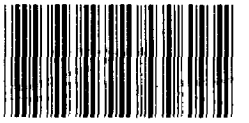
BY THE COMPTROLLER GENERAL

Report To The Congress

OF THE UNITED STATES

Improving The Effectiveness And Acquisition Management Of Selected Weapon Systems: A Summary Of Major Issues And Recommended Actions

As each Department of Defense weapon system evolves, it becomes susceptible to unique and unanticipated management, performance, technology, or funding problems. Major issues are highlighted on 24 selected weapon system programs, in various stages of the acquisition process, which could have a direct impact on the effectiveness and/or the programs' acquisition. A summary of GAO's recommendations and observations addressing these issues is also presented which, if acted upon, would either help to minimize risk and ensure effectiveness, improve disclosure to the Congress, affirm requirements, evaluate alternatives, reduce cost, or improve program management.



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COMPTROLLER GENERAL OF THE UNITED STATES
WASHINGTON D.C. 20548

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To the President of the Senate and the
Speaker of the House of Representatives

The planned growth in defense expenditures over the next few years makes it imperative that the Department of Defense exercise tight control over the development and acquisition of weapon systems. Each year we report on the significant issues affecting the development and acquisition of selected weapon systems, in various stages of the acquisition process, and make recommendations addressing these issues. This report contains summaries of each of the reports we issued on 24 major defense systems, highlights the principal issues that we found to be common among the weapon programs, and our recommendations on those programs.

Our review identified numerous issues which fall in two broad areas. About one-third of these issues would have a direct impact on the weapon systems' effectiveness in accomplishing its intended mission. The remaining two-thirds are program acquisition issues requiring management decisions or improvements. Since the systems are in various stages of the acquisition process, each issue may become more or less serious overtime depending on how the Department of Defense chooses to address it.

We made a number of recommendations and observations to the Congress, Secretary of Defense, and Secretaries of the Navy and the Air Force which addressed the program issues. The potential impact of these recommendations and observations include minimizing risk and ensuring effectiveness, improving disclosure to the Congress, affirming requirements, evaluating alternatives, reducing cost, and improving program management.

As of April 15, 1982, the Department of Defense officially responded to our recommendations and observations on 11 reports. Their comments along with our evaluation are presented in the applicable report summary.

Appendix I contains a listing of our other related reports issued during the 12 months ending March 26, 1982.

We are sending copies of this report to the Director, Office of Management and Budget, and to the Secretary of Defense.

Charles A. Bowsher

Comptroller General
of the United States

Contents

CHAPTER 1

INTRODUCTION

The expected rapid growth in defense expenditures during the next few years makes it imperative that the Department of Defense exercise tight control over the development and acquisition of weapon systems. Acquiring these systems is an expensive, time consuming, and complex process. As each weapon system evolves, it becomes susceptible to unique and unanticipated management, performance, technology, or funding problems. Our annual reviews of selected weapon systems provide the Congress and Defense officials, on a case-by-case basis, with information on major program issues as well as recommendations and observations that will aid them in carrying out their responsibilities.

From July 1981 to February 1982, we issued 25 reports on 24 selected systems to the Congress, committee chairmen, and the Secretaries of Defense, Navy, and Air Force. In chapter 2 of this report we highlight the major issues, common among the 24 programs, which could have a direct impact on the systems' effectiveness and/or on the programs' acquisition. Chapter 3 summarizes the potential impact we believe our recommendations and observations could have on the reviewed programs if acted upon. As of April 15, 1982, Defense had officially responded to our recommendations and observations on 11 reports. Their comments along with our evaluation are contained in the applicable report summaries which make up the remainder of this report.

Appendix I lists other relevant reports issued on military acquisitions and related work from April 1981 through March 1982. 1/

1/To obtain copies of reports which are classified (those report numbers beginning with a "C"), security clearance information must be provided along with a demonstrated need to know to the GAO's Director, Mission Analysis and Systems Acquisition Division.

CHAPTER 2

ISSUES AFFECTING THE ACQUISITION AND PROCUREMENT OF SELECTED WEAPON SYSTEMS

Our review of 24 selected systems identified 71 issues, falling into two broad areas and 15 rather specific categories, which either have a direct bearing on the weapon systems' effectiveness or management of the acquisition program. These issues, summarized in this chapter and displayed in a chart on page 3, are not intended to represent all of the problems or questions associated with the weapon programs reviewed. The issue categories should also not be considered independently because some of the categories are very closely related. Our work on individual weapon system programs is designed to highlight the key issues as the program matures. Since these systems are in various stages of the acquisition process, each issue may become more or less serious overtime depending on how and when Defense chooses to address it. Details on these issues can be found in the summaries or in the full reports.

SYSTEM EFFECTIVENESS ISSUES

Weapon system effectiveness issues fall into six categories: operational or performance limitations; logistics support; operational requirements; survivability or vulnerability; reliability, maintainability, and availability; and force level requirements.

Operational or performance limitations

Operational or performance limitations refer to those factors which restrict a weapon system from functioning as designed or expected within its threat environment. Our reviews found that some weapon systems or subsystems may not be meeting their originally established performance goals or fulfilling user needs. In other systems, the threat data indicates that enemy capabilities have been or will be enhanced to a point that questions the ability of some U.S. weapons to conduct successful operations. Specifically:

--The AH-64 helicopter's effectiveness could be limited by some shortcomings of its laser Hellfire missile.

--A critical system for improving the effectiveness of the Multiple Launch Rocket System may not be available until sometime after the rocket system is scheduled to begin deployment.

--The Viper light antitank weapon's demonstrated effectiveness barely meets the low end of the Army's requirements and, at that, only against the older Soviet tanks.

ISSUES ASSOCIATED WITH SELECTED MAJOR WEAPON SYSTEM PROGRAMS

	SYSTEM EFFECTIVENESS						PROGRAM ACQUISITION								
	OPERATIONAL PERFORMANCE LIMITATIONS	LOGISTICS SUPPORT	OPERATIONAL REQUIREMENTS	SURVIVABILITY VULNERABILITY	RELIABILITY MAINTAINABILITY AVAILABILITY	FORCE LEVEL REQUIREMENTS	AFFORDABILITY	TECHNICAL RISK	COST EFFECTIVENESS	INCOMPLETE DATA REPORTING	ADEQUACY OF TESTING	PROGRAM MANAGEMENT	PROGRAM CONCURRENCY	TIMELINESS	PRODUCTION READINESS
ARMY PROGRAMS															
AH-64 HELICOPTER/HELLFIRE MISSILE	●	●			●		●	●			●				●
DIVISION AIR DEFENSE GUN											●				
M1 TANK					●										
MULTIPLE LAUNCH ROCKET SYSTEM	●			●				●							
REMOTELY PILOTED VEHICLE							●	●							
VIPER LIGHT ANTITANK WEAPON	●							●	●						
NAVY PROGRAMS															
ADVANCED SIGNAL PROCESSOR	●						●		●						
ANTISUBMARINE STANDOFF WEAPON	●							●		●				●	
AV-8B AIRCRAFT		●					●		●						
DDGX DESTROYER			●												
EXPENDABLE RELIABLE ACOUSTIC PATH SONOBUOY		●					●	●	●						
F/A-18 AIRCRAFT		●					●								
LANDING CRAFT AIR CUSHION			●	●	●			●		●					
LIGHT AIRBORNE MULTI-PURPOSE SYSTEM	●						●								
TOMAHAWK CRUISE MISSILES	●		●	●		●				●					
AIR FORCE PROGRAMS															
AIR LAUNCHED CRUISE MISSILE	●			●							●		●		
C-X AIRCRAFT												●			
LOW ALTITUDE NAVIGATION AND TARGETING INFRARED SYSTEM FOR NIGHT								●	●	●					
MX WEAPON SYSTEM		●											●	●	●
30 MM GUN POD													●		
JOINT PROGRAMS															
ADVANCED MEDIUM RANGE AIR TO AIR MISSILE	●						●		●		●				
AIRCRAFT IDENTIFICATION FRIEND OR FOE SYSTEMS			●				●	●	●						
FLIGHT LIFE SUPPORT EQUIPMENT												●			
SPACE BASED LASER							●	●				●			
NUMBER OF ISSUES (71)	9	5	4	4	3	1	10	10	7	4	4	3	3	2	2
PERCENT OF TOTAL ISSUES	26/71 = 37%						45/71=63%								

--The Advanced Signal Processor may not meet the timely needs for some users because necessary computer programs will not be available. Also, the processor could become technologically obsolete in a relatively short time due to recent rapid advances in computer processing.

--Future improvements to the Antisubmarine Warfare Standoff Weapon which are necessary to support its proposed range may not be achieved.

--A significantly greater threat than was originally envisioned could seriously alter the antisubmarine warfare effectiveness of the Light Airborne Multi-Purpose System.

--The Tomahawk conventional land attack and antiship cruise missiles may be deployed with limited capabilities.

--Testing completed before the Air Launched Cruise Missile's first alert capability showed its operational effectiveness and suitability to be deficient. Also, the excessive time required for loading missile pylons on to B-52 aircraft could reduce the number of aircraft available in an emergency situation.

--Possible reductions in the Advanced Medium Range Air-to-Air Missile's projected effectiveness due to electronic countermeasures raises questions that need to be resolved.

Logistic support

Weapon systems depend on logistics support, an integral part of a system's acquisition and operation, to create and sustain their effectiveness. We identified instances where the planned logistics (that is, parts, test equipment, personnel, training, facilities, tools, technical data, and so forth) did not meet system availability and wartime usage requirements. Specifically:

--The Army's ability to adequately support the AH-64 helicopter will depend on overcoming serious problems with the automatic test equipment.

