Survivability/Vulnerability Information Analysis Center (SURVIAC): A Tool for the Aircraft Survivability Community

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The Survivability/Vulnerability Information Analysis Center (SURVIAC) is a Department of Defense Information Analysis Center serving the survivability community in the technical area of nonnuclear survivability and lethality. It was formed in December 1984 and merged the activities of two existing organizations—the Combat Data Information Center and the Aircraft Survivability Model Repository. SURVIAC maintains libraries, databases, and survivability models that are within its technical area. Services provided to the aircraft survivability community include responses to bibliographic and technical inquiries, copies of aircraft survivability models, and performance of special tasks. The SURVIAC resources available to assist the aircraft survivability community are described along with procedures for use of SURVIAC.

Introduction

THE Survivability/Vulnerability Information Analysis Center (SURVIAC) is a Department of Defense Information Analysis Center. Administrative management for SURVIAC is provided by the Defense Technical Information Center (DTIC) for the Defense Logistics Agency. The Joint Technical Coordinating Group on Aircraft Survivability (JTCG/AS) and the Joint Technical Coordinating Group for Munitions Effectiveness (JTCG/ME) jointly sponsor SURVIAC. Broad policy guidance for SURVIAC is provided by a Steering Committee made up of representatives from both JTCG/AS and JTCG/ME. Technical management is provided by the Flight Dynamics Laboratory of the Air Force Wright Aeronautical Laboratories at Wright-Patterson Air Force Base. SURVIAC is operated for the DOD by Booz, Allen & Hamilton Inc.

DOD IAC

Department of Defense Information Analysis Centers are formal organizations formed and operated in accordance with DOD Regulation 3200.12-R-2, "Centers for Analysis of Scientific and Technical Information." Currently, there are 21 DOD IAC's covering a wide range of specific technical areas. Four new IAC's are planned. Eleven of the 21 IAC's are administratively managed and funded by DTIC; 10 others are managed by other DOD activities.

Each center collects, reviews, analyzes, appraises, summarizes, and stores available information on subjects of highly specialized technical areas. The collections of information are frequently computerized and expanded on a continuing basis to incorporate and avail the most current research information. The synthesized information in the selected subject areas is then repackaged and disseminated according to expressed or anticipated needs. Support is provided primarily to DOD and DOD contractors with access provided to other organizations and the private sector to the extent practicable without impairment of service to DOD and consistent with security and other limitations on release of such data.

To offset costs incurred in preparing materials or responses, service charges are normally imposed on products and ser-

vices. Such costs are established according to guidance provided by the sponsoring DOD component.

Information on DOD IAC's may be obtained from the DTIC Program Manager for DOD IAC's by contacting:

Administrator
Defense Technical Information Center
Attn: DTIC-DF
Cameron Station
Alexandria, VA 22304-6145
Telephone: (202) 274-6260 or
AUTOVON: 284-6260

In addition, a recently completed DOD publication—DTIC/TR-86/4, *Information Analysis Centers in the Department of Defense*, April 1986—is available, which explores the IAC concept, defines the role of IAC's in the transfer of scientific and technical information, and describes each of the current 21 IAC's. The document number is AD A167001.

SURVIAC Technical Area

SURVIAC is distinguished from other DOD IAC's by its technical area. SURVIAC's focus is on nonnuclear survivability and lethality as they relate to U.S. and foreign aeronautical and surface targets. Nuclear information is excluded primarily because the DOD Nuclear Information and Analysis Center (DASIAC) is already responding to user needs in this area. The purpose of SURVIAC is to increase the knowledge and productivity of scientists, engineers, and analysts engaged in nonnuclear survivability and lethality scientific and engineering programs for the DOD.

