United States General Accounting Office

GAO

Testimony

For Release
on Delivery
Expected at
9:30 a.m. EDT
Thursday
May 16, 1991

Implications of SDIO's Changing Ballistic Missile Defense Architecture

Statement for the Record by
Samuel W. Bowlin, Director
Defense and Security Information Systems
Information Management and Technology Division

Before the
Legislation and National Security Subcommittee
Committee on Government Operations
House of Representatives

GAO/T-IMTEC-91-13

Mr. Chairman and Members of the Subcommittee:

I am pleased to submit this statement for the record as part of the Subcommittee's hearing today on this extraordinarily complex endeavor. As you recall, we reported in July 1990 that the Strategic Defense Initiative Organization (SDIO) would not be able to give the President enough information to support a 1993 decision to deploy the first phase of the Strategic Defense System. To do so would require a stable architecture and sufficient testing. However, SDIO was willing to support a presidential decision with far less information on system performance than originally deemed necessary. Given the uniqueness, size, cost, and complexity of the Strategic Defense System, an uninformed decision would increase the risk that this multi-billion dollar system will not work as intended.

The 1993 decision has now been delayed, and SDIO has an opportunity to gain enough information to support informed development and deployment decisions. The lesson learned from our previous work is that development and deployment decisions on complex systems should be event-driven, not time-driven. Mr. Chairman, a stabilized architecture and integrated system-level testing are two essential, interrelated events needed before making critical full-scale development and deployment decisions.

Now, I'd like to talk about the importance of these events. A stable architecture is essential before detailed system requirements and integrated testing strategies can be developed and implemented. It explains what the system pieces are and how they work together. A stable architecture will give SDIO the blueprint it must have for designing and developing each piece of the Strategic Defense System.

SDIO's unstable architecture has caused confusion, forced costly redesigns, and increased the risk that the Strategic Defense System will not perform as expected. Because of this, we recommended last year that the Boost Surveillance and Tracking System (BSTS) not move into full-scale development before the Phase I architecture was stabilized and integrated system-level tests performed. Had the Congress appropriated the $265 million dollars Defense wanted for full-scale development of BSTS, funds would have been spent on a system that is no longer part of the current SDI architecture. Two hundred sixty-five million dollars is only a fraction of the money that this program could consume if full-scale development decisions are made prematurely.

Changing threats, missions, and emerging technologies have kept the SDI architecture in a state of flux. As the attached chart shows, the SDI architecture has continued to change since 1987. Originally, the first phase of the Strategic Defense System was to deter a massive Soviet Intercontinental Ballistic Missile (ICBM) attack by intercepting and destroying a certain percentage of incoming warheads. However, political changes have led to reduced Soviet threat and increased Third World threat. Because of these changes, a new concept evolved called Global Protection Against Limited Strike (GPALS). The mission of GPALS is to protect American troops, our friends, our allies, and the entire United States against limited or accidental ballistic missile strikes from anywhere in the world. GPALS is to be able to evolve, if needed, to defend against a massive Soviet ballistic missile attack. From the chart, you can see that the proposed GPALS is very different from the 1988 Phase I architecture. In addition to new missions, advances in technology have also driven system design changes.

System architectures should be flexible enough to take advantage of new technologies that can increase effectiveness. However, there is a down side to this. If the technological change is great enough, it can ripple across the architecture, causing fundamental design incompatibilities necessitating changes. This is precisely what happened to Phase I when Brilliant Pebbles was added to the architecture. Advances in miniaturization of space-based system sensor, guidance, and processor components convinced SDIO that the Brilliant Pebbles proliferated weapon/sensor concept was feasible and desirable. However, adding Brilliant Pebbles in January 1990 reduced, changed, or eliminated the need for the other space-based subsystems in the 1988 design.

Brilliant Pebbles is now the cornerstone of SDIO's current approach to strategic defense. Consequently, many of the currently planned subsystems will need to interface with Brilliant Pebbles. However, Brilliant Pebbles is dependent on many state-of-the-art and emerging automated data processing and communications technologies. The unavailability of any one of these technologies could seriously undermine SDIO's ability to achieve its mission.

For example, hundreds of Brilliant Pebbles must be able to communicate with each other as well as with the other pieces of the system. Accordingly, sophisticated space-to-space communications and network management technologies are required for Brilliant Pebbles' successful integration into the planned system. If these supporting technologies are not available on time, the entire architecture could be affected, having significant cost, schedule, and performance implications.

