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SUPPORTABILITY INVESTMENT DECISION ANALYSIS CENTER (SIDAC):
A CUSTOMER-ORIENTED SOLUTION TO MODELING AND ANALYSIS PROBLEMS

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ABSTRACT

The move to reduce the DoD budget, and the escalating cost of the systems DoD will buy and maintain, demands exceedingly astute decisions relating to supportability investments. Within the world of analysis and decision support there are a myriad of effective, sophisticated tools and techniques, scattered through the DoD and private sector. The SIDAC is dedicated to becoming a Center of Excellence for the dissemination of quality information, modeling and analysis advice, and an expert source for supportability-related studies and services. The SIDAC promises a credible, quality product or service for the investment manager--the future demands it.

The early groundwork for the development of a Center of Excellence for the transition and insertion of laboratory-developed technologies into fielded systems, and the offering of analytical methods and models to improve investment decisions for systems supportability, evolved from a number of related tasks initiated at Air Force Systems Command's Wright Research and Development Center (WRDC). As well, the Air Force Logistics Command's Logistics Operations Center (LOC) was concerned with the autonomous R&M analysis efforts being conducted throughout the Air Force Logistics community.

SIDAC: The History

The need for an improved supportability investment decision support capability has been steadily evolving. This evolution is demonstrated by the many supportability-related activities conducted within AFLC, AFSC, and the Air Staff. Each of these activities, to some degree, has contributed to the decision to initiate the SIDAC Concept Definition Program. Some of these activities include:

- Weapon System Master Planning (AFLC)
- Science Advisory Board Ad Hoc Panel on R&M
- System-Level R&M Analysis Tools, SCOPE & MARGI, USAF/LE-RD
- USAF Logistics R&D Compendium (LOGCOM) Information System, WRDC
- High Reliability Fighter Studies, ASD/XR
- All Mobile Tactical Air Force (AMTAF) Model, ASD/XR
- Logistics Analysis Methodology Program (LAMP)/Logistics Assessment Work Station (LAWS), WRDC
- Logistics Technology Initiative for Existing Systems (LOGTIES), WRDC

The LOC sponsored an R&M Modeling Conference in February 1988 to promote a better understanding of on-going analysis initiatives. Over 100 industry and Air Force representatives discussed the fragmentation of modeling work across the DoD and industry.

Deciding which supportability investments yield the highest payoffs has always proved to be a challenge. The recurring problem revolved around how one should provide quantitative management: decision-making support that yields high return on investments. There exists a plethora of models, quantities of raw data, and countless ideas about how to use the models and data. Unfortunately, making a sound decision usually takes more time than initially anticipated.

It demands expertise in areas which don't impact one's everyday work experience, and an attempt to perform more than a few iterations usually borders on the impossible.

The need for an improved supportability investment decision support capability has been steadily evolving during this decade. With the promise of strategic arms limitation and GLASNOST extant, conventional weapon systems will be called upon to play increasingly more active roles in national defense. Existing weapon systems will need improved performance to meet future threats, and enhanced supportability characteristics to accommodate new technologies and operating scenarios. This need is characterized by the circular emphasis from a commodity orientation ("How many parts are in the bin?") to the importance of higher combat-oriented measures ("What is the daily sortie generation capability?") (Figure 1) and a backyard trend to a centralized management approach.

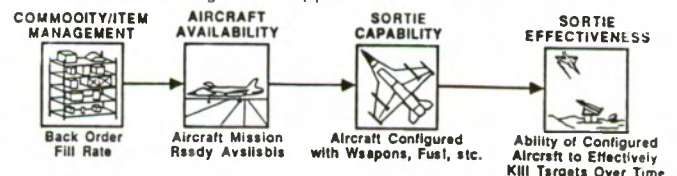


Figure 1. Transition to Weapon System Management

The focus is now a blend of the relationships of logistics functions as they enhance or constrain wartime capability.

