of spe-

°In my three years with the United States Southern Command I had many opportunities to work with the host military and the people. I was never involved in, nor did I ever hear or read of, an incident that was embarrassing to the host military, the people, or me.

cial, long-term programs; they can be a hindrance. There should be a new emphasis on a "low profile" or policy of avoiding a tutelary, paternalistic, and interventional posture. Our leaders should also recognize that "the resistance, by no means total, of Latin American political institutions, attitudes, and practices to change is determined much more by characteristics of a social structure shaped over several centuries than by recent U.S. policy." (p. 274)

Latin America *is* changing. The United States does *not* have an exclusive sphere of influence in Latin America. Other nations are making gains at our expense, some of them with our blessing. The ideological conflict, however, has just begun. Goldhamer opines that the United States, by inference, can probably offset Soviet gains by seeking more modest aims in Latin America. "Modest aims," he writes, "and decisions taken with the fullest provision for withdrawal or radical modification, might provide modest successes that in the long run could add up to greater benefits than are provided by 'enterprises of great pith and moment' for which one is ill-prepared and ill-equipped." (p. 302)

El Paso, Texas

STRATEGIC POWER: ON BALANCE

COLONEL WILLIAM T. BALLARD

Nothing except a battle lost can be half so melancholy as a battle won.
WELLINGTON

AN INHERENT danger in attempting to present a quantitative and objective analysis of such a dynamic process as the world strategic balance is that the analysis often becomes dated history before it is finished. Such is the inevitable fate, however, of portions of *Strategic Power and National Security*,† by Joseph I. Coffey, Professor of Public and International Affairs at the University of Pittsburgh. Those portions of his book dealing with force projections, alliance relations, Communist behavior, and some aspects of disarmament have indeed been dated by certain events in early 1972, including the Strategic Arms Limitation Talks, West Germany's treaties with the Soviet Union and Poland resulting from Brandt's *Ostpolitik*, Nixon's visits to Peking and Moscow, and Tanaka's trip to mainland China. Nevertheless, Coffey's book is still an excellent primer on the general subject of strategic power and its relationship to various phenomena in the political and military environment.

Too brief to be comprehensive, but containing fundamental aspects of strategic issues, the book attempts to reverse the trend of the arms race by arguing that nuclear superiority is not essential to deterrence. To the attentive student of the strategic balance, his thesis is anything but a surprise. Important, however, in any discussion of the subject is the question of whether the thesis reflects a realistic assessment of the U.S. strategic position vis-à-vis the Soviet Union or whether there is a genuine attempt to carve out a new policy based on diminishing strategic alternatives.

Professor Coffey asks some very penetrating questions regarding the strategic balance. Paramount among these is "whether the continuation of strategic superiority over the USSR and Communist China and the construction of comprehensive and effective strategic defenses are, as some have argued, essential to dissuade these countries from attacking the United States, from exerting pressures against its allies, or from encroaching on its interests." He answers with a "cautious no." (p. 169) To arrive at this conclusion, Professor Coffey analyzes the evolution of Soviet and United States policies over the last decade. He then discusses the central strategic balance within a rather detailed assessment of the relationship between strategic nuclear power and nuclear war, deterrence, Communist behavior, alliance relations, arms control, and national security. The common thread woven throughout his work is that both the United States and the U.S.S.R. now possess so much nuclear power that further qualitative and quantitative improvements would not essentially upset the strategic balance.

Coffey's discussion of the chronology of the U.S./Soviet arms race sets the stage for his ultimate conclusion. He generously details a number of force structure tables that compare American and Communist strategic weapon systems. All derived from open sources, often from Congressional hearings on defense appropriations, the author's estimates of the number of launch vehicles, warheads, and deliverable megatonnage are included. Also in tabular form is a projection of the U.S.,

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† Joseph I. Coffey, *Strategic Power and National Security* (Pittsburgh: University of Pittsburgh Press, 1971, $9.50), 214 pages.

U.S.S.R., and People's Republic of China intercontinental strategic forces circa 1975, which reveals a sizable increase in strategic power for all three.