--The AV-8B aircraft's ability to perform its mission could be adversely affected by potential maintenance personnel shortages, shipboard space constraints, limited repair capability, and inadequate ground-support equipment.

--The Expendable Reliable Acoustic Path Sonobuoy requires development of special handling, storage, safety, training, and maintenance procedures to be compatible with antisubmarine warfare aircraft.

--Logistics problems with the F/A-18 aircraft, including delays in delivery of test equipment and pilot training

devices, could adversely impact effective maintenance support and operational use of the aircraft.

--On the MX missile program, there is a shortage of affordable housing for missile technicians who are necessary to support currently scheduled launches.

Operational requirements

Operational requirements designated for a weapon system are those approved characteristics considered necessary for that system to meet a needed defense capability. These requirements are often defined before beginning development work but may be frequently modified as directed from development results. Issues arose where the precise role of the system or proposed requirements were questioned or not firmly established, in most instances casting doubt on the weapon's performance capabilities. Specifically:

--In view of the future environment in which the DDGX destroyer is planned to operate, the additional capability to be obtained by installing the tactical towed array sonar is questionable.

--Uncertainty exists as to how ongoing efforts to revise the Landing Craft Air Cushion's operational concept will affect the overall program and planned acquisition of a future Marine Corps assault system.

--Repeated attempts by the Navy to avoid funding its portion of the Tomahawk medium range air-to-surface missile raises possible questions about its need and commitment to the program.

--The effective military operation of a next generation aircraft identification friend or foe system, the MK XV, may be limited by the lack of agreement among North Atlantic Treaty Organization member governments on a common frequency band allocation.

Survivability or vulnerability

In a hostile environment, survivability is the extent that a system is able to avoid or withstand an abortive impairment or degradation in accomplishing its mission objectives; whereas, vulnerability refers to the characteristics of a system which render it unable to perform its designated mission. It presumes an enemy could inflict damage or reduce system effectiveness and therefore diminish the system's fighting capability. We found:

--Changes in the Multiple Launch Rocket System design may be necessary to ensure adequate survivability.

--The need to decrease the Landing Craft Air Cushion's vulnerability was identified during testing of advance development air cushion vehicles.

--Questions on Tomahawk conventional land attack and antiship cruise missiles' survivability raises concern.

--The Air Launched Cruise Missile's survivability against enemy defenses is a concern when calculating the longevity of the weapon as a credible deterrent.

Reliability, maintainability, and availability

Reliability, maintainability, and availability levels affect the readiness, mission capability, and sustainability of a weapon system. Reliability is commonly expressed as the probability that a system will execute its intended function for a period of time under stated conditions. Maintainability is the quality of the system to be retained or restored to a specified level of performance within a given time. A weapon system's availability is the degree in which it is in an operational state of readiness to perform its mission and, therefore, capable of being committed to battle at any time. Three systems have experienced problems or uncertainty in this category. Specifically:

--The AH-64 helicopter's reliability, maintainability, and availability calculations may be overstating its capability in these areas.

--The M1 tank's power train, including its turbine engine, has not met the Army's durability requirements. Also, test results have indicated frequent maintenance is still required.

--The Landing Craft Air Cushion's reliability, maintainability, and availability will not be known until a representative craft is available for testing.

Force level requirements

Force level requirements refer to those quantities of a weapon system necessary for carrying out the objectives of a mission need, as determined by specific military and/or political requirements. Our review of the Tomahawk program found that the currently planned number of antiship cruise missiles may not satisfy mission needs. Also, the total number of ground launched cruise missiles required could be affected by such matters as the resumption of strategic arms talks.

PROGRAM ACQUISITION ISSUES

Categories we identified as affecting program acquisition are affordability, technical risk, cost effectiveness, incomplete

data reporting, adequacy of testing, program management, program concurrency, timeliness, and production readiness.

Affordability

Affordability encompasses the availability of sufficient fiscal resources to effectively and efficiently support weapon system acquisitions. On 10 systems we identified increasing, uncertain, or incomplete program costs that raise questions concerning the continued availability of program funds and could, in some instances, also disrupt the procurement expectations for other programs. Such strains on the defense budget often result in compromises in the military requirements of the system, delays in fielding other new equipment, longer acquisition cycles, equipment inventory shortages, and inefficient rates of production. Specifically:

--Introducing several new expensive Army systems simultaneously may cause budgetary pressures for the AH-64 helicopter/Hellfire missile.

--Developing the Remotely Piloted Vehicle System has been slowed by funding uncertainties created by competing demands of higher priority programs on the Army's budget.

--The Advanced Signal Processor's total program costs are unknown.

--Present AV-8B program cost estimates do not provide for procurement of trainer aircraft, a 25-mm. gun system, and a stretched out production schedule.

--The expense associated with acquiring the Expendable Reliable Acoustic Path Sonobuoy could significantly affect the procurement of other needed sonobuoys.

--The F/A-18's program cost could increase due to continued use of lower than projected inflation rates and higher than expected contractors' manufacturing hours. Cost saving measures are available.

--The Light Airborne Multi-Purpose System MK III program uncertainties could result in further cost increases. Management actions and program alternatives are available which can reduce costs.

--The substantial increase in Advanced Medium Range Air-to-Air Missile's unit cost estimate is a concern.

--The future investment in aircraft identification friend or foe systems is expected to be substantial and raises questions concerning their overall affordability.

--The affordability of an effective constellation of Space-Based Lasers is uncertain. Technical uncertainties need to be favorably resolved before determining affordability issues.

Technical risks

With the highly sophisticated/complex weapon systems being fielded today, it is not unusual to encounter technical risks during the acquisition cycle. Technical risk refers to those problems or uncertainties that may hinder the achievement of design and development goals for a weapon system. Failure to resolve these matters could have major impacts on program cost, schedule, and ultimate performance. Specifically:

--Integrating a new more powerful engine into the AH-64 helicopter involves considerable risk.

--Technical problems with the Multiple Launch Rocket System warhead submunition, vehicle transmission, fire control system, and the launcher's directional reference system require resolution.

--The Remotely Piloted Vehicle's development has been slowed by technical problems with two key subsystems.

--Solutions to the Viper light antitank weapon technical problems, such as accidental firings, firing mechanism failures, and water immersion, have not been fully demonstrated.

--The Antisubmarine Warfare Standoff Weapon is subject to increased risk due to problems in a related program.

--The Expendable Reliable Acoustic Path Sonobuoy is hampered by many technical problems which are costly and complex.

--Problems identified during testing of advance development air cushion vehicles need to be resolved and modifications incorporated into the Landing Craft Air Cushion design. Also, the current engine under consideration for craft use has experienced problems.

--Development of the Low Altitude Navigation and Targeting Infrared System for Night has been slowed by concerns over program risks.

--In developing the next generation aircraft identification friend or foe system, problems of interference with existing telecommunications and traffic control systems need to be considered.

--Many technical uncertainties need to be resolved before an effective Space-Based Laser defense system can be developed and deployed.

Cost effectiveness

From an evaluation of alternatives (such as management actions, equipment, weapon systems, and support systems) a cost-effective balance must be achieved among acquisition costs, ownership cost, and system effectiveness relative to the mission to be performed. Questions arise when the options being pursued do not appear to be the most effective at the least cost. For example:

--The Viper light antitank weapon's increased cost and reduced operational value warrants consideration of potential foreign alternatives which may offer better performance.

--The Advanced Signal Processor's cost effectiveness in comparison to alternatives has not been demonstrated.

--Developing a new trainer aircraft for AV-8B pilots may be more cost effective than purchasing an existing trainer aircraft. Also, improvements to the AV-8B's survivability are possible but at the expense of increased program cost and reduced aircraft performance.

--A cost-effective mission for the Expendable Reliable Acoustic Path Sonobuoy relative to other available sensors or tactics has not been demonstrated.

--Two major assumptions used to support the cost effectiveness of the Low Altitude Navigation and Targeting Infrared System for Night may no longer be valid.

--The Advanced Medium Range Air-to-Air Missile's electronic countermeasures capability must be successfully developed and validated if it is to be more cost effective than the currently used AIM-7M missile.

--The investment in improvements, which are to be made to the current MK XII aircraft identification friend or foe system, for air targets should depend on how soon the improved next generation MK XV system can be deployed.

Incomplete data reporting

It is essential that accurate and informative data on the status and progress of selected major weapon programs be made available to the Congress and Defense's top-level management. Incomplete, misleading, or inaccurate status reporting could result in congressional and Defense decisions that would not otherwise be made. The Selected Acquisition Report has become the key recurring report for providing a standard, comprehensive

summary of a program's planned cost, schedule, and performance. We found that programs of such magnitude as the Antisubmarine Standoff Weapon, Landing Craft Air Cushion, Tomahawk medium range air-to-surface missile, and Low Altitude Navigation and Targeting Infrared System for Night are not being included in the selected acquisition reporting system, thereby limiting the information available to key decisionmakers.

Adequacy of testing

The adequacy of testing during weapon system development is a matter of serious concern. Tests are conducted to minimize uncertainties that could adversely affect the systems' effectiveness, cost, or availability for deployment. We found the following examples of inadequate testing.

--The AH-64 helicopter production decision included data derived from the test of two major subsystems--the target acquisition designation sight and helicopter engine--whose configurations have not been fully tested and differ from those of the final production design.

--The production decision for the new Division Air Defense gun will be made before substantial testing and evaluation for assessing its performance and logistics supportability has been completed.

--Air Launched Cruise Missile testing has not been operationally realistic. Also, testing of the engine storage reliability and the mission planning system is not scheduled until after the missile's initial operational capability.