A JOINT AFLC/AFSC INITIATIVE

The Supportability Investment Decision Analysis Center (SIDAC) is an initiative jointly sponsored by the Air Force Logistics Command (AFLC) and the Air Force Systems Command (AFSC); it is expected to be operational in FY90. This initiative was conceived to help improve the full spectrum of weapon system supportability, beginning with the earliest stages of technology development and progressing through the final phases of the life cycle.

Traditionally, IAC's accumulate information in a specialized discipline and disseminate the information to managers, scientists, engineers, and analysts. IACs engage in activities such as:

- acquiring and selecting scientific and technical information
- analyzing, evaluating, and repackaging required material
- creating new information with bibliographic control
- setting standards within areas of expertise
- conducting special studies and analyses

Concept Definition Phase

The SIDAC concept extends the responsive nature of an IAC to that of a proactive force within the AFLC and AFSC communities, and places a strong emphasis on identifying opportunities to improve the supportability investment process and communicate those opportunities to the community (Figure 2).

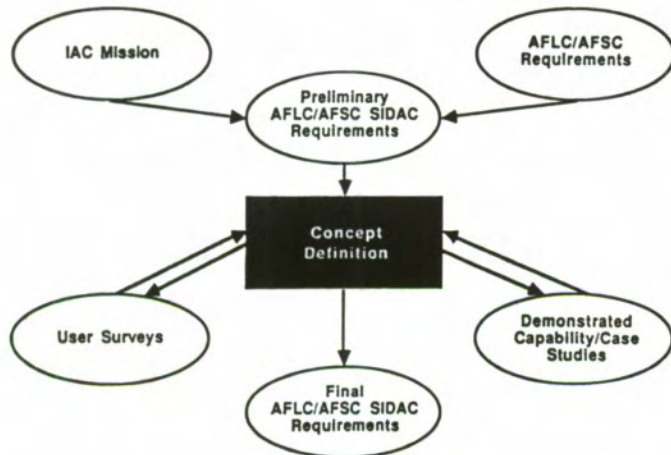


Figure 2. Joint AFLC/AFSC Concept Definition

The SIDAC concept was tested in several functional areas in order to assure its feasibility, including a technology insertion case study; the production of newsletters; conducting a technical conference; and operating an Intercommand On-line Network (ICDN) and an electronic Information Base. The primary lesson learned in prototyping these activities was an appreciation role of the crucial play in operating a successful IAC and distributing information within the community.

The key to SIDAC's success is its ability to offer a rigorous, credible response to the needs and interests of the technology, acquisition, and logistics communities within the Air Force. SIDAC will provide the kind of support services illustrated in the following case study conducted during the Concept Definition phase.

F16 Supportability Analysis

The F-16 System Program Manager (SPM) required an analysis to quantify the impact of installing sealed, lead-acid batteries on the F-16 fleet. The F-16 SPM was aware that the Navy's F-18 Program realized a 23:1 reduction in servicing requirements for the battery subsystem when the Navy implemented the same upgrade. How did SIDAC see the problem? What would be the benefits, drawbacks, and Air Force R&M 2000 impacts on the upgrade?

By consulting SIDAC, the F-16 SPM found there were two known capabilities existing within the SIDAC Information Base that could support the battery case study: the LAWS-based R&M 2000, peacetime, steady-state model developed for a WRDC case study on the Mission Integrated Transparency System (MITS); and the Dyna-METRIC Microcomputer Analysis System (DMAS), developed under the Weapon System Management Information System (WSMIS).

SIDAC concept definition contractor personnel, in conjunction with SPM personnel, identified applicable models and data, and performed the battery assessment study. They acquired copies of the models and documentation, loaded the models on the F-16 SPM's computers, trained F-16 SPM personnel, and supported the acquisition of data.

The F-16 SPM benefited from the study by acquiring a quick-reaction capability; by having SPM personnel involved in the process; by acquiring trained personnel, working models, and developed data sets; and thereby demonstrating that centralized coordination and existing capabilities can be affordably applied to a weapon systems program. This case study will be used in a new logistics course, LDG 399, at the Air Force Institute of Technology (AFIT). In addition, the results can also be distributed to potential SIDAC users as an example of a typical SIDAC application.