One rather generalized conclusion drawn from a comparison of qualitative and quantitative strategic power portrayed by the projection is that, without procurement of U.S. weapon systems now under development (longer-range sea-launched ballistic missiles [SLBM] and a new bomber), U.S. forces postulated for 1975 would be able to survive a Soviet assault and have sufficient residual destructive power to "hedge against any further Soviet deployment of ABM's." (p. 13) The assumptions made in projecting the forces for 1975 credit U.S. forces with MIRV capability on the Minuteman III and Poseidon systems. According to Dr. Coffey's table, five hundred Minuteman IIIs will each have three 200-KT re-entry vehicles (RV's), and 496 Poseidons will each have ten 50-KT RV's. Each of the 160 Polaris A-3s will have three 50-KT multiple re-entry vehicles (MRV). In addition, force loading for each B-52 includes four 1.1-MT bombs and twelve 200-KT short-range attack missiles (SRAM) and for each FB-111 includes two bombs and four SRAM's. However, in predictions for the Soviet strategic forces there is no multiple independent re-entry vehicle (MIRV) capability credited on any weapon system, and only three 5-MT MRV's on 500 SS-9 missiles.

The conclusion based on force projections for 1975, namely, that the U.S. could survive an all-out Soviet attack and still have residual power to hedge against future Soviet antiballistic missile (ABM) deployments, neglected to consider the potential and intent of the Soviet Union to develop and employ the MIRV. The sensitivity of MIRV is critical to the strategic balance, and this sensitivity factor must be applied to both sides of the strategic equation before such an unequivocal conclusion can be drawn.

With this foundation for subsequent analysis, Coffey turns to a discussion of the relationship between strategic power and nuclear war, which leads to a rather elementary but essential task of defining terms used in any study of strategic power. He attempts to define strategic power, strategic sufficiency, and strategic superiority, taking care to remind the reader of the problems involved in using terms that are not readily adaptable to precise measurement. These serviceable definitions reveal some of the multifarious aspects in attempts to quantify strategic power. Coffey's preferred measure of strategic power is the ability to inflict damage in a nuclear exchange; but in arriving at relative strategic power, he attempts to account for all the asymmetries that relate to nuclear power: quantitative values, technical capabilities, political implications, economic factors, etc.

Coffey persuasively argues that defensive systems complicate the planning and execution of nuclear strikes, reduce the amount of destruction, and create uncertainties about the outcome of a nuclear exchange. He contends that many diverse defensive and offensive scenarios have revealed the complexities of a strategic defensive system. As an example, he cites a RAND Corporation study which stated that even a $600 billion expenditure on defensive systems to "protect people, production facilities, and essential supplies could not guarantee American survival against large-scale attacks." (p. 34)

Coffey maintains that air defenses, although essential, are complicated by and vulnerable to diverse and unanticipated tactics and new penetration aids. Antisubmarine warfare (ASW) effectiveness is even more complicated. Coffey reports that the present U.S. ASW system is adequate to detect and intercept most Soviet-built submarines to a distance of several hundred miles, primarily because of the noisiness of the Soviet submarine. This still, however, leaves some key coastal targets vulnerable to Soviet SLBM's. The improved Soviet submarine is, of course, much quieter and could become as invulnerable as U.S. missile submarines. He contends that both air defense and

ASW forces are vulnerable to missile strikes against defense operations, communications, and air bases.

On the surface, then, it would appear that efforts to perfect an ABM system should enjoy the highest national priority despite its high cost and as yet unknown effectiveness. An ABM system safeguards against accidental launch, minimizes damage from relatively small nuclear attacks, introduces uncertainties about reliability into the calculations of our strategic capabilities, and reduces damage from attack by another superpower. However, despite these advantageous features, Coffey asserts that a comprehensive ABM system would not prevent heavy human losses, nor would it hedge against saturation launches with MIRV, new penetration aids, or decoys. Additionally, employment of a fractional orbit bombardment system (FOBS) or heavy reliance on bombers and supersonic cruise missiles could minimize the effectiveness of the ABM. Professor Coffey cites President Nixon on this subject, who said that "the heaviest [antiballistic missile] defense system we considered to protect our major cities, still could not prevent a catastrophic level of U.S. fatalities from a deliberate all-out Soviet attack." (p. 36) In short, Coffey believes that it is doubtful either a Soviet or a U.S. ABM system could reduce damage from an attack in sufficient measure to change the strategic balance between the two.

Coffey's discussion of defensive systems is emphasized in this review purposely because the details presented provide a most compelling argument for a strategic mixed-force concept, the TRIAD. Building from each offensive capability of the TRIAD, defenses are developed that can only be neutralized by countervailing measures of the other side or as a result of devoting disproportionate resources in trying to defend against all three offensive systems. The ever compounding difficulties one encounters in trying to defend against each leg of the TRIAD are described by Coffey in such a way as to provide a complete and unqualified endorse-ment of the in-being U.S. strategic mixed force.