--The adequacy of Advanced Medium Range Air-to-Air Missile test data for decisionmaking is a concern in view of the reduced validation phase flight test program.

Program management

Program management involves the continuing actions of planning, organizing, directing, coordinating, controlling, and evaluating the use of money, materials, staff, and facilities to field an effective and supportable system. On three of the programs reviewed, we found a need for better program management. Specifically:

--C-X aircraft program funds may have been used in a manner contrary to the intent of the congressional approval of the program. Also, the maximum practical competition may not be solicited if an airlifter other than the C-X is to be selected to meet U.S. airlift requirements.

--Standardizing efforts for acquiring flight life-support seating systems have not been, for the most part, adequately organized, planned, and supported.

--It is questionable whether the existing Space-Based Laser program is a well structured, funded, and managed effort needed for developing a technology with such long-range military potential.

Program concurrency

Program concurrency occurs when production begins before development is complete and the system is approved for service use. In the absence of an overriding immediate military need, concurrency is generally undesirable because it could increase the degree of program risk and result in higher costs and lower performance. Our reviews found:

--Development concurrency in the Air Launched Cruise Missile program increases the risk that the initial operational capability milestone may not be met with a fully operational missile.

--The present commitment to the MX missile's initial operational capability date cannot be met with the preferred warhead system. A decision to field MX missiles with a substitute warhead to meet the date requires a subsequent retrofit, increasing program costs.

--The 30mm gun pod program has entered into highly concurrent development and production when the urgency for it appears to be questionable.

Timeliness

An objective of any system's acquisition is to achieve its initial operating capability within the time dictated by the need or threat. We found that delays on two programs could affect the fielding of the systems in a timely manner. Specifically:

--The remaining phases of the Antisubmarine Warfare Standoff Weapon's acquisition cycle may be affected because of its delay in entering the demonstration and validation phase.

--Certain delays within the MX missile program could have an adverse effect on achieving future milestones.

Production readiness

The production readiness of a system rests on the assurance that the final design and the necessary managerial and physical preparation for initiating and sustaining a viable production effort will support a production commitment. An inappropriate production readiness decision could incur unacceptable risks to a program's schedule, performance, or cost and seriously affect the quality and adequacy of the production unit. On two programs, we questioned the production readiness of the systems. Specifically:

--Contractor readiness to begin AH-64 helicopter production is still at a point where it is not without some potential program inhibiting risks.

--MX missile construction may be affected by a limited production capacity for producing certain critical materials.

CHAPTER 3

POTENTIAL IMPACT OF OUR RECOMMENDATIONS AND OBSERVATIONS

Objectives of our reviews are to recommend ways of promoting the efficiency of proposed or ongoing programs, to assist in the process of program choices, and to make the results of our work known before decisions are irreversible. In our reports, we have made a number of recommendations to the Congress and to the Secretaries of Defense, Navy, and Air Force addressing the issues in chapter 2 and, if implemented, contributing to overall improvement in the management of the programs and development of the weapon systems. In some cases, our reports contain observations rather than recommendations. These observations are intended to stress matters which we believe could have possible consequences for the program if left unresolved and continue to deserve management attention.

We believe all our recommendations and observations will have a potential impact on the reviewed weapon programs if acted on. This chapter summarizes them. Complete recommendations and observations can be found in the report summaries.

As of April 15, 1982, we received official Defense comments on 11 of these reports. Defense disagreed with some of our recommendations or observations on the AH-64 helicopter, M1 tank, Viper light antitank weapon, DDGX destroyer, Light Airborne Multi-Purpose System, C-X aircraft, and the 30mm gun pod programs. Other Defense comments were received on the C-X aircraft, MX weapon system, and Advanced Medium Range Air-to-Air Missile programs. Defense's views and our evaluations are addressed in each summary. (See pp. 27, 38, 50, 60, 76, 92, 98, 104, 106, 108, and 112.)

IMPACT AREAS

The potential impacts of our recommendations and observations fall into six broad areas: (1) minimize risk and ensure effectiveness, (2) improve disclosure to the Congress, (3) affirm requirements, (4) evaluate alternatives, (5) reduce cost, and (6) improve program management.

Minimize risk and ensure effectiveness

Many of our recommendations and observations are intended to minimize risks and ensure the effectiveness of the systems. Recommended actions include improved testing and restrictions on the appropriation and obligation of procurement funds until most risks and uncertainties are resolved. While we recognize that it is unrealistic to resolve all problems and uncertainties during development, experience has shown that problems identified during

POTENTIAL IMPACT OF GAO RECOMMENDATIONS AND OBSERVATIONS ON SELECTED MAJOR WEAPON SYSTEM PROGRAMS

AIM OF OLR RECOMMENDATION/ OBSERVATION IS TO: / REPORTS ISSUED ON:	MINIMIZE RISK/ ENSURE EFFECTIVENESS	IMPROVE DISCLOSURE TO THE CONGRESS	AFFIRM REQUIREMENTS	EVALUATE ALTERNATIVES	REDUCE COST	IMPROVE PROGRAM MANAGEMENT
ARMY PROGRAMS						
AH-64 Helicopter/Hellfire Missile	●			●		
Division Air Defense Gun	●					
M1 Tank	●	●		●		
Multiple Launch Rocket System	●					
Remotely Piloted Vehicle	●		●			
Viper Light Antitank Weapon				●		
NAVY PROGRAMS						
Advanced Signal Processor		●	●	●		
Antisubmarine Standoff Weapon		●				
AV-8B Aircraft	●	●	●	●		
DDGX Destroyer					●	
Expendable Reliable Acoustic Path Sonobuoy	●		●			
F/A -18 Aircraft	●				●	
Landing Craft Air Cushion	●	●				
Light Airborne Multi Purpose System					●	
Tomahawk Cruise Missiles	●	●	●			
AIR FORCE PROGRAMS						
Air Launched Cruise Missile	●					
C-X Aircraft						●
Low Altitude Navigation and Targeting Infrared System For Night	●	●				
MX Weapon System					●	
30 MM Gun Pod	●		●			
JOINT PROGRAMS						
Advanced Medium Range Air-to-Air Missile	●			●	●	
Aircraft Identification Friend or Foe Systems	●				●	
Flight Life-Support Equipment				●	●	●
Space Based Laser			●			●

development which go unresolved often lead to serious problems once the systems are deployed. By resolving most of these problems now, we believe that many future operational and support problems can be avoided, leading to improved weapon system capability and readiness. Specifically:

--Delay production approval of the AH-64/Hellfire system until satisfactory completion of Government tests and evaluations showing favorable results.

--Defer the Division Air Defense gun's production decision to allow completion and assessment of critical testing and make the production approval contingent on a number of other factors. Also, the system's fiscal year 1983 procurement funds should be conditioned on assurance that the system has adequately demonstrated its performance requirements.

--If the M1 tank's durability requirement has not been met after the 1982 production testing, compare the performance and durability of the turbine and diesel engines and select one of the two for the remaining production based on an analysis that addresses their cost and performance.

--Investigate accelerating acquisition of a critical associated system that is to be used in conjunction with the Multiple Launch Rocket System which would enhance its effectiveness. Also, determine whether the Multiple Launch Rocket System's survivability needs improvement.

--If progress on the Remotely Piloted Vehicle is adequate, budget for and pursue development of system enhancements. Furthermore, ensure the testing program is structured to demonstrate both individual subsystem and total integrated system performance.

--Develop adequate logistics support and support equipment to achieve the AV-8B's operational mission and evaluate the cost effectiveness of increasing the aircraft's combat survivability.

--Provide convincing evidence and a sound justification that technology is at hand and the Expendable Reliable Acoustic Path Sonobuoy is needed. Otherwise, the program, as presently structured, should be terminated.

--Actions should be taken to facilitate development of the F/A-18's trainer aircraft. Also, future reductions in the aircraft's operational readiness due to delayed test equipment should be precluded.

--Closely scrutinize the acquisition plans for the Landing Craft Air Cushion and make sure the lead production effort

provides adequate milestones for monitoring cost, schedule, and performance progress.

--Limit fiscal year 1983 and later year production rates of the Tomahawk conventional land attack missile to those which can be effectively used against a wide spectrum of high-value targets.

--Consider funding fewer Air Launched Cruise Missiles unless the problems have been resolved or at least minimized to the point where there is little risk that missiles with limited capabilities will be deployed in significant numbers.

--Take the results of the most recent Low Altitide Navigation and Targeting Infrared System for Night cost effectiveness studies into account before providing further funds for the program.

--With the 30mm gun pod's environmental, developmental, and operational testing scheduled to begin early in 1982, it would appear that the action to enter into a production contract may have been premature.

--In the Advanced Medium Range Air-to-Air Missile's full-scale development decision, determine and consider the degree to which electronic counter-countermeasure concepts need to be and will have been validated, the adequacy of available test data, and the usefulness of the missile's multiple target attack capability and increased range.

--Determine the priority that the MK XV aircraft identification friend or foe system should have for interoperability with other identification systems in the North Atlantic Treaty Organization, relative to the other factors to be considered in selecting the frequency allocation band for the MK XV.

Improve disclosure to the Congress

For the Congress to better make decisions and to allocate national resources among Government programs, it is essential that more accurate and complete information be provided by Defense on the cost, schedule, and performance of weapon systems. On seven systems, we see a real need for Defense to either improve or provide more thorough disclosure to the Congress on program status and issues. Specifically:

--Provide an assessment of the M1 tank power train's capability and an estimate of funds that may still be needed for improvements that would enable the power train to meet the durability requirement.