Mission

The SURVIAC mission is to perform the functions of a full-service DOD IAC as described in DOD Regulation 3200.12-R-2 in the technical area described previously. More specifically, SURVIAC maintains a technology base within its technical area, provides authoritative responses to user inquiries, provides technical assistance and support to the user community, prepares authoritative technical reference works, and performs special tasks and studies. SURVIAC's major fields of interest are target survivability and weapon lethality. These fields encompass survivability design, technologies, assessments, and methodologies, as well as munitions effectiveness. The scope ranges from system-level issues down to component or individual part survivability considerations.

Threats

The nonnuclear threats included within SURVIAC's scope are: 1) conventional weapons [i.e., small arms/automatic

weapons (SA/AW), antiaircraft artillery (AAA), surface-to-air missiles (SAM's), air-to-air guns, air-to-air missiles (AAM), field artillery and direct fire weapons [i.e., tanks, tube-launched, optically tracked, wire-guided (TOW) missiles]; 2) directed-energy weapons including laser, millimeter wave, and particle beams; and 3) chemical/biological weapons. Data requirements in the threat area include, as applicable, acquisition, detection, tracking, launch, flyout, and fuzing characteristics, the countermeasures and counter-countermeasures employed, and terminal effects.

Targets

Both U.S. and foreign aeronautical and surface targets are included within SURVIAC's scope. The aeronautical targets include fixed- and rotary-winged aircraft, manned and unmanned, and missiles. Surface targets include tanks, trucks, armored personnel carriers, artillery, and radar vans.

Data requirements in these areas include, as applicable, physical and functional characteristics; design, performance, and radar signatures; combat damage and repair; and system, subsystem, and component probability of kill given hit ($P_{k/h}$) functions. Initial emphasis will be placed on aeronautical targets. As SURVIAC develops, additional priorities within the framework described herein will be established.

Functions, Services, and Products

As the DOD IAC for nonnuclear survivability/vulnerability, SURVIAC is a major support center and focal point within DOD for nonnuclear survivability/vulnerability data, information, methodologies, models, and analyses relating to U.S. and foreign aeronautical and surface targets. The specific functions and services that SURVIAC performs and provides are described below:

1) Determine general and specific needs of the user community.

2) Identify, collect, review, evaluate, and store all available scientific and technical data and information relevant to nonnuclear survivability/vulnerability.

a) Provide data and information to the technical community in response to user needs.

b) Provide technical advice and support to the user community on technical data and information.

c) Summarize or analyze selected subject areas of collection, based on expressed or anticipated needs, and disseminate the results to the user community.

3) Serve as a repository for selected survivability/vulnerability methodologies, models, their associated databases, and documentation and maintain configuration control of them.

a) Disseminate methodologies, models, documentation, and databases in response to user needs.

b) Provide technical assistance, advice, and guidance to the user community on methodologies, models, and databases.

4) Prepare and provide products to the user community.

5) Provide referrals to other related technical organizations and IAC's.

6) Support conferences and symposia.

7) Perform special studies and tasks.

The types of products that SURVIAC will provide to its user community are listed below:

1) Handbooks.
2) Data books.
3) State-of-the-art reports.
4) Critical reviews and technology assessments.
5) Newsletters, brochures, and informative summaries.

SURVIAC Origin

The core of SURVIAC was formed from the merger of the Aircraft Survivability Model Repository (ASMR) and the Combat Data Information Center (CDIC). These two func-

tions, which already existed and were in place, were transitioned and integrated into SURVIAC in early 1985.

ASMR

The ASMR was formed in 1981 by the Joint Technical Coordinating Group on Aircraft Survivability to serve as a focal point for models related to aircraft survivability. It maintained standardized and approved models and their associated databases, disseminated the models to users, received and verified model changes, developed and maintained test cases for models, and provided technical support and documentation for the models to assist model users. The models, test cases, and databases maintained by the ASMR included: P001A, PACAM V, PACAM 8, SAMS (classified and unclassified), BLUEMAX II, and SCAN. These models represented the starting point for the SURVIAC in terms of models and methodologies.