In a very credible discussion of the relationship between strategic power and deterrence, Professor Coffey relates an assessment of the factors bearing on deterrence. He carefully dissects the problems and paradoxes of deterrence, the arguments, pro and con, for the capability of assured destruction, the complexities of determination (how to measure and how to communicate), and the deterrent effect of uncertainty. The reality of man's ability to reason is the framework for the alternatives designed to make one "think the unthinkable." This same reality, in my opinion, increases the credibility of his thesis that changes in the strategic balance receive too much attention. Coffey claims that more emphasis should be devoted to the risks, the difficulties, and the costs associated with attempts to alter the political balance. Deterrent factors, not military by nature but which must be considered by an aggressor, include such elements as the probable cost, the potential risks, internal political conditions, uncertainties associated with damage calculation, and uncertainties of the opponent's intent or resolve. He sums up that military factors are diminishing in importance as deterrents in the age of nuclear weapons because of the wider demand by people in all nations for a more influential voice in decisions on foreign affairs, the increasing requirement for governments to look inward to deal with domestic issues, and the extremely high political and psychological costs of aggression. (p. 73)

In a less-than-totally convincing discussion of the relationship between strategic power and Communist behavior, Coffey attempts to present an insight into the incentives, motivations, and intentions of the Soviets and the People's Republic of China. Attempts to provide such insights are inherently vague and ill defined. He is convinced that the Soviets will not use force because they fear the dangers of nuclear war and because of their "pride in past achievements, their desire to preserve and enjoy the fruits of previous efforts, and their belief that

the inevitable 'victory of socialism' can be promoted through social and economic progress. . . ." (p. 74) Further, a shift in the nuclear balance will have only marginal impact on the willingness of the Soviet Union to engage in nuclear war or actions risking nuclear war.

Coffey is convinced that while the Soviets may rely on a less overt and provocative approach to win over the third world countries, the Chinese believe in a return to the fundamental purpose of the Communist party, which is to arouse "class consciousness among the workers" and prepare "the way for the proletarian revolution." (p. 90) Coffey believes the Chinese have carefully avoided any military action that might lead to a direct conflict with the United States because of the overwhelming technological lead possessed by the latter. They fear the consequences of a nuclear attack despite claims to the contrary. In addition, Coffey feels that internal weaknesses within China, manifested by a decline in industrial production, division among leaders, separatism in the provinces, and loss of a generation of students because of the "cultural revolution," militate against a provocative or reckless foreign policy. (p. 92) Reduced to its lowest common denominator, Coffey considers that China is just too far behind the U.S. to get involved in a situation which might result in a nuclear conflict.

In his discussion of Communist behavior, Coffey related that he did not believe the Soviet Union would use force for a number of reasons. Not discussed in any depth, however, yet certainly an imperative to any discussion of this nature, was the question whether the Soviet Union would threaten the use of force and, if so, the effectiveness of that threat. The United States was certainly successful by threatening to use force in the Cuban crisis. Much has been written since then about Soviet assessments as to whether Kennedy would or would not use force to preclude the placement of missiles in Cuba. Kennedy's threat to use force, however, proved to be a powerful and successful prescription.

The questions of use of force and threat to use force should both be analyzed. Moreover, and of immense importance, Coffey's assessment that China would not resort to tactics which could risk the use of force, because of the overwhelming superiority of the U.S., must be reconsidered when this superiority no longer exists. In other words, a change in the strategic balance between China and the U.S. or the Soviet Union is an entirely different matter from such a change between the U.S. and the Soviet Union.

As Coffey assesses the relationship between strategic power and U.S. allies, he recognizes the difficulty in trying to assess the myriad problems, but he is able to highlight some of the key issues. The certain focus of this relationship is the question of the extent of U.S. strategic nuclear forces and whether the strategy for employment of these forces is adequate to insure the protection of U.S. allies. He also discusses allied assessments of the adequacy of these forces and strategies in view of the changed strategic balance.