--Fully define the total cost to produce, operate, and support the Advanced Signal Processor.

--Begin preparing Selected Acquisition Reports on the Antisubmarine Warfare Standoff Weapon, Landing Craft Air Cushion, Tomahawk medium range air-to-surface missile, and Low Altitude Navigation and Targeting Infrared System for Night.

--Include in the AV-8B program cost estimates the cost of developing and procuring a trainer aircraft, the 25-mm. gun system, and other aircraft changes.

--Include in the selected acquisition reporting system any changes in the Tomahawk antiship missile total inventory objective in terms of numbers needed and the effect on program cost.

Affirm requirements

Establishing clear, specific goals, and objectives is essential for successfully initiating and maintaining any acquisition program through to its final completion. However, as programs evolve, some requirements may be affected by changing circumstances, such as the severity of the threat, technological advances, demands of other programs, and so forth. It may be necessary to reassess the program and either adjust its structure, schedule, and funding to more fully maximize its intended benefits or channel its resources into other programs. Our recommendations and observations are directed at providing better assurances that the systems and subsystems being acquired and the quantities programed for purchase are commensurate with the mission needs being addressed. Specifically:

--Reevaluate the Remotely Piloted Vehicle, Advance Signal Processor, AV-8B aircraft, Expendable Reliable Acoustic Sonobuoy, Tomahawk medium range air-to-surface missile, and the 30mm gun pod programs to determine that either the current progress, planned inventory levels, or need is justified to continue each program in its present status.

--Establish a total inventory objective for the Tomahawk antiship missile based on its limitations and potential additions to its target base to determine the eventual cost of the program.

--Devise a Defense Space-Based Laser program plan that recognizes its relative priority within Defense and commit the necessary funds required.

Evaluate alternatives

Weapon systems are not developed in a vacuum. To ensure that the system acquired is the best and most cost-effective solution, there is a need throughout the acquisition process to explore and evaluate attractive alternatives to systems or actions currently planned. On seven programs, we believe there are possible

opportunities to identify less costly and/or more effective alternatives to existing plans. Specifically:

--In view of the high cost of adding the AH-64/Hellfire system to the Army's weapon inventory and its effect on an already strained budget, explore other more cost-effective alternatives.

--Evaluate the analysis of the two engines considered for the M1 tank and select one for incorporation into the balance of the production run.

--Explore the possibility of developing an improved version of Viper and/or the availability of European systems with potential for meeting the Army's requirements.

--Provide conclusive evidence to demonstrate that the Advanced Signal Processor is cost effective in comparison to other alternatives.

--In considering trainer aircraft for the AV-8B, reevaluate the planned purchase of TAV-8A and consider developing a TAV-8B after examining their relative costs and benefits.

--Determine and consider the projected cost effectiveness of the Advanced Medium Range Air-to-Air Missile compared to the currently used AIM-7M.

--Concerning flight life-support equipment, review aircraft programs near the completion of development, or in early production, to determine if existing or standard seats have been or could be incorporated.

Reduce cost

The rising cost of acquiring weapon systems requires that increased attention be directed at identifying opportunities for reducing development and acquisition costs. On seven programs, we made specific recommendations or gave observations concerning management actions that could reduce, minimize, or avoid increases to program cost. We found:

--A decision not to equip the entire projected buy of new design DDGX destroyers with the Tactical Towed Array Sonar could reduce program costs by approximately $589 million.

--Accelerate implementation of the Navy's proposed F/A-18 aircraft cost reduction initiatives, estimated to save $1.2 to $4.6 billion. Other management actions are also available which could result in estimated identifiable savings of $120 million.

--Several management actions concerning the Light Airborne Multi-Purpose System MK III program have been identified

which Defense could take, at some sacrifice in total mission capability, to reduce total program costs by $970 million to $1.85 billion. One additional action, requiring a legislative change, could reduce program costs by $388 million.

--Further consider whether the benefits associated with meeting the MX initial operational capability offset additional costs of $400 million to $1 billion required to initially field missiles with a substitute warhead/reentry vehicle and subsequently retrofit them with the preferred warhead/reentry vehicle.

--Determine and consider the validity of current Advanced Medium Range Air-to-Air Missile cost estimates and the potential for continued increases.

--Make the amount to be invested in the MK XII aircraft identification friend or foe system contingent on how soon the MK XV identification system can reasonably be expected to become available.

--For flight life-support equipment, determine if use of an existing or standard aircraft seat design would be cost effective on a life-cycle basis for those aircraft in which the service is planning to develop or procure a peculiar seat.

Improve program management

Because of large resource requirements, high technological content, and importance to an agency mission, system acquisition programs require establishing an effective management structure that will enable program objectives to be accomplished efficiently. We have recommendations or observations on three systems which are directed at improving the overall management of the program. Specifically:

--Ensure that the maximum competition practicable is solicited if an airlifter other than the C-X is considered for development or procurement. We expressed concern in a later report that certain allocations of fiscal year 1981 C-X program funds may have been used contrary to the intent of the limited congressional approval.

--To effectively achieve standardized flight life-support equipment (1) identify opportunities for standardized tactical aircraft seats, (2) promote service support for standardized development programs, and (3) require Navy and Army coordination of life-support equipment plans.

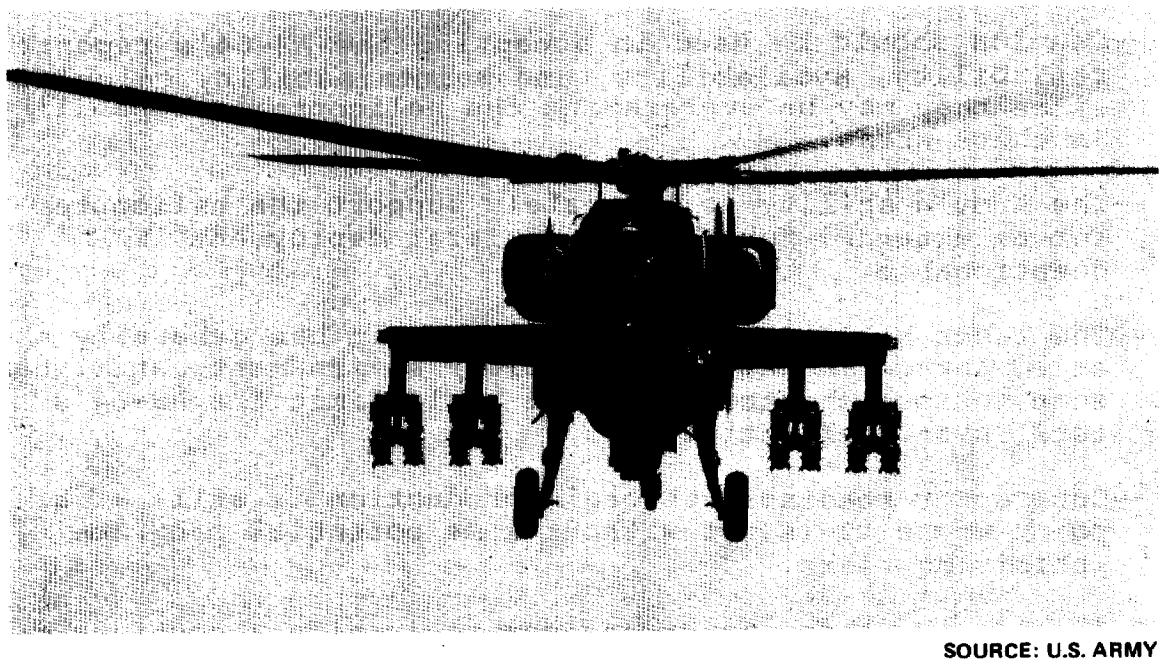
--Establish a management structure for the Space-Based Laser program to accomplish the program objective efficiently.

CHAPTER 4

ARMY PROGRAMS

THE ARMY'S ADVANCED ATTACK HELICOPTER

IS NOT READY FOR PRODUCTION



SOURCE: U.S. ARMY

We have been reviewing the status of the Army's Advanced Attack Helicopter (AH-64) and laser Hellfire missile programs. Although our review is not yet complete, we have several concerns in view of the imminent decision on the merits of starting production of these two weapon systems.

New program cost estimates prepared by the Army indicate that AH-64 procurement costs would increase by 40 to 50 percent from the $4.8 billion reported in the September 1981 Selected Acquisition Report. This major increase created an affordability problem and the Army now intends to reduce the total program quantities from 536 to 446 aircraft. With this change, the projected AH-64 unit production cost now exceeds $13 million. The merits of producing the AH-64 and Hellfire must be weighed against resulting reductions in funds available for other programs.

Should the Secretary of Defense decide to continue with plans to produce AH-64/Hellfire, a number of risks and uncertainties still exist about the new systems that warrant delaying the start of their production until better information and more thorough analyses are provided.

We have five basic concerns:

--The data currently available for decision purposes includes data derived from tests of two key subsystems--the target

acquisition designation sight (TADS) and the helicopter engine--whose configurations will differ from the subsystems to be made a part of the production aircraft.

--Caution should be used in accepting the AH-64's reported reliability, availability, and maintainability calculations since they may be overstating the helicopter's capability in these areas.

--The Army's ability to adequately support the helicopter for an extended period after initial deployment is questionable.

--The laser Hellfire missile, although it has generally shown an advantage in testing in a clear environment, still has some serious shortcomings that could limit the AH-64's total system effectiveness.

--Contractor readiness to begin production is still at a point where it is not without some potential program-inhibiting risks.

Collectively, these concerns seem to justify a cautious approach in arriving at a production decision. We believe a decision at this time would necessarily be relying on incomplete information, questionable evaluations, and optimistic projections, and would result in considerable risk regarding system cost, performance, reliability, and supportability.