CDIC

The CDIC was a central repository and dissemination center for combat, combat-related, operational, and test data for use in aircraft, ship, and ground vehicle survivability, vulnerability, maintenance, logistics, and military operations studies. It was established in 1970 by the Joint Technical Coordinating Group for Munitions Effectiveness and had major holdings of combat data from the Southeast Asia conflict, Arab-Israeli wars, and simulated combat threat test programs. These data were maintained both in computerized databases and in original raw form as collected from reporting agencies. In addition, computer-indexed reference libraries containing reports pertinent to these databases were maintained ranging from general survivability/vulnerability publications and reports, damage repair and maintenance information, to specific topics such as lasers, and radar cross-section information. Approximately 40 separate databases were held and were available supported by over 5600 hard copy reports of interest to the survivability/vulnerability community. Both the databases and the document holdings were increased regularly.

Current Resources

The resources currently held by SURVIAC include the databases, models, libraries, and other data collections that resulted from the merger of ASMR and CDIC. These resources have been expanded through on-line access to other selected databases that serve to broaden the information base available to SURVIAC to cover the wide range of both threats and targets included in its charter. The extent of these resources is described below.

Aircraft Survivability Models

SURVIAC is the maintainer and disseminator of seven aircraft survivability models. The purpose of the model repository function is not only to serve as a source where qualified users can obtain the models but also, and very importantly, to maintain the controlled, standard version of a model being used in the survivability analysis community. The SURVIAC model is always available as a standard against which an analyst may compare his or her own model for a specific application. Having a controlled, standard version available makes it easier to compare results obtained by different modelers. The current SURVIAC models are described next.

BLUEMAX II

BLUEMAX II is an aircraft flight-path generator. This improved version of the original BLUEMAX program was developed by Fairchild Republic under the sponsorship of Headquarters, USAF Studies and Analysis. The revised program was generated to provide an enhanced capability to produce detailed trajectory data (presently at 0.5-s intervals) suitable for input to survivability programs such as SAMS and

P001. Inputs required for BLUEMAX II include aircraft characteristics such as aerodynamic and propulsion data.

PACAM 8

The Piloted Air Combat Analysis Model is a model developed to assist in the evaluation of aircraft, armament, and tactics by simulating the performance of aircraft and weapons in combat. The model has been developed through several evolutionary steps. The current version was developed by Schiller Consulting and Veda Inc. for the USAF Aeronautical Systems Division Deputy for Development Planning. A significant feature of the current version is the ability to include up to eight aircraft in combat with up to 16 missiles in the air. Also added was the ability to simulate the use of lasers as weapons or designators. There are nine categories of input data, some required and others optional, depending upon the analysis being performed. Included are tactics, aircraft aerodynamics and performance data, missile aerodynamic, propulsion, and guidance data, and control and scenario parameters.

P001A

P001A is an antiaircraft artillery simulation program. It was developed by the Air Force Armament Laboratory and documented by Armament Systems Inc. The current version allows the integration of BLUEMAX II generated flight-path data directly into the gun engagement model. The program computes the single shot probability of kill of a target aircraft. The probability of kill results are accumulated over the target flight path and may be presented as a function of various user-selected parameters. Some of the input data required to use the model for analysis include the ground weapon siting and density parameters and the target aircraft vulnerable area data.

SCAN

SCAN is a methodology for evaluating the effects of fragmentation warhead-equipped missiles on aircraft. The model was developed at the Pacific Missile Test Center to predict the probability that an aircraft will survive the missile attack. It simulates the encounter between a missile and its airborne target and computes the expected target damage. Recent improvements and updates to the model were made by the University of Dayton Research Institute. Some of the data required as input include aircraft geometrical description, including vulnerability criteria, a description of the encounter geometry, and warhead, fuze, and blast data.