User Investigation

During the Concept Definition, nearly two hundred potential users of SIDAC in AFSC, AFLC, the Air Staff, major commands, and OSD were surveyed. The purposes were to determine the level of support for the SIDAC concept, and to determine which type of service would be best provided by the center.

The user community indicated strong support for a SIDAC-type organization. The results of the users investigation survey have revealed many potential users who have a strong need for SIDAC-type services. The groups interested in SIDAC support cover the full spectrum of the supportability process.

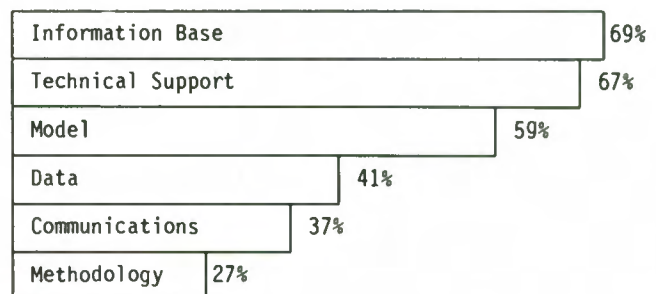


Figure 3. Services Requested by Potential SIDAC Users at WPAFB

SIDAC TECHNICAL SERVICES

The official mission statement of the Joint AFLC/AFSC SIDAC is:

To improve and apply analysis methods, models, techniques, and enabling services for every aspect of weapon system supportability; and to actively assess and promote enhancements to the associated supportability investment decision processes.

SIDAC will provide analyses of supportability investments for AFSC and AFLC customers as well as other government and private-sector customers. Influencing design, technology insertion and setting priorities among candidate modification projects are three examples of decision analyses that fall under the category of supportability investments. SIDAC's technical services and resources will include:

- Analysis Methods
- Models and Simulation
- Data Sources and Pre-Processors
- Analysis Automation Techniques
- Technical Expertise
- Information Base
- Source Library
- Newsletters
- Conferences, Seminars, and Workshops
- Intercommand On-Line Network (ICON)
- Education

SIDAC's interest in enhancing weapon system supportability will be focused on six key services: analysis methods, models and simulations, data access and processing techniques, communication networks, information retrieval and repository, and special studies and tasks. Each of these services was studied as part of the SIDAC Concept Definition Program.

Analysis Methods

SIDAC capabilities must support and adapt analytic methods and standards that assist technologists, engineers, logisticians, and manager across the full range of supportability-related responsibilities. Of particular interest are analysis methods that help technologists to credibly quantify logistics impacts of technical products, aid engineers and logisticians in accessing system-level impacts of R&M improvements at the subsystem and component indentures, and assist managers in setting corporate priorities among competing options for weapon system upgrades and modifications, and address the entire LSA process. SIDAC will use methods that provide high validity products and require minimum essential investment in computer models, data gathering and input, and interpretation of results. SIDAC will work with the user community to create and pursue the development of innovative and responsive methodologies that complement future opportunities and needs in the supportability investment decision arena.

Analysis Models and Simulations

SIDAC will investigate, identify, assess, catalog, and advertise analysis models that quantify decision options in terms of the USAF R&M 2000 goals and other appropriate measures of merit. SIDAC will begin with a basic suite of Air Force logistics analysis models, such as LCOM, Dyna-METRIC, LCC2A, TSAR/TSARINA, AMTAF, LAMP/LAWS, SCOPE, MARGI, or many others. SIDAC will have the capability to store and operate selected models within the facility and transfer the models to external organizations, will adapt existing models, and will provide a configuration control service on a case-by-case basis. SIDAC will provide consulting services to users on an "ad hoc" basis or under a formal long-term business agreement. By special arrangement, SIDAC will act as the principal repository and implementation agent for some supportability-related models, such as the SCOPE and MARGI models developed by Synergy, Inc. and Anser Corp. for USAF/LE-RD.

