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UNITED STATES GENERAL ACCOUNTING OFFICE ~~19150~~ ~~19151~~
WASHINGTON, D.C. 20548

MISSION ANALYSIS AND
SYSTEMS ACQUISITION DIVISION

AUGUST 13, 1981

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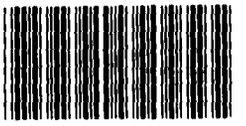
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The Honorable Caspar W. Weinberger
The Secretary of Defense

Attention: Assistant for Audit Reports

Dear Mr. Secretary:

Subject: [Adoption of Preplanned Product Improvement Techniques Can Reduce Cost of Improving Effectiveness of Systems During Their Lifetime] (MASAD-81-39)

We surveyed the Department of Defense (DOD) plans for modifying major weapon platforms, such as aircraft and ships, and subsystems, such as radars. Our objectives were to identify ways of reducing the time for fielding modified systems, reducing their costs, and increasing their level of operational readiness. The survey was terminated because of your recent actions to adopt preplanned product improvement techniques as part of the overall acquisition practices in DOD.

Modifications are an important part of DOD activity, both in dollar amount and in their contribution to the readiness and effectiveness of the Armed Forces. Major weapon platforms are likely to remain in DOD's inventory for at least 20 years. During the 1980s, we understand that fewer new starts on major platforms are expected. At the same time, innovations at the subsystem level will be occurring with greater frequency. Preplanned product improvement can help maximize long-term platform effectiveness and concurrently enable DOD to keep pace with advances in technology and changes in the threat.

The April 30, 1981, Office of the Secretary of Defense memorandum on improving the acquisition process recommended that the services implement preplanned product improvement techniques for most new and existing systems. On July 6, 1981, the Deputy Secretary of Defense directed DOD activities to appoint organizational focal points to evaluate all ongoing and recently fielded weapons for potential preplanned product improvement applications. We

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support this initiative and believe it promises to enhance the acquisition process. In future reviews of major acquisition programs, we intend to assess the extent and adequacy of preplanning initiatives to systematically plan for system upgrades and the implementation of the resulting plans.

We identified some current initiatives undertaken by each service which indicate recognition of the importance of planning for future modifications. To support your efforts, we are providing some thoughts on these initiatives and on preplanning which might be helpful to the other services and the Under Secretary of Defense for Research and Engineering in developing plans for implementing preplanned product improvement as directed by the April 30, 1981, memorandum.

WHAT IS PREPLANNED PRODUCT IMPROVEMENT?

Preplanned product improvement is a systematic acquisition strategy which begins during the conceptual design phase of platform or subsystem development. Evolutionary improvements of existing systems during their useful life are planned and facilitated through the use of designs to accommodate future changes and improvements. The technological risk during initial development is reduced by using proven technology to the maximum extent possible. Inclusion of advanced technology is limited to those subsystems offering the greatest operational or cost benefit commensurate with the risks involved. This is expected to allow earlier deployment of major weapon platforms. Preplanning requires

--a "stepped" requirements process,

--a system initially designed to accept future upgrades,

--improved communication with the defense industry encouraging them to present new ideas on concepts for upgrades leading to more competitive opportunities, and

--up-front funding of research and development.

Preplanning proposes a stepped requirements process in which a platform using current technology is fielded sooner to help counter the existing threat. This means that new technologies which might take years to develop, and therefore lengthen acquisition times, may not be included in the initial fielding of the platform. Instead, the platform will be built to accept the developing technology later through making provisions for such factors as extra space and wiring needs. Thus, initial requirements can be written for a shorter time frame, with planned additional requirements for the future.

The initial design of a platform should allow for future improvements. This requires estimating future needs for

engineering factors, such as weight, space, power, cooling, wiring, and automatic data processing capacity, as well as attempting to minimize the impact that a change in one subsystem has on other interacting subsystems. Such planning should reduce the cost of making the improvements in later years.

Anticipated improvements which have been provided for in the initial design of a platform or subsystem should be communicated to the entire defense industry. This communication can increase competition for future system improvements by fostering the submission of ideas from other companies as well as the existing prime/subcontractor team.

Preplanned product improvement may require additional funding in the early years to sufficiently develop planned improvements and to design the necessary growth capacity in the platform. However, this should lower costs in later years when improvements are actually made. Historically, pressures to reduce cost growth have influenced funding decisions which resulted in deferring desirable early research to a later time.