ESAMS

The Enhanced SAMS (ESAMS) is a surface-to-air missile engagement model supporting survivability and vulnerability assessments of current and future aeronautical weapon systems. It has evolved out of a family of computer programs called TAC ZINGER, which were developed by Headquarters, USAF Studies and Analysis. The model simulates the interaction between a single airborne target and a surface-to-air missile (to be specified by the user) fired from a designated location. The ESAMS endgame simulates warhead fuzing and, if fuzing criteria are met, the detonation of the missile warhead. The miss distance and kill probability are then calculated. Missile system data, such as thrust, aerodynamics, and guidance, must be input. Other inputs required include target signature, vulnerability, electronic countermeasures (ECM), and flight path.

Expansion

The model repository function of SURVIAC will continue to grow in a controlled manner. A mechanism has been established to evaluate models proposed for incorporation into SURVIAC. A Methodology Advisory Committee made up of JTCG/AS and JTCG/ME representatives has been established and criteria have been adopted for evaluation of additional models. The final decision for incorporation is made by the SURVIAC Steering Committee.

Future expansion plans will begin with the JTCG/AS and JTCG/ME family of models, i.e., those models used extensively within these two technical communities. The two models selected for initial expansion of the model repository were COVART II and FASTGEN 3. COVART II (Computation of Vulnerable Areas and Repair Time) produces output tables of presented areas and vulnerable areas as measures of a target's vulnerability to specified threats. FASTGEN 3 produces a target description shotline file that describes the target geometry and is used as an input to models such as COVART II. These models were incorporated into SURVIAC in late 1986. Additional models will be entered each year.

Reference Libraries

SURVIAC maintains four principal reference libraries and has acquired password access to eight other libraries and databases. These are described subsequently. For the four principal collections, copies of the reports or documents are maintained on file at SURVIAC and are available for reference use. Loan services are not available; however, documents may be reviewed during on-site visits.

General Survivability Reference Library

An extensive collection of reports, studies, analyses, and raw data covering aircraft, ship, and ground vehicle survivability, vulnerability, maintenance, logistics, and military operations has been compiled at SURVIAC and continues to grow daily. This library, as with the Laser Reference Library and Combat Evaluation Library described subsequently, has been indexed into a total-text storage and retrieval system (BASIS), which has an extremely powerful search and identification capability. This library is a valuable resource available to SURVIAC requesters for identifying existing subject matter relating to nonnuclear survivability for conventional and chemical weapons. Current holdings total approximately 9000 documents.

Laser Reference Library

The SURVIAC also has available holdings covering laser information, including detailed test reports, laser R&D efforts, and general laser system information. This library is also expanding rapidly with approximately 1400 documents now on hand. BASIS is the database management system (DBMS) for the Laser Reference Library also.

Combat Evaluation Library

This library is a collection of reports and summaries of U.S. Army operations in Southeast Asia. The collection covers special operations analyses, evaluations of military operations, intelligence data, and similar material. Approximately 700 documents are retrievable by keyword searches.

Vehicle Signatures Reference Library

This library has recently been established at SURVIAC. The focus of the collection is on vehicle signatures and covers information on radar cross section and infrared and acoustic signatures. The collection currently consists of over 1000 documents. Hard copies of the documents are on file, and selected bibliographic data on the reports are included on a computer using the System 2000 database management system. Retrievals are made overnight as the database is classified.

Links with Other Libraries and Databases

The libraries described previously have been supplemented by establishing links with several other libraries and databases. Access, with one exception, is by on-line access via password

in order to perform keyword searches. These additional
resources, listed subsequently, are utilized if the quality of the
responses to a specific question will be enhanced by access to
the subject matter in them.

   1) DTIC Defense RDT&E On-Line System (DROLS).
   2) DT&E Joint T&E Library.
   3) Chemical Defense Database.
   4) Chemical/Biological Database.
   5) Smoke and Aerosol Obscurants Database.
   6) DIALOG Reference Data Collection.
   7) NASA Scientific and Technical Information Library.
   8) FTD CIRC II Database.