Coffey presents a brief but useful description of the various strategies used by the U.S. in all parts of the world and how these strategies have altered with the dynamics of the international situation, citing the transformation from the strategy of massive retaliation to that of flexible response in Europe as a case in point. He discusses the credibility of the U.S. nuclear guarantee and European defense in light of what he believes to be the erosion of U.S. nuclear superiority, the diminished NATO capability primarily due to the French withdrawal of her military forces from NATO, the continued modernization of Soviet forces, and the strengthened Soviet fleet in the Mediterranean. Coffey then examines some hypotheses designed to increase the credibility of the U.S. nuclear guarantee and enhance the defense of Europe, including an increased European conventional force in NATO, an increased U.S. strategic nuclear weapons capability vis-à-vis the Soviet Union, an increased defensive system to

reduce the levels of damage the Europeans would suffer from a nuclear strike, and an increased European nuclear force. He also debates some of the issues involved in the creation of an Anglo-French nuclear force under European control and the construction of a multinational force. None of these possibilities, as the discussion makes clear, would resolve all the problems of NATO.

For a number of reasons, Coffey asserts that American strategy in Asia is not well defined. The fact that the U.S. has individual pacts and not an overall Asian treaty, as in Europe, is the chief reason for lack of definition. However, the geographic dispersal of the potential Asian participants, the diversity of American interests from area to area, and the power differential of China versus the Soviet Union militates against such a treaty. (p. 118)

The political question, whether the U.S. nuclear capability will maintain its deterrent credibility in the eyes of the Asian allies, remains unanswered in Coffey's work. Perhaps the most articulate expression concerning this question comes from Professor Makoto Momoi of the Japanese War College. Prior to President Nixon's visit to Peking, the professor was asked how he viewed the American nuclear deterrent. His answer: "It's like a Bible. You may know every word in it, and believe it to be true, but can you really be sure of salvation?" When asked the same question *after* the Peking visit, he replied: "I think you can say that we've put the Bible away. It's something around the home, but the children don't read it any longer." [1] Methods to strengthen the credibility of the U.S. nuclear guarantee and to increase the image of the U.S. as the unquestioned leader in the free world to protect against aggression were not discernible in Coffey's discussion. The question of how the U.S. would react if put to another test, such as Cuba, Korea, or Vietnam, needs further study.

Although widely covered by the press, the complex subject of arms control is probably the least understood issue before the people today.

Yet it is so important that it demands the understanding of every American. Professor Coffey, in the brief 34 pages devoted to arms control, guides any student of disarmament to an understanding of the critical issues. It was impossible in that space to deal adequately with the many relevant factors, but he does discuss some of the most urgent questions: how strategic armament limitations would enhance U.S. security, how various types of arms control measures would impact on the strategic balance, how specific disarmament measures would affect the credibility of the U.S. strategic deterrent, and how U.S. allies, protected under the nuclear umbrella, would view the arms agreement. He bases his discussion of this subject on the premise that, although arms control measures cannot *insure* security, they can reduce the risk of accidental war; avoid war through miscalculation by providing for communication between parties; "preclude deployments which may seem threatening or provocative"; assure any "adversary that one is not contemplating a first strike" by revealing intent, capability, and state of readiness; and minimize the advantage accruing from "striking first by stabilizing the forces on either side" through qualitative and quantitative restrictions. (pp. 137–38)

In answer to his original question of whether the continued strategic superiority is essential to deter, Professor Coffey argues against striving to increase strategic power. Reduced to the most basic issues, his "cautious no" is based on the following: The destructive ability of modern weapons is so great that only a few of them will kill millions of people. The importance of additional forces diminishes once sufficient means of delivery and of safeguarding these weapons have been achieved. Relatively, increasing or decreasing the level of damage is of no major consequence. An attempt to alter the strategic balance merely causes the other side to take measures to offset any advantage gained, thus perpetuating the arms race. The continued quest to gain "strategic superiority

or to construct strategic defenses can generate fears and create tensions, largely because the Soviets and Chinese Communists tend to believe that the United States has aggressive intentions." (p. 170)

Coffey argues that we are hopelessly deadlocked in a standoff which cannot be altered by a change in strategic balance. One cannot say categorically that strategic advantage is necessary "to deter a potential aggressor or influence his political behavior." (p. 171) Deterrence in the future will depend more upon the reluctance of major powers to take risks, incur costs, and heighten tensions than upon strategic advantage. To square the circle, the United States might be better off to insure the continued effectiveness of its deterrent through arms limitation measures.

Arguments, subject to many value judgments, will persist and intensify as to the significance of the Soviet and Chinese buildup in strategic power. Because this book was published prior to SALT I and the promise of further arms control measures to come out of SALT II, and prior to those significant events in 1972 mentioned at the beginning of this review, the contents of Coffey's work must be evaluated from that perspective, with an eye on its predictive value.