Data Access and Processing Techniques

R&M 2000 analyses require input data from several sources, including the AFLC-managed Logistics Management Systems Center (LMSC). By intentional design, SIDAC will rely on established AFLC systems, among others, to generate pertinent data. However, SIDAC will also help users describe and set boundaries for their data requirements, in conjunction with the efficient use of models and methods. SIDAC will process and format the acquired data to facilitate compatibility with the pending analysis requirements.

Communication Networks

One of the fundamental services of an IAC is to provide information services to the user community. One way of facilitating information dissemination is through a two-way electronic communication network. Individuals within the supportability analysis community will be able to access a SIDAC communications forum and browse through the SIDAC information base, electronic bulletin board, and SIDAC newsletters. Other services available through the communications network may include point-to-point transfer of models and data, multi-user, on-line analysis conducted in real time, and remote access to models and data files.

Information Retrieval and Repository

SIDAC proposes to maintain both an electronic information base and a traditional, hard-copy information base of original material. SIDAC will provide a central repository for methods, models, and techniques used within the supportability analysis community.

The SIDAC plan is to collect information from a wide range of sources, such as planning information from MAJCOMs, Air Staff and OSD, case files concerning special studies and analyses, AFSC Logistics R&D Investment reports, AFLC Weapon System Master Plans, Acquisition Engineering studies, Development Planning efforts, and Defense Science Board (DSB) and Scientific Advisory Board (SAB) reports.

SIDAC will advertise its services through a quarterly newsletter, briefings conducted throughout the user community, and through hosting conferences, seminars, and workshops to gather the community together to further the exchange of information.

Special Analysis Tasks

SIDAC will, upon request by a customer, conduct special studies that fall under the SIDAC charter. Any user has the option of requesting a SIDAC-sponsored investigation. As an example of a SIDAC special study, SIDAC could assist laboratory technologists in quantifying the logistics impacts of an advanced technology product by recommending the appropriate analysis models, identifying input data requirements, and identifying data sources. SIDAC could then undertake the analysis task or provide expert advice and counsel, as required.

In keeping with the IAC concept, experts will be available to participate in technical discussions and to provide consulting services. Users may contact SIDAC to receive advice concerning the appropriateness of a model or method for their analysis, to acquire resource material concerning a particular subject, to verify the quality and applicability of a particular model, or to identify an individual within the community with a similar analysis challenge.

Basic consulting services may be limited by the complexity of the request and the time required to resolve the task. For example, many IACs limit basic consulting services to a maximum of 40 hours per request. For efforts requiring additional time, the customer may request a special study or task.

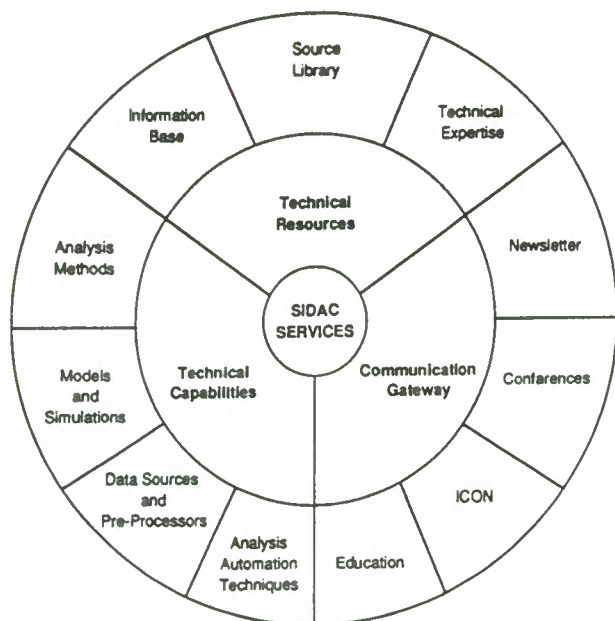


Figure 4. Core SIDAC Services

SIDAC: THE ORGANIZATION

SIDAC is envisioned as a government center, located at or near Wright Patterson Air Force Base (WPAFB). Community feedback indicates that satellite "mini-centers" at major user organizations could increase effectiveness of SIDAC. The central WPAFB SIDAC facility will be managed by a few DoD personnel and supported and operated by contractor employees.