I have just described factors that have contributed to the fluid nature of the SDI program. But, without a stable architecture, no Strategic Defense System that SDIO finally selects can be effectively and efficiently designed, developed, or tested. A stable design is particularly important for developing a strategy for real-time integrated system-level testing. SDIO originally intended to perform such tests before either a full-scale development or a presidential deployment decision. However, SDIO officials later said that such tests would not be run before the

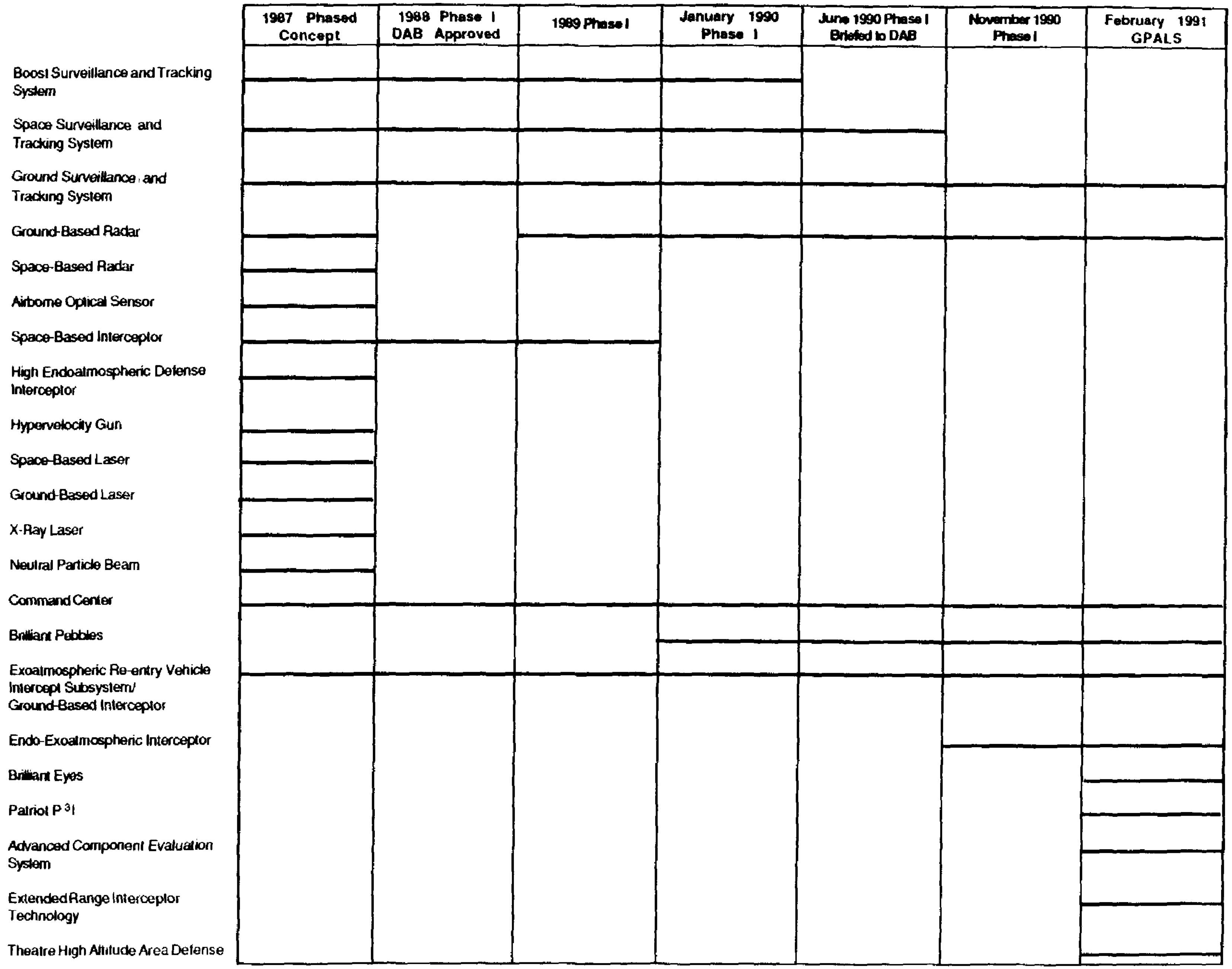
President's 1993 decision. These tests demonstrate technology feasibility as well as subsystem interoperability. Basically, such testing is essential for providing confidence that the Strategic Defense System will perform as intended.

Incorporating Brilliant Pebbles rendered many of the system test plans and results moot; now, with the new, refocused SDI program, many if not all system concepts, requirements, corresponding documentation, analyses, test strategies and plans have become obsolete. If the Defense Acquisition Board approves the GPALS approach late this year, SDIO will again have the opportunity to stabilize the architecture.

In conclusion, we believe it is impossible to make an informed development or deployment decision on any part of the Strategic Defense System until the design has been stabilized and sufficient system-level testing conducted. Otherwise, the risk of making costly, incorrect decisions will increase. This risk was exemplified when BSTS was nearly moved into full-scale development. Moreover, given GPALS' expanded mission, a stable architecture and sufficient system-level testing has become even more critical.

The 1993 presidential decision on deployment of the Strategic Defense System has been postponed. SDIO now has the opportunity to stabilize the new design and develop a comprehensive system-level test and evaluation program. SDIO officials are striving to have GPALS deployed by the end of the century. To do so would require making a GPALS system-level, full-scale development decision in the 1995 timeframe. Mr. Chairman, SDIO must not be allowed to once again subordinate an informed decision to a time-driven schedule. Instead, a sound, stable SDI architecture--supported by comprehensive system tests--must dictate the timing of decisions that have national and international implications and involve billions of taxpayer dollars.

SDIO's Candidate Architectures



ATTACHMENT