TWO MAJOR SUBSYSTEMS WILL BE CHANGED FOR PRODUCTION AIRCRAFT

The configurations of two major subsystems presently on the AH-64 do not represent the final production design. TADS, which has not been very reliable, is undergoing major changes. In addition, the existing engines will be replaced by newly designed engines that have yet to be flight tested on the AH-64. Therefore, the true performance and reliability characteristics of the AH-64 will not be known until the latest subsystem configurations are adequately tested and evaluated.

TADS' development schedule has experienced several delays. Because the contractor was late in delivering upgraded preproduction units to the Army, the first of two scheduled 500-hour endurance tests was canceled and the second deferred. The AH-64's operational test was substituted for the first endurance test and demonstrated the need for further development of TADS. Army test officials reported that on the average TADS demonstrated about 20 hours between each failure against a criterion of 100 hours, judging it to be marginally acceptable.

The schedule for microminiaturizing TADS electronic components has also been delayed. Although component qualification of this

effort was supposed to be completed before the AH-64's operational test, it will not be completed until April 1982.. In addition, the components will not complete flight testing at the system level until March 1983--15 months after the scheduled AH-64 production decision.

TADS' laser rangefinder/designator to be incorporated in production models has been extensively redesigned and is undergoing qualification testing. Due to a schedule delay, it is unlikely that the testing will be completed before the scheduled production decision. Because the AH-64 needs the laser system to engage targets with the Hellfire missile, considerable risk is involved in not qualifying it before the production decision.

The Army's decision to replace the existing T-700 engine with the more powerful T-701 engine was made to offset excessive aircraft weight to meet certain performance requirements. Although the T-701 is derived from the T-700 and is similar to the 401 engine to be used in the Navy's LAMPS helicopter, we believe that integrating the new engine into the AH-64 involves considerable risk.

Initial flight testing of the T-701 in the AH-64 is planned for March through June 1982. Our main question is whether the more powerful engines will place added stress on aircraft components, reducing their reliability and/or durability. The flight test should address aircraft performance, vibration, and torsional stability; engine reliability; cooling provisions; and effects on the infrared suppressor.

RELIABILITY, AVAILABILITY, AND MAINTAINABILITY DATA SHOULD BE USED WITH CAUTION

Our primary concerns with reliability, availability, and maintainability data collected during operational tests is that conditions existed which may detract from the reliance that can be placed on the reported results. During the test, 49 percent of the maintenance actions were performed with contractors' assistance or solely by the contractors. Some of the automatic test equipment was not available because it was not completely developed, nor was the test equipment used in a representative operational mode. Test maintenance activities were also supported by a logistics system dedicated solely to the tests with direct access back to component manufacturers for parts support and expedited shipment.

Army test officials concluded that the AH-64, as a total system, met all intended reliability, availability, and maintainability objectives except for repair time. They calculated that the mean time to repair the AH-64 was 1.69 hours compared to the objective of not more than .9 hours. Overall, test officials judged AH-64 maintainability as marginal. Without

extensive contractor assistance, maintainability would probably have been worse.

The Army evaluation of mission reliability shows 17.9 mean hours between mission failures, close to the objective of 17 hours. This calculation represents failures that caused actual aborts and that were charged only to the hardware. By including other failures that represented potential aborts caused by the hardware, as well as those charged to crew and maintenance errors or to unknown causes, operational mission reliability dropped to 3.5 mean hours between failures. Although no goals were established for operational mission reliability, we believe this value reflects the effect of hardware complexity, the immaturity of the system, and what could be expected in an operational environment unless planned improvements are realized.

Test officials concluded that the operational test showed the AH-64 meets the requirement for achieved availability. Achieved availability does not consider the unavailability of the aircraft due to logistics delays. The material need document indicates a desired combat operational readiness rate of 80 percent which includes considering logistics time to provide repair parts. Using the Army's standard for calculating logistics time, we computed that operational availability was about 58 percent.

SYSTEM SUPPORTABILITY IS QUESTIONABLE

We question how well the AH-64's automatic test equipment will be able to support the aircraft. The AH-64's maintainability depends on (1) the fault detection/location system to identify faulty components and (2) the automatic test station to diagnose those faulty components so that they can be repaired.

The detection/location system's performance has not been fully demonstrated. Little testing of the system has been conducted to date, particularly with TADS. Since the system in essence triggers unscheduled maintenance actions and has a significant effect on the automatic test station's workload, its performance is key to the AH-64's maintainability and availability. Army logisticians are skeptical of the system's eventual ability to perform all needed fault detection/location functions. This could create the need for additional test equipment.

The test station's availability under operational conditions is a major issue. The computer system to be used in the test station has proven unreliable and unmaintainable in a field environment. In a recently completed development test of the computer system, the Army determined that the system achieved only 14 mean hours between each failure compared with the required 75 hours. The system was particularly sensitive to hot and cold temperatures and high humidity. In addition, Army personnel were unable to

maintain it and eventually had to give the maintenance function to the contractor.

The test station is to be tactically mobile and is to accompany aviation units within the combat division. Each time it becomes necessary to move, it will probably take over 12 hours to shut down the station, move, setup, and warmup the system. Thus, the time available for aircraft maintenance could be seriously restricted.

Critical development and testing of the automatic test station configured specifically for the AH-64 is yet to be accomplished, particularly software and associated peripheral equipment. An operational test of the station is not planned until 1984 when all the equipment pieces are intended to be integrated into expandable shelters aboard two semitrailers and operated and maintained by Army personnel.

IMPROVEMENTS STILL NEEDED FOR HELLFIRE EMPLOYMENT

The laser Hellfire missile program is directly linked to the AH-64 program and has been scheduled to coincide with it. No other firing platforms are being seriously considered for Hellfire.

To date, the missile has generally demonstrated good reliability and accuracy, particularly in a clear environment and under controlled conditions. However, some improvements are still being considered and several critical tests, including bad weather, electro-optical countermeasure, and system qualification tests, have been delayed until after the production decision.

A prime operational issue is the missile's motor which produces significant amounts of smoke under many humidity and temperature conditions. The smoke makes the launch helicopter more visible to the enemy. In addition, it can obscure the crew's field of view, degrade autonomous designation, and impair rapid or ripple fire engagements.

Another operational problem involves approximately 13 Hellfire missile launch constraints that tend to detract from the system's tactical effectiveness. These constraints include the height of the aircraft, the distance to the target, the laser reflectivity angle, and others which are reported to complicate effective employment of the missile. This points to the need for effective training--a situation which will be impaired until the AH-64 combat mission simulator, now under development, becomes available in the late 1980s.

CONTRACTOR READINESS FOR PRODUCTION POSES SEVERAL RISKS

As the AH-64 and Hellfire systems make the transition from development into production, problems could arise resulting in higher procurement costs. The Army has identified several risks associated with contractor production readiness. Whether these risks are acceptable is a matter of judgment. Nevertheless, we believe particular attention should be given to the adequacy of the risk assessment and translation of the risks into a range of likely costs. In other Army programs, specifically the Blackhawk helicopter, Stinger missile, and M1 tank, procurement costs have increased substantially because of poor production risk assessments or unrealistic projections of the manufacturing processes. 1/

In July 1981, the AH-64 prime contractor decided that the helicopter's final assembly plant would be located in Mesa, Arizona. Before that time, the assembly was expected to take place at an existing plant in Culver City, California. This decision poses schedule risks because no buildings, flight test facilities, or utilities have been established on the contractor's 200 acres of land located in the Mesa area. Although plans are underway, it will take several months to construct the plant.

The Army also questions the availability of a sufficient number of workers with critically needed skills, specifically, industrial engineers and quality control inspectors. Recruitment from outside the Mesa area is considered necessary and a potential problem according to Army studies. Army officials have expressed similar apprehension about facility readiness and labor shortages at the Culver City plant where the AH-64 prime contractor intends to fabricate AH-64 components before shipment to Mesa. Labor shortages have also been identified in Ocala, Florida, where the Hellfire missile seeker is to be manufactured.

The AH-64 prime contractor's quality control program is still under development and portions of it may not be ready when helicopter production activities are scheduled to commence. Procedures are incomplete for acceptance testing of items procured from suppliers and for production testing of finished products. The Army has experienced quality control problems with its M1 tank which required additional work on tanks produced at the contractor's plant and significantly slowed their delivery.

Army officials have reported that plans to complete development and Government validation of the AH-64 prime contractor's performance measurement system are behind schedule and, unless promptly resolved, could lead to generating unreliable cost and

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1/Report to the Congress dated October 20, 1981 (MASAD-82-5).

schedule data for several months after production is scheduled to begin. Such a management information system is essential in controlling contract performance--a lesson the Army recently learned on the Blackhawk helicopter program.

CONCLUSIONS

In our opinion, the AH-64/Hellfire program's high cost warrants serious consideration of more cost-effective alternatives such as an improved Cobra/TOW or other types of weapons. If the system must be produced, a sufficient number of risks and uncertainties still exist which warrant delaying the start of production. Until these matters are resolved on the AH-64, it would seem prudent to also delay production of the Hellfire missile. Obviously, the costs associated with postponing the decision must be weighed against the benefits of obtaining better information and greater confidence in the total system's merits.

We believe that during the past year, the AH-64 program has been hastily conducted and has resulted in insufficient information for decisionmakers. To ignore the information yet to be developed would essentially lower the use of several management tools, such as evaluations by independent test and system support agencies, that have been designed to ease the burden of making difficult choices.

