

REPORT BY THE COMPTROLLER
GENERAL OF THE UNITED STATES

DOD'S SPACE-BASED LASER
PROGRAM--POTENTIAL,
PROGRESS, AND PROBLEMS

D I G E S T

The United States is pursuing directed-energy weapon technologies involving devices for generating and controlling laser, particle, and microwave beams which may revolutionize military strategy, tactics, and doctrine. Beam weapons could rapidly destroy targets by means of intense electromagnetic radiation or particle fluxes, instead of by projectiles and explosives. They are expected to play an increasing defense role in the future.

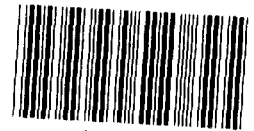
Laser weapon technology is the best understood and most mature of the three types of directed-energy weapon technologies. The Department of Defense (DCD) has been developing technology to demonstrate the feasibility of high-energy laser weapon systems for various tactical and strategic missions. One widely discussed laser weapon concept involves a constellation of laser weapon platforms in space which has the potential to provide a credible air and ballistic missile defense system for the United States (no such defense currently exists).

WHY THE REVIEW
WAS MADE

Since no other laser weapon concept currently being developed has such profound military implications, this report is devoted to the DOD space-based laser (SBL) program. GAO's review of the program was undertaken because of the recent interest in the area by the Congress, DCD, and the media. The review assessed program progress, examined the issues associated with demonstrating SBL weapons potential, and assessed the existing SEL management structure.

FEASIBILITY OF SBL
WEAPONS UNCERTAIN

While effective SEL missile defense systems could not be deployed until well into the future, emerging technology has progressed to the point at which its military use is relatively clear. However, significant technical uncertainties remain to be resolved before



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even a limited first-generation weapon system is possible. The uncertainties relate to all aspects of the system, including the laser device; beam control; acquisition, tracking, and pointing; surveillance; command, control, and communications; and launch and on-orbit servicing. Because of the early nature of the technology, a diversity of opinion exists in the scientific, industrial, and defense communities regarding whether current laser and related technologies can support a constellation of SBL weapons for air and missile defense that would be effective and affordable.

The pace for resolving the uncertainties has been discussed in recent DOD studies of program options. GAO's report discusses the pace of the current SBL program and two of DOD's options to accelerate the pace of the program. These accelerated options considered most prudent by experts move the technology development effort at a pace constrained by technology rather than funding limitations as is now the case. One option includes an early commitment to an on-orbit demonstration to obtain knowledge relating to system integration. The report also discusses the advantages and disadvantages of such an on-orbit demonstration. (See pp. 12 to 19.)

LIMITATIONS OF THE EXISTING SBL PROGRAM

The Defense Advanced Research Projects Agency (DARPA) within the Office of the Secretary of Defense is presently responsible for demonstrating the three major components of an SBL system--the laser, the large optics, and the extremely accurate acquisition, tracking, and pointing system. These components referred to as Alpha, large optics demonstration experiment, and Talon Gold, respectively, are collectively called the DARPA Space Triad. During 1981, the Air Force has established a program office for SBL efforts. (See pp. 5 and 6.)

GAO's review highlighted the following situations in the existing program and management structure:

--The present program is a funding-limited approach to developing the technology for SBLs. This approach risks keeping the potentially

revolutionary technology in component development for the foreseeable future. (See pp. 13.)

- Future prospects to augment the present program above that recommended by the Defense Science Board appear bleak. As a result, all SEL feasibility issues will not be fully addressed before a demonstration decision. (See p. 22.)
- Funding limitations have caused performance reductions and schedule slippages in the Triad programs. These delays will have implications later since future efforts require data from the DARPA programs. (See pp. 23 and 24.)
- The SBL program is becoming a joint Air Force and DARPA effort. The Air Force is responsible for SBL weapons development while DARPA is responsible for demonstrating the feasibility of the Space Triad technologies. (See pp. 21 and 22.)

CONCLUSIONS AND RECOMMENDATIONS

Because of the high cost and high military potential, GAO believes that SBLs will continue to attract attention by both the Congress and the Office of the Secretary of Defense, particularly relating to program pace, management, and cost. To illustrate, the DOD Authorization Conference Report directed the Secretary of the Air Force to provide a plan for the management of future high-energy laser weapons programs and a study of the feasibility, cost, schedule, and technological issues associated with SBL weapons. While the Air Force is now responsible for SBL weapons development, including a feasibility demonstration, DARPA continues to be responsible for the Space Laser Triad programs which are designed to demonstrate the technical feasibility of the three major space laser components.

GAO believes that with such long range military potential, it is important that the SEL program be a well structured, funded, and managed effort from the outset. GAO questions whether such a program currently exists.

To address these issues, GAO recommends that the Secretary of Defense

- establish a DOD SBL program plan containing clear and specific milestones and objectives which recognizes the relative priority of SBLs within DOD,
- commit the necessary funds to meet these objectives and to maintain stability of the program selected, and
- establish a management structure to accomplish program objectives efficiently.

VIEWS OF PROGRAM OFFICIALS

GAO did not request official comments on this report because of the need to issue the report in time for congressional consideration of the fiscal year 1983 defense budget request. GAO did, however, discuss a draft of this report with high level officials associated with management of the program and they agreed with the facts presented. Their views are included as appropriate.