Combat Damage Incident Databases

SURVIAC maintains several combat damage incident
databases which were originally established under CDIC.
These databases represent a unique collection of combat
damage and loss information on a variety of combat vehicles.

ACFTDAB

The Southeast Asia Fixed-Wing Aircraft Database (ACF-
TDAB) was the first database established at the CDIC. It was
initiated using the reports prepared by the Battle Damage
Assessment and Reporting Teams (BDART) formed by the
three services and deployed to Southeast Asia. The BDART
reports contain detailed descriptive documentation on in-
dividual combat incidents involving damage or loss to U.S.
equipment in the conflict. Since the BDART teams collected
data on only a fraction of the total incidents that occurred, ad-
ditional sources (about 20 different ones in all) were used to
expand the collection to its present size of 11,836 separate
combat incidents. The information is kept on file in individual
incident folders. Certain key categories of information were
extracted and stored in a computerized storage and retrieval
system from which data elements can be retrieved as required.
Included for each incident are identification data for the air-
craft, operational data pertaining to the aircraft mission,
description of the threat that caused the damage, the damage
itself, the repair required, and much more. More specifics can
be provided upon request.

HELODAB

The Southeast Asia Rotary-Wing Aircraft Database
(HELODAB) is analogous to ACFTDAB but pertains to
helicopters. The raw data, from which the computerized data
were extracted, were accumulated by the Army Materiel
System Analysis Activity (AMSAA) but were subsequently
turned over to CDIC. At present, the incidents in the com-
puterized database total 18,236. As with ACFTDAB, each in-
cident is backed up by an individual folder containing the raw
data.

GNDVEHSEADB

Resulting from data on ground vehicle combat incidents
collected by Army BDART, the Southeast Asia Ground
Vechicle Database (GNDVEHSEADB) represents data on
over 700 individual incidents involving vehicles in the broad
categories of armored vehicles, wheeled vehicles, and
engineering equipment. Again, selected data on each in-
dividual incident have been extracted from the individual
folders and incorporated into a computerized data storage and
retrieval system.

Yom Kippur

The Arab-Israeli Conflict (1973) Database (Yom Kippur)
was established for ground vehicle damage assessment data
collected at the conclusion of the 1973 Mideast conflict. The
database consists of 774 reports describing combat damage to
individual vehicles (tanks and armored personnel carriers). In-
formation describing the threat and damage has been ex-
tracted and included in the computerized database.

Other Combat Data Collections

SURVIAC possesses several combat data collections that
focus on various aspects of combat operations. The collec-
tions were compiled from U.S. experience in Southeast Asia.
They are accessible manually via an index that allows the
specific desired information to be located. These collections,
described by their acronyms or titles, are listed below:

   1) COLED-V—Combat Operations Loss and Expenditure
Data-Vietnam.
   2) Navy BDART—Combat Damage Data on U. S. Navy
Ships and Riverine Craft.
   3) VCOD—Vietnam Combat Operational Data.
   4) AVDAC—Aviation Data Analysis Center Database.
   5) Army Aviation Performance in Vietnam.
   6) COACT—Combat Activities Report.
   7) OPREA—Combat Air Summary File.
   8) SITRA—Ground Combat Operations File.
   9) STRKHIST—Strike History File.
   10) VNDBA—Vietnam Database.

Ballistic Test Databases

SURVIAC holds a variety of ballistic test databases com-
posed over the past several years. These were developed in-
dependently and document individual test shots and results.
Appropriate test parameters were selected and input to a com-
puterized database for storage and retrieval. These databases
are used relatively infrequently and are available for "selec-
tive" retrieval at present. The databases are:

   1) FUELSYS—Fuel System Database.
   2) FUELSUM—Fuel System Summation Database.
   3) BLSTFRG—Blast Fragmentation Database.
   4) ENGVULN—Engine Vulnerability Database.
   5) CONTROD—Continuous Rod Database.
   6) A-X Fuel Tank System Evaluation.
   7) Aircraft Structure and Component Tests.
   8) Munitions Degradations Effects Program (DEP) Col-
lection.