The clear and decided nuclear superiority possessed by the U.S. over the Soviet Union since World War II has indeed been trimmed, at best, to a level of much less disparity. There is no need to recapitulate here the Soviet quantum increases in strategic weapon systems, tactical and naval forces, and air defense systems, as well as her growing capability in avionics and computer science technology since the mid-1960s. Let it suffice to say that the Soviet capability in these areas has increased significantly. Some argue that we are now at parity with the Soviet Union and that, given the momentum the Soviets have in building their strategic nuclear forces, we will be hope-lessly inferior by 1975 without some arms control agreements.

The single major weakness I find in this book is contained in Coffey's assessment of the relationship between strategic power and Communist behavior. Professor Coffey examined the forces and issues that would tend to act as imperatives in policy-making decisions at both Moscow and Peking. But do we possess sufficient knowledge of the way Soviet or Chinese policy is made and of the institutional framework within which it is made? Lacking such intimate knowledge, we seemingly can only suggest or hint at the attitudes of those in power and at possible outcomes. One must challenge Coffey's implied assumption that this type of assessment provides sufficient basis for valid political conclusions, no matter how thorough the assessment. The same challenge must be made of the implication that the complexities of the strategic balance, or perceived power relationships, can be condensed into the restricted theory of behavioral relationship. National survival cannot be assured by unilateral self-restraint and a trust in the rational behavior of potential adversaries. Deterrence is too complex a phenomenon and the consequences of its failure too devastating to rely on other than hard, objective facts as the basis upon which decisions are made. With the security of our country involved, we cannot risk miscalculation on the optimistic side.

On balance, the questions raised and issues discussed in *Strategic Power and National Security* are likely to remain materially important for a considerable length of time. The book therefore will be a useful addition to the libraries of students of strategic power.

Cambridge, Massachusetts

Note

1. Denis Warner, "Would U.S. Fight Again after Vietnam Experience?" *Kansas City Star*, 13 October 1972, p. 19.

The Contributors

MAJOR GENERAL KENNETH R. CHAPMAN (USMA; M.S., University of California) is Deputy Chief of Staff for Development Plans, Hq Air Force Systems Command. After flying training, he flew B-29s stateside and overseas. In 1952 he entered the AFIT program in nuclear chemistry and has since specialized in nuclear research and development—at the AF Special Weapons Center, Los Alamos Scientific Laboratories, Atomic Energy Commission, and Hq USAF until his present assignment in 1970. General Chapman is a graduate of Armed Forces Staff College and Industrial College of the Armed Forces.
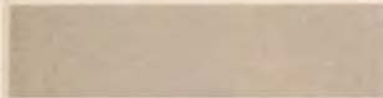
LIEUTENANT COLONEL JOHN F. GANDER (M.S., Florida State University) was a Staff Development Engineer, DCS/Development Plans, Hq Air Force Systems Command, until his recent assignment to the Office of the Assistant Secretary of Defense (Manpower and Reserve Affairs). He was commissioned from flight training in 1955, and his service experience has included assignments with SAC, TAC, AFSC, and the AFOSR. He attended AFIT, is a graduate of the Air Command and Staff College, and served a Southeast Asia combat tour in F-4s.

CAPTAIN RAYMOND S. BLUNT (USAFA; M.A., Central Missouri State College) is a research officer and lecturer on doctrine at Squadron Officer School. His previous assignments were as an instructor and stand-board evaluator in the Minuteman system and as an action officer in the Directorate of Doctrine, Concepts and Objectives, Hq USAF, under the ASTRA program. He is a distinguished graduate of Squadron Officer School. . . . CAPTAIN THOMAS O. CASON (B.A., University of Alabama) is a lecturer on national power and military strategy at Squadron Officer School. His previous Air Force assignments were as an electronic counter-countermeasures officer (1963–68) and as data automation officer (1968–70). A graduate of SOS, Captain Cason completes a master's degree in political science from Auburn University in May 1973.

DR. RAYMOND J. BARRETT (Ph.D., Trinity College, Ireland) is Department of State Advisor, John F. Kennedy Center for Military Assistance, Fort Bragg, N.C. With State, he has served in Mexico, Managua, Dublin, Cairo, and Madrid; in the office of Southern and East African Affairs, as Canadian Desk Officer; as U.S. Secretary of the U.S.–Canada Permanent Joint Board on Defense; and as Deputy Chief, Program Staff, Office of International Conferences. He recently served an exchange tour as Assistant Chief, Global Plans and Policy Division, Hq USAF.