RECOMMENDATIONS

In view of the high cost of adding the AH-64/Hellfire to the Army's weapon system inventory, and its effect on an already strained budget, we recommend that the Secretary of Defense explore other more cost-effective alternatives such as the Cobra/TOW or other types of weapons.

If the Secretary decides that the AH-64/Hellfire should be procured, we recommend that production approval be delayed until the satisfactory completion of Government tests and evaluations showing favorable results.

Agency comments

In responding to our report by letter dated March 9, 1982, Defense stated that it shared our concerns on the AH-64, and that a decision to transition the program from development into production has yet to be made. Defense was concerned over the helicopter's cost growth in transitioning into production, and difficult funding choices may still have to be made. However, Defense officials were confident that the other areas of risk in the program were manageable. They emphasized the AH-64's increased capabilities relative to the AH-1S Cobra and underscored the need for the system to defeat Warsaw Pact Forces.

Since this response, on March 26, 1982, Defense made a favorable production decision on the AH-64. This represented a 4-month delay in making the decision, which enabled better information to be available for the decisionmakers. We believe the AH-64 still retains considerable risk upon entering production which could result in further cost growth. Key testing remains on the target acquisition sight, engine, and automatic test equipment, and problems have surfaced regarding operations in temperature extremes. The prime contractor's financial capability is a serious concern, and recent testing has raised some questions as to employment procedures against a sophisticated threat.

TESTS AND EVALUATIONS STILL IN PROGRESS SHOULD INDICATE DIVISION AIR DEFENSE GUN'S POTENTIAL EFFECTIVENESS

SOURCE: FORD AEROSPACE AND COMMUNICATIONS CORPORATION

It is not possible now to make a reliable assessment of the Division Air Defense (DIVAD) gun's potential in combat. The system that emerged from prototype testing in November 1980 was not fully developed. Several critical tests are still in progress, and evaluations of the results will not be available until April 1982, when a production decision is due. However, other important tests will not be completed or have been deferred until after the production decision. Little is known about how well DIVAD meets the Army's requirements for maintainability, logistics supportability, and ease of operation by the troops. The Army's primary emphasis has been on developing the hardware.

GAO undertook this review because of the impending important decisions to be made both by the Secretary of Defense and the Congress. They involve consideration of the forthcoming Army request for $814 million contained in its fiscal year 1983 program to procure 96 DIVADs, spares, and ammunition. The total program cost for 618 DIVADs is about $4.5 billion.

A key to any assessment of DIVAD is a 3-month test completed in January 1982. The Army refers to this testing as a "check test" because it is designed primarily to determine if all shortcomings identified in tests conducted in 1980 were corrected. The testing was planned to provide data needed to assess DIVAD's technical performance. Other critical assessments to be made, not as heavily dependent on this testing, cover human factors and system supportability.

A fixed-price incentive contract, with a ceiling price of $1.725 billion, was awarded to Ford Aerospace and Communications Corporation in May 1981 after a competition with General Dynamics Corporation. The contract requires Ford to complete engineering development of DIVAD and produce and deliver 276 of them.

Final delivery is scheduled for September 1986. Nevertheless, a source selection board's analysis of Ford's proposed system specifications and test results revealed several deficiencies and shortcomings. The major deficiencies to be corrected, before the 3-month check test, included the system's reaction time, software integration, turret armor protection, excess weight, and the radar's performance in an electronic countermeasure environment.

SUBSTANTIAL TESTING AND EVALUATION DEFERRED UNTIL AFTER PRODUCTION DECISION

Several tests will not be completed until after the production decision. They include tests to assess the new DIVAD's performance under a stressful environment and in a natural cold weather climate. A durability and mobility test of 5-months duration is scheduled to start in February 1982. It is designed to assess DIVAD's performance in intensive road and firing conditions. DIVAD's logistics supportability will not be fully evaluated until almost 2 years after the production decision.

ACQUISITION STRATEGY USED CONTAINS INHERENT RISKS

The Army's "hands-off" acquisition strategy used to procure DIVAD was a factor in testing delays which have resulted in a program stretchout of about 17 months. The strategy has also

affected scheduling some evaluations of the system's test results.

The prototypes delivered for the 1980 tests to demonstrate performance were not ready for testing. Their unexpected lack of technical maturity caused the demonstration to be canceled and forced a limited delay in starting the development and operational testing. The lack of maturity appears to have surprised the Army since, due to the hands off approach, its information about the systems in development was basically limited to that contained in quarterly reports from the competing contractors.

CONCLUSIONS

If the new DIVAD can be successfully fielded, it should provide a quantum improvement over the system it is to replace. However, the jury is still out until critical tests, including some that will not be completed until after the production decision, are evaluated. Without the mobility test results, for example, important information on DIVAD's performance, reliability, and maintainability is lacking. To begin production without it constitutes a risk.

To assess the procurement strategy followed in procuring DIVAD is premature at this stage. There have been certain drawbacks, particularly the sparsity of information during its development and the consequent limited evaluations of some aspects of the system's capability. However, if the system comes through successfully in forthcoming tests and substantially meets the Army's requirements, these shortcomings could be overlooked.

Regardless of the final outcome, however, the Departmnet of Defense should be careful in applying this strategy to other systems since its success would hinge on many factors that vary with each acquisition--the degree of risk, the competence of the contractor, and the reliability of cost projections, to mention three.

RECOMMENDATIONS

GAO recommends that the Secretary of Defense should

--defer the production decision to allow completion of the durability and mobility testing

and to provide the evaluation agencies more information and time to assess DIVAD and

--make eventual production approval contingent on a positive indication that DIVAD will meet the Army's requirements for maintainability, logistics supportability, and ease of operation by the troops.

GAO also recommends that the Congress should condition the obligation of fiscal year 1983 procurement funds it may approve for DIVAD, by having the Secretary of Defense provide advance assurance that the system has adequately demonstrated that it meets the Army's performance requirements.

VIEWS OF PROGRAM OFFICIALS

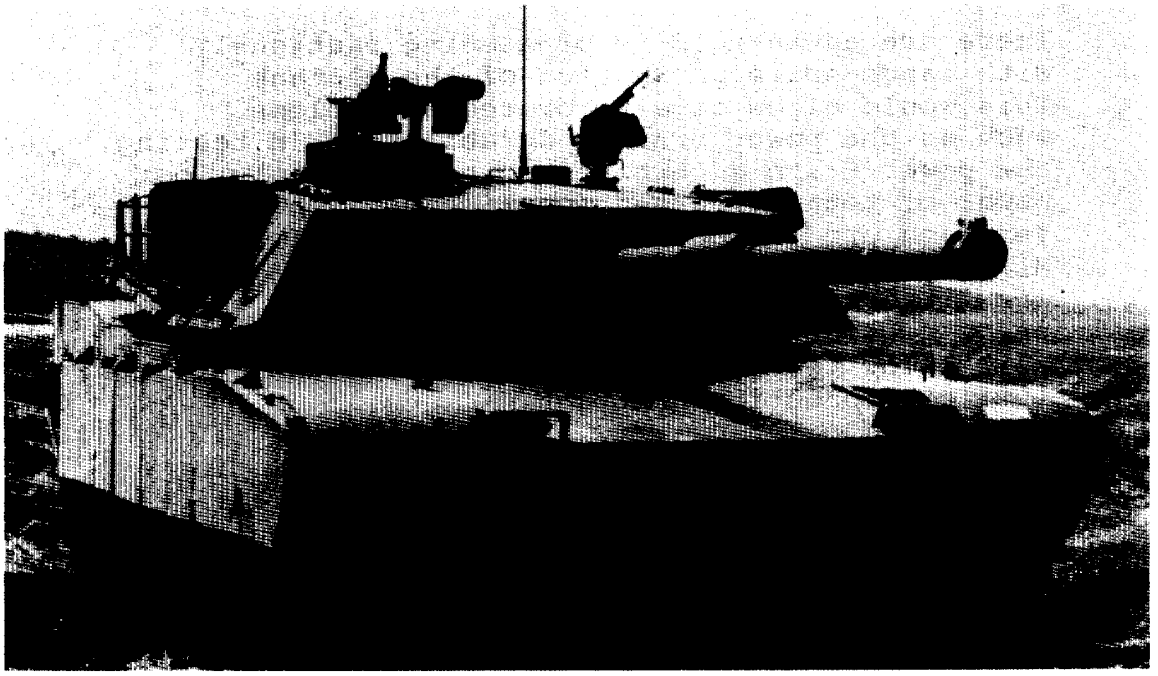
GAO did not request official comments on this report because of the need to issue the report in time for congressional consideration of the fiscal year 1983 defense budget request. GAO did, however, discuss a draft of this report with high level officials associated with management of the program. These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

The Army believes the program risks are not so great as to warrant delaying production. To do so, they maintain, would cause the Army to lose the opportunity to take advantage of favorable procurement options. The first option, for 50 units, must be exercised by May 31, 1982. The Army also views a delay as negating the benefits it sees in following the procurement strategy it adopted for DIVAD.

GAO disagrees with the Army's position. GAO believes that the perceived benefit of the favorable procurement contract option should be weighed against the risk of proceeding into production.

Defense officials agreed that experience with DIVAD procurement should be evaluated before the hands-off procurement strategy is applied to selected programs in the future.

LARGE-SCALE PRODUCTION OF M1 TANK SHOULD BE DELAYED UNTIL ITS POWER TRAIN IS MADE MORE DURABLE



SOURCE: U.S. ARMY

Production of the M1 tank started in May 1979, but reliability and durability problems led the Secretary of Defense to limit the initial production rate to 30-a-month pending their resolution.

