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STRATEGIC DEFENSE INITIATIVE PROGRAM

Status of Space Surveillance and Tracking System

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The Honorable J. Bennett Johnston
The Honorable William Proxmire
United States Senate

The Strategic Defense Initiative (SDI) is the Department of Defense's program to determine the feasibility of developing and deploying a defense against nuclear ballistic missiles. The program envisions a layered defense system capable of destroying a nuclear ballistic missile during any of its four phases of flight—boost, post-boost, midcourse, or terminal.

This report responds to your request for information on the status of the Strategic Defense Initiative Organization's (SDIO's) research on the Space Surveillance and Tracking System (SSTS). We provided a more detailed classified report to you on October 29, 1987 (GAO/C-NSIAD-88-5).

Background

As currently envisioned, the SDI's layered defense against ballistic missiles will require a space-based sensor system to find nuclear warheads in the post-boost and midcourse phases. The proposed SSTS would acquire and track post-boost vehicles and nuclear warheads and discriminate warheads from a significantly larger quantity of decoys and debris.

SSTS has four major functions during the post-boost and midcourse phases: to (1) acquire and track threat objects, (2) discriminate warheads from decoys and debris, (3) provide target location information to other systems, and (4) assist in damage assessment of targets. The SSTS would also serve a surveillance role for the U.S. "space defense" mission. Under this mission, the SSTS would provide surveillance support to U.S. antisatellite weapons, warn of attacks on U.S. satellites, and monitor and catalog all objects in orbit around the earth.

To assess the feasibility of achieving this space-based surveillance capability, SDIO budgeted $102.4 million for fiscal years 1985 through 1987 for the SSTS program, which is managed by the Air Force's Space Division. The requested budget for fiscal year 1988 is $170.8 million and for fiscal year 1989, $210.8 million. SSTS's success also depends on several technology base programs that are separately funded and support several other sensor programs in addition to the SSTS. The fiscal years 1988

and 1989 budget requests for these technology programs are $295.5 million and $326.8 million, respectively.

Status of SSTS Program

In July 1987, the SSTS program concluded its initial phase of determining requirements and investigating preliminary system concepts. Changing development approaches, or plans, extended this initial phase. The program could again be altered as a result of a midcourse sensor study occurring from September through December 1987. This study is to support a January 1988 SDIO decision on what mix of sensors is appropriate to cover the midcourse in an initial SDI deployment. The study is also to define a technology development path to a more capable future system and to identify experiments that will demonstrate the feasibility of midcourse surveillance and tracking.

The program has had three different development plans in 3 years and will have cost over $100 million by the end of fiscal year 1987. The SDIO originally awarded 9-month contracts to three companies, totalling $12 million, to define requirements and preliminary concepts. These contracts were extended to nearly 3 years at a cost of $65 million. Other program support costs consumed the remainder of the $102.4 million.

The first development plan was designed to satisfy a space defense surveillance role and a limited initial ballistic missile defense (BMD) surveillance role. The second development plan called for increasing the BMD capability of the initial system. This plan was ultimately judged too costly and complex.

The third and current plan, effective in February 1987, was again for a limited, initial BMD capability. Under this plan, contracts for the definition of preliminary concepts and mission requirements were completed in July 1987.

Two contractors were awarded follow-on contracts in July 1987 to develop the system concept and continue analyses of SSTS requirements as threat, technology, and architecture evolve. Subsequent contract options are to cover the more costly later stages of design and demonstration of an SSTS and a prototype space experiment. Development cost estimates total $966 million for fiscal years 1988 through 1990.

A contract for subsequent fabrication, testing, and flight of the space experiment would be awarded to a single contractor. An estimated cost

of about $681 million is being used until more reliable estimates for the experiment can be made.

The potential exists for another revision to the SSTS development plan. SDIO representatives said that they are keeping the SSTS program flexible until they are able to sufficiently define the threat, SDI system requirements, and architectures. SDIO has not determined what SSTS's role would be in either a near-term SDI system or in the fully capable SDI system, which SDIO proposes to deploy in phases. SDIO's ongoing midcourse sensor study is to lead to a January 1988 decision on whether the architecture for an initial SDI deployment would include an SSTS. It is also to recommend a technology development plan for achieving a more capable future system, including a plan as to what space experiments should be performed to support midcourse sensors development.