The recommended management and technical organization for SIDAC is based upon the experiences of other IACs and complies with DoD Regulation 3200.12-R-2. Typically, IACs are administratively managed and receive technical direction from the Contracting Officer's Technical Representative (COTR). The SIDAC COTR will be appointed by the Air Force and will be approved by the Director of Defense for Research and Engineering (DDR&E) when SIDAC achieves DoD-level status. An Air Force Management Integration Office (MIO) will establish and manage SIDAC. Many IACs are also governed by a Steering Group or Technical Advisory Group. SIDAC will have both a consolidated Steering Group whose members contribute and help manage SIDAC core funds, and a more extensive, technical Advisory Group that helps accommodate the technical needs of the SIDAC community.

THE CUSTOMER PERSPECTIVE

The real value of SIDAC will be determined by the customer, how he or she views the worth of the services to his or her productivity and efficiency. SIDAC customers will come from a variety of managerial levels and functional areas. How SIDAC will address this diversity is a function of its ability to understand the long-standing problems in the world of logistics, beginning with R&D, moving across the acquisition and operational areas, and becoming most evident in the actual support of fielded systems, within AFLC. To illustrate, the typical AFSC customer may be a Program Manager performing tradeoffs on technology insertion efforts, in order to select those for pursuit in development. The present challenge is to, on his own, select models, analysis tools, and current data relating to Logistics Research and Development projects. The current approach is an ad hoc one, attempting to effect technology insertion with little or no quantitative measures of benefits to system performance improvements or R&M goal improvements.

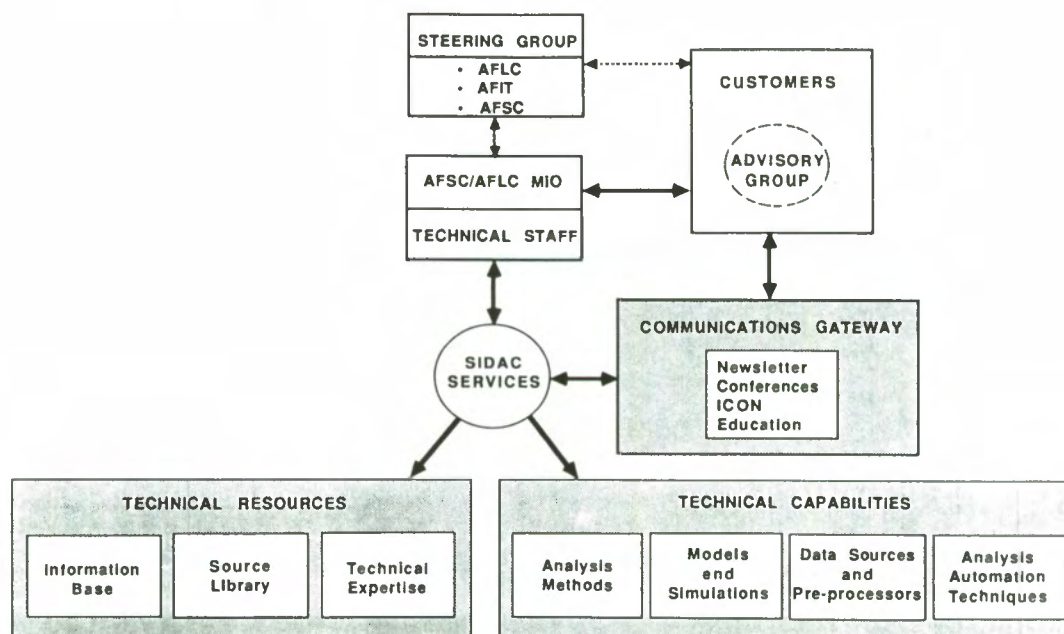


Figure 5. SIDAC Functional Overview

The operational world customer may well be a member of a requirements staff producing a major command position on modification prioritization. The present challenge for him or her is to search for models and/or data tailored to the specific operational command's weapon systems, and appropriate usable data; tools and techniques that clearly indicate optimal ranking of modifications to effect increased combat capability. The operational manager is thus confronted with the inability to effectively rank modifications by the highest benefit in terms of R&M goals.