WILLIAM J. DePAOLA is Art Editor and Illustrator, Air University Review. Following four years in the USAF as an electronics technician, he was graduated from Philadelphia College of Art in 1957 and later was an illustrator with Boeing. Except for a one-year interval, Mr. DePaola has been with the Review since 1962.

LIEUTENANT COLONEL PHILIP M. FLAMMER (Ph.D., Yale University) is Associate Editor, Air University Review. After flying training and weather assignments, he was with the Air Force Academy History Department from 1958 until 1971, except for two years at Yale under the AFIT program. Colonel Flammer's articles have appeared in Air University Review, Aerospace Historian, and Military Review.

CAPTAIN MICHAEL O. WHEELER (USAFA; Ph.D., University of Arizona) is an Assistant Professor of Philosophy at the United States Air Force Academy. Before this assignment in January 1971, he had tours with Air Force Institute of Technology; the Directorate of Intelligence, Hq Tactical Air Command; and the Wing Intelligence Division, 355th TAC Fighter Wing, Takhli, Thailand. Captain Wheeler is a graduate of Squadron Officer School.

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GEORGE C. CREWS (M.S., University of Delaware) is a career civil service project engineer, Air Force Armament Laboratory, Eglin AFB, Florida. In 1956 he joined the Ballistic Research Laboratories, Air Proving Ground, Maryland, where he worked on the generation and analysis of hypervelocity terminal ballistic test data and ordnance velocity impacts. In his present position since 1966, he specializes in target vulnerability assessments and munition lethality evaluations.

MAJOR JAMES H. CONELY, JR. (Ed.D., Columbia University Teachers College) is an academic adviser and writing instructor in the Academic Instructor Course, Air University. Previously he served two tours at the USAF Academy teaching English and music and as speech writer at the Space and Missile Systems Organization. He has written on education, music, and literature in the *Instructors Journal, Music Educators Journal, Air University Review*, and published *18 Short Pieces and Modulations for Organ*. He is listed in the *Dictionary of International Biography*.

ALEXANDER O. GHEBHARDT is a consultant on Soviet military affairs for the Hudson Institute and the Foreign Policy Research Institute. In 1971 he was an instructor in political science at the University of Maine. After earning a degree in government from the University of Manchester (England), Mr. Ghebhardt continued his graduate studies at Columbia University.

DR. WILLIAM SCHNEIDER, JR. (Ph.D., New York University) is an economist with a background in national security policy issues. He is coauthor of *Why ABM? Policy Issues in the Missile Defense Controversy* (Pergamon, 1969). He is currently a consultant to the Hudson Institute and a U.S. Senate staff member.

LIEUTENANT COLONEL GORDON K. PICKLER (Ph. D., Florida State University) is Chief, Military Environment Division, Directorate of Curriculum, Air Command and Staff College, Air University. His preceding assignment was as a navigator, Tan Son Nhut AB, Vietnam. He was a combat crew member in B-57s and B-47s for twelve years before attending Air

Command and Staff College. While a faculty member there, 1966–69, he was selected for the Air University Ph.D. program.

LIEUTENANT COLONEL LAUN C. SMITH, JR. (USAF, Ret), (M.A., University of Pennsylvania), was Associate Editor, *Air University Review*, at the time of his retirement in 1972. He served as Information Officer in Morocco and at Richards-Gebaur AFB, Missouri; Assistant Professor of History, USAFA; Deputy Assistant for Policy and Programs, SAF-OII; and Regional Desk Officer for Central America, Public Affairs Office, U.S. Southern Command. In retirement he is engaged in free-lance writing.

COLONEL WILLIAM T. BALLARD (M.A., Auburn University) is a Research Associate, Center for International Studies, Massachusetts Institute of Technology. After flying duties with SAC in the B-36 and B-52, he began a career in the USAF Security Service, much of it in the Far East. His next assignment will be in Intelligence, Hq USAF. Colonel Ballard is a graduate of the Air Command and Staff College ar Air War College.

AWARD

The Air University Review Awards Committee has selected "The Need for Military Officers as Strategic Thinkers" by Lieutenant Colonel Richard D. Besley, USAF, as the outstanding article in the March-April 1973 issue of the *Review*.

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