The defense acquisition community is continually faced with trade-offs between increasing performance through developing new technology versus using proven technology with lower performance expectations. Inherent in the use of a stepped requirements process is the management goal of minimizing the technical risk which results from simultaneously including many new technologies into a platform at the same time. Preplanned product improvement, by its emphasis on time-phased improvements, should lower the overall technical risk of a new platform since risk taking will be concentrated in areas with the greatest expected payoff both in the initial and in the subsequent upgrades.

IMPLEMENTING PREPLANNED PRODUCT IMPROVEMENT.

Developing procedures for implementing preplanned product improvement is an important key to its success. Some of the key procedures are:

--Requiring provisions for growth in the request for proposals for platform design.

--Developing standards for modular construction of subsystems.

--Developing master plans documenting long-term growth potential.

--Providing funds needed for the work of defining upgrade packages.

--Periodically assessing future technological advances for inclusion in future upgrades.

To ensure that planning for future improvements to a platform takes place in the early stages of development, the initial request for proposals should include a requirement that proposed designs have provisions for future improvements. The adequacy of these provisions should be addressed in the services' evaluations of proposals. For example, the request for proposals for the DD-963 specified that flexibility to permit adaptations to new tactics and equipment be reflected in the proposed design. It directed that attention be given to future modernization and furnished information on modularity as a means of reducing the life-cycle cost. This was the only case we found where the request for proposals had requirements to build flexibility into the platform.

A critical test of a successfully designed evolutionary approach to platform improvements is the ease with which new or upgraded subsystems can be integrated into an existing platform architecture. Platform improvements can be facilitated through modular design and construction. The Navy has been doing this for years in its ship construction programs. With proper planning, a ship's overall design should be minimally disrupted by adding a new subsystem. This concept of modularized platforms and subsystems might be applied to other platforms also.

A platform designed under a preplanned product improvement strategy can benefit from a formalized comprehensive long-term modifications plan originated during the conceptual stage of development. A consistent approach to documenting modifications plans can help ensure coordination of upgrades and facilitate top management oversight over the evolutionary improvement process. The Air Force recently developed a style guide which provides a good example of a format for preparing long-term modifications plans. The style guide directs the Air Force personnel to determine the amount of key engineering factors needed on a platform for future improvements. This involves evaluating the engineering factors required by each modification under consideration. Using a series of matrices, the Air Force projects the potential impact of selected future modifications on the platform, its existing subsystems, and various engineering factors.

The services can use master plans to inform the Congress of funding needed to develop and adapt the upgraded subsystems to the platform. The Army is doing this for the M1 tank. It has also submitted an M1 Tank Improvement Program to the Congress specifying the timing of the planned modifications. It has also requested research and development funds to develop the technology involved in each modification. Presenting plans such as these to the Congress emphasizes that if maximum platform flexibility is desired in later years, some investment is needed earlier in the research and development phase.

The ability to develop a sound long-term plan for upgrading a weapons platform depends on some knowledge of future technological advances. Such knowledge can be determined, in part, by

joint DOD/industry studies. For example, in the 1960s a Navy-sponsored study assessed desired antiair warfare technology which was likely to be developed for use in the 1980s. This study resulted in the Aegis air defense concept. We understand the Navy intends to perform a similar study to assess what technology lies beyond Aegis. Such studies can foster a more coordinated approach to technological developments throughout the defense community.

CONCLUSION

As an approach to acquisition, preplanned product improvement already has support within the acquisition community. However, top management surveillance is needed to ensure that program managers follow preplanning concepts when developing an acquisition strategy for individual weapon systems.

Implementing preplanning in DOD offers the potential to reduce acquisition costs over the life of a system and speed up its fielding. We believe it would be desirable for DOD to establish a consistent approach for program managers to follow for documenting their modification plans. This would help ensure coordination of the improvements and facilitate management oversight over the evolutionary improvement process.

We would appreciate you keeping us apprised of DOD's progress in implementing preplanned product improvement.

Copies of this letter are being sent to the Director, Office of Management and Budget. We are also sending copies to the chairmen of the Senate Committees on Appropriations, Armed Services, and Governmental Affairs and the House Committees on Appropriations, Armed Services, and Government Operations.

Sincerely yours,

W. H. Sheley, Jr.
Director