In the world of AFLC, support of fielded systems, a System Program Manager can be faced with a requirement to put his or her efforts in priority order in a Weapon System Master Plan (WSMP), defend the need for funding, report and advocate via Weapon System Program Decision Package (WSPDP) and Weapon System Program Assessment Review (WSPAR). The SPM is currently on his own to select an appropriate prioritizing approach. There is now no source of information on the relative merits and limitations of models. The SPM is forced to use what is known or to spend scarce 583 sustaining engineering funds to develop another modeling approach. The result is widespread inconsistency with other SPMs, which leads to defending an approach and its results; selection of a model without understanding its assumptions; duplicative effort developing a modeling approach, and unnecessarily spending scarce dollars.

Putting ourselves in these shoes, we see a range of benefits which we want to highlight to the novitiate SIDAC customer, whether from the acquisition, operational or support areas. SIDAC promises services inclusive of:

- An on-line access to a catalog of models describing applicability, assumptions, input requirements, and output products
- A person-to-person access to experts who can help select an existing model and easily gain access to data necessary to exercise the model
- The availability of documentation on models and techniques
- The availability of training on supportability investment decision analysis via seminars, guides, and SIDAC-enhanced AFIT training courses
- A conduit for the most cost-effective model modifications and/or maturation, avoiding a lock-in to a contractor who may be tied to a specific model or a contractor who needs to charge for his model learning curve.

The availability of integrating efforts to help make multiple models "play together" to do the intended job;

- Help in getting data into models efficiently; and
- Availability of information on data access.

CONCLUSION:

Historical experience has shown that IACs within the DoD provide valuable services to their customers. As SIDAC is approved and implemented, many possibilities are envisioned as the program matures which will expand the basic set of SIDAC services.

With the increase in the need to maintain our current inventory and with the reduction in resources, both in manpower and hardware, throughout DoD for the near term and into the next century, we recognize the absolute necessity to use every technique within our grasp to optimize resource investment decisions. SIDAC promises to make that a reality.

BIOGRAPHIES

Michael B. Silverman

Michael B. Silverman is currently Manager of the Integrated Logistics Technology Office within the Wright Research and Development Center (WRDC) at Wright-Patterson AFB, Ohio. He is the WRDC corporate advocate for logistics research and development. Mr. Silverman pioneered the development of R&M 2000 tools and methods, and a USAF logistics R&D information system. He also helped create a joint AFSC/AFLC Program to establish a new supportability analysis center at Wright-Patterson AFB. He has served as a principal member of Air Staff and AFSC R&M study teams. Mr. Silverman received his Bachelor of Science in Chemistry and Masters of Science in Nuclear Engineering from Michigan Technological University. He is a member of the Society of Logistics Engineers.

Mary C. Potter

Mary C. Potter is a Program Analyst in the Tactical Assessment Division, Tactical Force Structure Directorate, Logistics Operations Center. She is the AF Program Manager for the Supportability Investment Decision Analysis Center (SIDAC) and LOC/TL focal point for R&M and Quality initiatives. Ms. Potter has worked in the LOC since its formation in June 1983. Prior to her employment in LOC, she worked for two years in the Air Force Acquisition Logistics Division, and for over four years in the DCS/Engineering and Services, HQ AFLC. Ms. Potter has a Bachelor of Arts and Master of Arts degrees from Wright State University. She is a member of the Society of Logistics Engineers.