Status of Demonstrations

The SSTS program manager is responsible for demonstration of some component technologies and SSTS integrated demonstrations. Both ground-based demonstrations and a space-based demonstration are proposed. The scheduled start of SSTS integrated demonstrations has been delayed by about 2 years. SDIO's program manager said that specific plans as to what will be demonstrated are being developed, now that the first contracts for the concept development and technology demonstration program phase have been awarded.

Within the SSTS program, only ground-based integrated demonstrations are scheduled prior to the SDI full-scale development decision in 1992. SDIO program officials said that they are also looking into how to best utilize space experiments scheduled under technology base projects, so as to support SSTS data needs.

Status of Technology Base Development

The SSTS will require technology that is being developed under other SDI technology programs funded and managed separately. The key technologies are (1) component technologies for long-wave infrared sensors, including optics, detectors, signal processors, and cryogenic coolers, and (2) technologies for laser radars and space-based radars.

In addition, a body of data representing how each sensor type "sees" various target and background "signatures" must be collected and analyzed. These "phenomenology" data are important to the design of a sensor's signal processor hardware and algorithms.

SDIO has reduced funding for technology development work because of overall budget constraints. Program officials stated that technology contracts have been stretched out or delayed, and alternate, backup technologies are not being funded, thus increasing the risk involved in a full-scale development decision. SDIO has maintained the more mature technologies in order to support an option for near-term deployment of the first phase of an SDI system.

Conclusions

SDIO has spent $65 million over 3 years for three parallel contractor efforts to analyze technology, propose preliminary system concepts and associated mission performance and interface requirements, define data needs for sensor design, and develop preliminary demonstration plans. The completion of this contract phase was delayed by SDIO's uncertainty over SSTS's role and requirements in an overall system architecture. SDIO had originally estimated that completing the first program phase would cost $12 million over 9 months, with a possible extension to 12 months.

The recently convened midcourse sensor study reflects the need to come to grips with SDI sensor needs and architectures. Although SDIO and the Air Force have awarded contracts to begin the SSTS program's concept development and demonstration, considerable uncertainty must be resolved by the Department of Defense before the concept and demonstrations can be well-defined. The bulk of the cost and effort for this concept development and demonstration is contained in pending contract options that program officials say will not be exercised until the midcourse sensor study is complete and decisions are reached on sensor requirements. A major task in the initial months of these contracts is to support the recently chartered study.

Funding constraints prompted SDIO to cut planned technology base effort supporting the SSTS in fiscal years 1986 and 1987; this pattern could continue in the future. The effect of these cuts is to increase the risk in a proposed 1992 development decision, unless that decision is delayed. Technological risks, as well as schedule and cost risks, are assessed as high under the existing program schedule, according to program estimates.

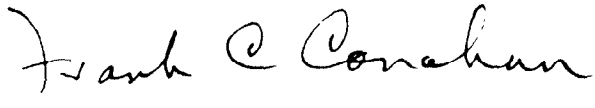
Objectives, Scope, and Methodology

To determine the cost, schedule, and performance status of the SSTS, we reviewed information on the technological issues that must be resolved before an effective system can be developed and the approaches used by the program office to resolve these issues. We reviewed various SDIO

studies that identified the need for an SSTS-type system and the plans for meeting that need. We reviewed development plans, acquisition strategies, mission and technical requirements, contracts, and various other documents. We discussed the SSTS program and related technology base programs with appropriate officials at SDIO in Washington, D.C.; the Air Force's Space Division in El Segundo, California; the Air Force's Space Technology Center in Albuquerque, New Mexico; and the Air Force's Rome Air Development Center in Rome, New York. We also visited contractors to obtain their views. Our review was conducted between May 1986 and August 1987 in accordance with generally accepted government auditing standards.

We discussed this report with SDIO and Air Force officials and have included their comments where appropriate. As requested, we did not obtain official Department of Defense comments on this report.

As arranged with your offices, unless you publicly announce its contents earlier, we plan no further distribution of this report until November 27, 1987. At that time we will send copies to the Secretary of Defense, the Secretaries of the Air Force and the Army, the Director of SDIO, and other interested parties.



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