In September 1981, the Secretary lifted the 30-a-month production restriction, based largely on optimistic projections by a blue ribbon panel of experts convened by the Department of Defense. The panel believed the M1's power train, which presently fails to meet the Army's durability requirement, would show substantial improvement provided certain modifications to the engine and transmission are incorporated.

The Army requested $1.624 billion to buy 720 tanks in fiscal year 1982.

WHY THE REVIEW WAS DONE

GAO undertook this review because the M1 acquisition program, which represents the Army's most costly new weapon system, has reached the acquisition phase requiring the commitment of large financial resources. The course it takes

will have a significant effect on the Army's budget.

ISSUES BEARING ON LARGE-SCALE PRODUCTION

There are advantages to proceeding cautiously with large-scale production of the M1 tank. This would allow time to overcome problems, such as the power train's durability. In testing, the power train's turbine engine frequently lost power or totally ceased functioning. These problems and production difficulties have slowed M1 deliveries up to now. Until October 1981 when it delivered 32 tanks, production by the prime contractor, Chrysler Corporation, had been well below the 30-a-month required by the current limited production contract.

A modest production rate would also allow time to accumulate more information on the capabilities of a diesel engine currently in development while attempts continue to improve the power train's durability. The diesel engine may offer an alternative to the M1's turbine engine.

With these uncertainties and the time still needed to ready a second tank plant for production, there seems to be no urgency to committing funds at this time for the M1's full production. The Government-owned second production plant will not be ready to begin low-rate M1 production before March 1982, at the earliest.

POWER TRAIN HAS NOT MET ARMY'S DURABILITY REQUIREMENTS

The latest series of tests has again confirmed that the M1 has met virtually all of its major combat requirements in the areas of firepower, armor protection, and mobility. The M1 has been impressive in demonstrating its shoot-on-the-move capability, its speed, its ability to rapidly traverse rugged terrain, and the protection afforded by its armor. In these respects, the M1 seems destined to live up to the Army's expectations.

Despite this fine showing, a problem of great concern was disclosed in the testing. The M1's power train failed to meet the Army's durability goal. The power train components

are the engine, transmission, and final drive. In July 1981, when testing was nearly completed, the Army reported that the power train had demonstrated a 37-percent probability of meeting the requirement to achieve 4,000 miles without a need to replace a major component compared to the 50-percent probability required.

Actually, even this disappointing showing benefited from the performance of the transmission and final drive. Each improved substantially in durability after successful modifications were applied to correct earlier problems. The turbine engine failed to show similar progress. In the latest operational tests at Fort Knox, Kentucky, the replacement rate of failing engines was even higher than it was in tests held there in 1979.

ALTERNATIVE DIESEL ENGINE WARRANTS FURTHER CONSIDERATION

Because of congressional concerns over the turbine engine's durability, the Army began developing a backup diesel engine. This engine is currently undergoing tests scheduled for completion in December 1982.

The Army plans to conduct M1 production testing from May to October 1982 in hopes of demonstrating that a quality assurance program instituted by AVCO Corporation, the turbine engine contractor, will have helped produce a power train that meets the Army's durability requirement. It would seem that the Army should also give serious thought to the potential offered by the diesel engine and have the engine demonstrate its capability in testing similar to what the turbine has undergone. Differing opinions exist on how long it would take to get a diesel engine into production, but it would be at least 2 years.

OPERATIONAL AND DEVELOPMENT TEST RESULTS INDICATE FREQUENT MAINTENANCE IS STILL REQUIRED

In accordance with prescribed Army scoring criteria, which have been in use for several years, the M1 rolled up impressive reliability and maintainability scores. The M1, for example, averaged 126 miles between system failures,

surpassing the Army's goal of 101 average miles between such failures.

However, the scores mask the fact that components failed much more frequently than shown by the official results. Actually, the M1 averaged only about 30 miles in development testing at Aberdeen, Maryland, and 32 miles in operational testing at Fort Knox, Kentucky, before a need for some type of maintenance was indicated. The Army does not attach any significance to these statistics since these maintenance actions also included minor incidents, such as tightening a clamp or operating with a missing bolt, whose correction was deferred until the next scheduled maintenance. However, statistics showed the average miles traveled between what the Army terms "essential maintenance" were not much better. They showed the tanks averaging 48 miles at Fort Knox and 43 miles at Aberdeen between essential maintenance demands.

CONCLUSIONS

The M1 tank should perform well in combat. To take full advantage of its excellent inherent capability demands an improvement in the tank's power train durability. Until the durability requirement is met, it appears unwise to produce large numbers of tanks. To do so before an improvement is effected will create a large inventory of tanks hampered by engines requiring frequent replacing and that are expensive to maintain.

The Army plans to continue improving the turbine engine. It is also testing the alternative diesel engine. Therefore, the Army has the opportunity to compare the performance of both engines so that one of the two can be selected based on their showing in testing and their respective life-cycle costs. Prudence dictates that this opportunity not be overlooked.

RECOMMENDATIONS

GAO recommends that the Secretary of Defense should:

--Direct the Army, if the durability requirement has still not been met after the 1982 production testing, to compare the performance and

durability of the turbine and diesel engines as demonstrated in testing and to prepare an analysis of the two engines that addresses their cost and performance.

--Evaluate the Army's analysis and select one of the two engines for incorporation into the balance of the production run.

--Provide the key congressional committees with an estimate of funds that may still be needed for improvements to elicit, from whichever engine is selected, the type of performance that would enable the power train to meet the durability requirements.

MATTERS FOR CONSIDERATION BY THE CONGRESS

Although the M1 is to start large-scale production, its power train's acceptability has not been demonstrated. Therefore, the Congress should consider conditioning future appropriations for large production of the M1 on the power train meeting the Army's durability requirement.

AGENCY COMMENTS

Basically, it is the Department of Defense position that full production is warranted based on the blue ribbon panel's projections of the power train's durability potential. The panel projected that the application of certain modifications could raise the power train's durability to where it would exceed the Army's requirement The Army is aware that the engine's frequent failures would result in high maintenance and support costs.

The blue ribbon panel's report, in addition to the improvement it forecast, was concerned about vital modifications for which it saw an immediate need, including some that would correct problems that have not yet surfaced but which are to be anticipated. It urged more testing and more aggressiveness in dealing with the power train's recurring problems.

The Department of Defense officials said they will test the diesel engine but could not consider it a serious contender, principally, because they believe it will take 4 years to produce.

Granted that improving the readiness of the armed forces demands early fielding of modernized equipment, much of the advantage of early deployment could be lost if the tanks were to experience frequent durability failures and require frequent maintenance.

Agency comments

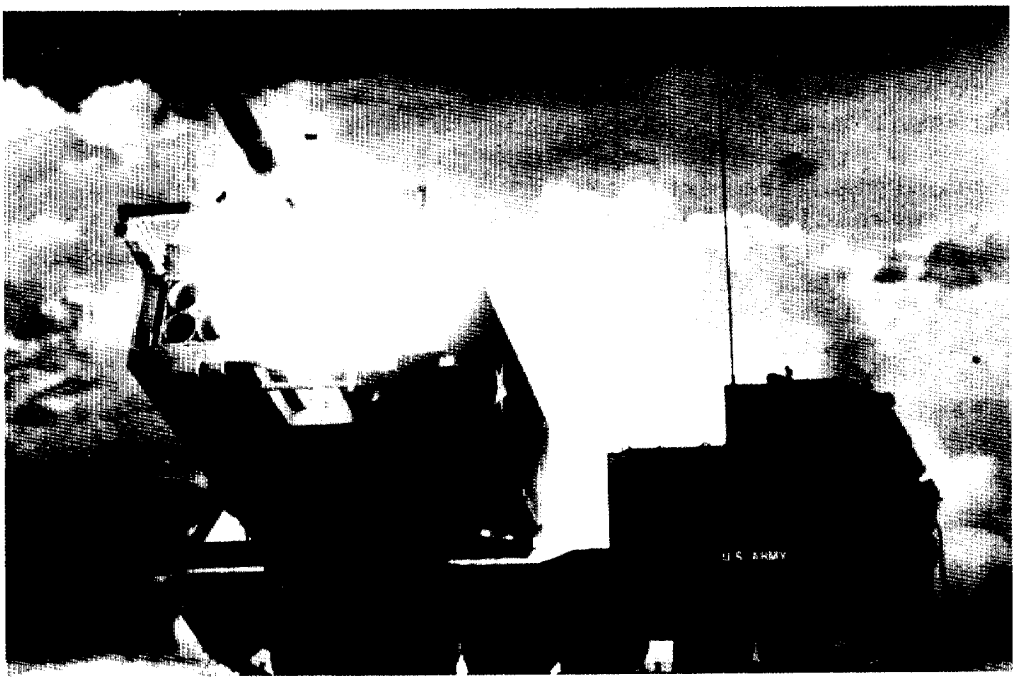
By letter dated March 15, 1982, Defense stated that it shared our concern with the M1's failure to meet the Army's durability requirements and agreed that evaluation of the alternative diesel engine should continue.

Defense disagreed with our recommendations that it reduce M1 production levels pending resolution of continuing power train problems and provide congressional committees with cost estimates for power train durability improvements. Also, Defense did not accept our observations that the Army methods for scoring the M1's reliability did not indicate the considerable maintenance that the M1 will require.

We recognize that national security needs could support a conclusion that full production should proceed even with a degraded power train. Also, we continue to maintain that the Army's scoring methods do not indicate the actual maintenance burden.

THE ARMY'S MULTIPLE LAUNCH ROCKET SYSTEM

IS PROGRESSING WELL AND MERITS CONTINUED SUPPORT



SOURCE: U.S. ARMY

Certain technical problems require resolution, but, the Army's Multiple Launch Rocket System has done quite well in testing so far. The system is also meeting its cost and schedule goals, after adjustments for inflation.