Laser Test Database

Under the CDIC, a laser test database (LASERDAB) was
established to provide a mechanism for the storage and
retrieval of information pertaining to the terminal effects of
laser radiation as a potential weapon. The database focuses on
the response of aerospace materials and components to laser
radiation. Individual test shot results have been documented
and entered into the database. The test shot results were ex-
tracted from reports contained in the Laser Reference Library.
System 2000 is used as the DBMS. The overall database is
classified with retrievals made via overnight computer runs.
Over 4000 test shots are included in the database. The major
data categories included follow:

   1) Report Identification.
   2) Laser Equipment.
   3) Target Information.
   4) Test Set-up Information.
   5) Beam Description/Exposure Information.
   6) Target Effect Information.

Special Program Test Data and Reference Collections

SURVIAC is the repository for information documenting
the results of several special test programs and collections
related to vehicle survivability compiled in the recent past.
These programs are:

   1) HITVAL—Antiaircraft Guns Versus Aircraft.
   2) GRAPH ANGLE—Antiaircraft Gun System Accuracy.
   3) MEXPO—Combat Vehicle Vulnerability.
   4) T65—Gun Tracking and Performance.
   5) HAVE EDUCATION—Aircraft Response to Fragment
Impact.
   6) WEDEP—Weapon Delivery Evaluation Program.
   7) Analysts' Reference Manuals.

Available Services

SURVIAC offers a wide variety of available services, which range from requests for additional information on SURVIAC (information inquiry) to performance of special studies or tasks. The categories of services available are:

1) Information Request—description of SURVIAC functions, products, services, and current resources.

2) Bibliographic Request—search of libraries or databases or referral to other source for more data.

3) Technical Request—extraction, summarization, and/or analysis of information from SURVIAC libraries or databases; includes limited technical support on SURVIAC models.

4) Model Request—provide model code, documentation, and limited test case data.

5) Special Study or Task—request for detailed or extensive analytical effort that exceeds the level of support available under basic SURVIAC operations; funded by requester.

These services are provided to qualified requesters. A qualified requester may be any DOD agency personnel or their contractors. Contractors must have a current, valid DOD contract and verified need-to-know. Also, security clearances and special access authorizations are often required. A pamphlet detailing procedures for the initiation of a special study or task is available upon request.

Summary

The Survivability/Vulnerability Information Analysis Center (SURVIAC) has been established and is now opera-tional as a prototype Department of Defense (DOD) Information Analysis Center. It is a major support center and focal point within the DOD for nonnuclear survivability and lethality data, information, methodologies, models, and analyses relating to U.S. and foreign aeronautical and surface vehicles. It supports users in the areas of survivability design, survivability technology, survivability methodology, and munitions effectiveness. SURVIAC is available to requesters now and contacts are welcomed.

Contact Information

SURVIAC may be contacted at the primary SURVIAC facility at Area B, Building 45, Wright-Patterson Air Force Base, Ohio. The mailing address is:

AFWAL/FIES/SURVIAC
Wright-Patterson Air Force Base, OH 45433-6553

Telephone numbers are: Commercial: (513) 255-4850/3956; AUTOVON: 785-4840/3956.

A SURVIAC Satellite Office is also available in the Washington, D.C., area to better serve the many survivability and lethality organizations there. The Satellite Office is located in Booz, Allen & Hamilton facilities at Room 229, Suite 1100, Crystal Square 2, Arlington, VA. The mailing address is:

SURVIAC Satellite Office
Booz, Allen & Hamilton Inc.
1725 Jefferson Davis Hwy.
Rm. 229, Suite 1100
Arlington, VA 22202-4158

The telephone number is (703) 769-7720.