The Multiple Launch Rocket System is an unguided, surface-to-surface rocket system. It can fire up to 12 rockets individually or in rapid sequence. The system is to be mounted on a chassis derived from the Infantry Fighting Vehicle. The system is especially designed for use during surge periods when enemy forces present targets in sufficient quantities and density to strain the capacity of available fire support systems.

The weapon system, an almost $4 billion program, depends on other systems for operational use. They include a target acquisition system, a meteorological data system to provide weather information, and a communication system.

GAO conducted this review to determine the Army's progress in developing this system as it approaches its critical testing phase and as the

Congress prepares to review requests for large-scale funding to finance its procurement.

Some of the system's more difficult technical problems involve the submunitions. Instances of their failing to explode on impact have been greater than the Army believes can be tolerated. Also, particularly in cold climate tests, a significant number of the submunitions cracked as they were dispensed. Other problems were experienced in testing with the vehicle's transmission, the fire control system, and the launcher's directional reference system which provides direction and elevation information. The Army will have the opportunity to test solutions designed by the contractors in upcoming operational tests this year before the production decision due in March 1983.

Although the rocket system's survivability has been questioned by some Army analysts who believe some design changes may be needed, the Army believes its tactics should ensure adequate survivability. The Army would consider design changes only if future survivability evaluation strongly suggests they are needed.

The program has two other concerns. A critical system still in development, the meteorological data system, will not, according to present plans, be available when the rocket system is due to begin deployment. Also, the Army may face difficulty in accommodating the procurement of a costly system, such as the Multiple Launch Rocket System, given the budgetary pressures it is facing as it introduces several new expensive systems simultaneously.

The Army believes the existing meteorological data system is adequate for the interim but recognizes that a new one is needed to improve the rocket system's effectiveness when it is deployed. The Army believes that the budgetary process, in which weapon systems are ranked according to priority for funding purposes, should enable the rocket system to continue receiving the funding support it warrants.

RECOMMENDATIONS

GAO recommends that the Secretary of Defense

--investigate the possibility of accelerating the acquisition of the meteorological data system that would enhance the Multiple Launch Rocket System's effectiveness when it is ready for deployment and

--require the Army to review its survivability estimates and determine whether there is a need for improving the system's survivability in the light of the updated evaluation results.

VIEWS OF PROGRAM OFFICIALS

GAO did not request official comments on this report because of the need to issue this 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. These officials generally agreed with the material presented in this report and their views are incorporated as appropriate.

THE ARMY'S REMOTELY PILOTED VEHICLE SHOWS GOOD POTENTIAL BUT FACES A LENGTHY DEVELOPMENT PROGRAM

SOURCE: U.S. ARMY

The Remotely Piloted Vehicle (RPV) system shows promise of significantly enhancing the Army's combat capability. Its development has been slowed, however, by major technical difficulties and by funding uncertainties created by competing demands of higher priority programs on the Army's budget.

RPV is designed to acquire targets for artillery, to designate targets for precision-guided munitions, for reconnaissance, and for other functions. The system is planned to extend the attack capability of division commanders beyond the forward edge of the battle area to the full range of artillery weapons where ground-based systems cannot see and where the risk to piloted observation aircraft is high because of the enemy's sophisticated air defense systems. The system consists of an air vehicle, a ground control station, a remote ground terminal antenna, launch equipment, recovery equipment, and support equipment.

The latest program cost estimate is approximately $1.6 billion. The system still faces a lengthy development and testing program.

GAO undertook this review to evaluate and assess the Army's prospects for successfully deploying its RPV system in the light of important program decisions to be made shortly by the Secretary of Defense and the Congress about financing its continuing development.

TECHNICAL PROBLEMS TO BE SOLVED

Technical problems with two key subsystems--the data link and the mission payload--have slowed RPV's development. In both cases, problems resulted primarily from the difficulty of fitting the electronic equipment into the small air vehicle which is designed to stringent size and weight limitations. The Army has modified its program development plan in an attempt to minimize the effects of these technical difficulties by developing two additional data links, one for interim use during testing and another as a possible alternate should the data link originally planned to go into production prove unable to overcome its technical difficulties. The alternate data link is not as capable as the original one.

Development of the mission payload subsystem has been hindered by difficulty in designing the software and problems with a key component, the composite optics.

Difficulties in overcoming technological problems and indecisiveness about funding the program have prolonged RPV's development. Testing has been limited primarily to the individual components. Integrated testing is 2 years away. Yet, RPV shows potential for good survivability, and some planned system enhancements raise the prospects of overcoming some battlefield conditions that threaten to lower its effectiveness.

Some decisions have to be made soon, and program stability is a major concern. Consideration should be given to the likelihood of when RPV technology problems can be resolved and whether their resolution can be expedited by the infusion of additional funds. If the research and development problems are deemed solvable, RPV

will need a firm commitment to continued funding support so that its full potential can be realized and its scheduled initial operational capability achieved in an efficient manner. The Congress has expressed its view. The House Defense Appropriations Subcommittee reported in November 1981, shortly after the Army announced its proposed major reductions to the RPV program, that it believes the RPV technology should be vigorously pursued and adequately funded to ensure that the opportunities for early field testing can be provided.

RPV's success largely depends on the progress achieved in miniaturizing the data link. However, in addition, the system as a whole still requires considerable development and testing. Its progress through the testing phase, if the program goes forward, should be carefully monitored and evaluated periodically.

RECOMMENDATIONS

GAO recommends that the Secretary of Defense direct the Army to

--determine whether the RPV program's progress is such that it should command sustained funding levels that would permit achieving its initial operational capability on schedule;

--budget for and pursue the development of system enhancements, if progress is adequate, to overcome some of the potential operational limitations of the system; and

--ensure that the testing program is structured so that operational tests demonstrate both individual subsystem and total integrated weapon system performance.

GAO further recommends, if RPV progress is such that it does not command high sustained funding, consideration be given to discontinuing the program or reorienting it to a low-level research and development program.

VIEWS OF AGENCY OFFICIALS

GAO did not request official comments on this report because of the need to issue it in time for congressional consideration of the fiscal year 1983 defense budget. 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 incorporated as appropriate.

CONCERNS ABOUT THE ARMY'S VIPER LIGHT ANTITANK WEAPON

SOURCE: U.S. ARMY

Our review of the Army's Viper light antitank weapon system program included an examination of test results through the latest operational testing completed at Fort Benning, Georgia, in July 1981, and the program's cost history. We discussed the planned use and the Viper's demonstrated effectiveness with the Army's Director of Combat Support Systems in the Office of the Deputy Chief of Staff for Research, Development, and Acquisition; officials of the Army's Training and Doctrine Command; the Missile Command, including the project office; and the Army Materiel Systems Analysis Activity. We also examined information provided by the Army on light antitank weapons currently operational or under development in several European countries, which might offer an alternative to Viper.

Viper is headed for a production decision to be made August 3, 1981, at an Army In Process Review. It is our view that the Viper should not be produced in its present configuration. Our conclusion is based primarily on the fact that test results indicate that Viper, though somewhat more capable than the system now in inventory, barely meets the low end of the Army's requirements, and, at that, only against the older Soviet tanks. Viper's cost has increased significantly while at the same time its value has gone down from the level envisioned when it began its development. Also, the Army has not seriously examined the potential of foreign weapons meeting its requirement.

We also determined that Viper has some unresolved technical problems, one of which represents a potential safety hazard, and

another for which a solution is being considered that would remove a safety feature from the current design.

Light antitank weapons are used by the infantry. They are referred to as "last ditch" weapons to be used against tanks when the troops are being overrun. The best scenarios for Viper's use is said to be in fighting taking place in urban or wooded areas, where it is more probable that a shot can be launched at the tank's sides where it is much more vulnerable than at its front. The Army desires a weapon that can disable enemy tanks firing from a range of from 250 to 300 meters.

Viper has been developed to replace the existing M72 LAW. It is designed to complement the Dragon and TOW in the Army's family of light, medium, and heavy antiarmor systems. Intended primarily as the individual soldier's antitank weapon, Viper weighs 9 pounds and fires a rocket from a throwaway launcher. The launcher consists of two overlapping tubes and is carried strapped to the infantryman's shoulder. Before it is fired, the infantryman must extend the outer tube, to give a total launcher length of about 3-1/2 feet. Viper is currently scheduled to become operational in the United States and Europe in January 1983 and August 1984, respectively.

The existing M72 LAW does not measure up to the Army's requirements for probability of kill.

TEST RESULTS SHOW VIPER'S EFFECTIVENESS TO BE LOWER THAN ANTICIPATED

Tanks the Viper would face in Europe, when it is deployed, are more heavily armored than was anticipated when Viper's performance requirements were drafted. Viper's stated primary targets are identified as the Soviet T-55, a tank deployed in the late 1950s; the T-62, deployed in the early 1960s; and the T-64, deployed in the mid-1970s.

In December 1980, the Army user agreed to accept a lower capability against stationary tanks. This lower capability was demonstrated 2 months earlier, through testing and evaluation, as Viper's projected effectiveness. The requirements against moving tanks remained the same.

The Soviets began introducing its T-72 tank in the late 1970s. According to intelligence estimates, its newest tank, the T-80, is to begin deployment early in this decade. Against the newer tanks, Viper is not projected to fare as well as against the T-55 and T-62.

Viper's cost has increased significantly

When the Viper was proposed in 1975, a design-to-unit cost goal of $78 a unit was established. The current unit procurement

cost is estimated at $793. The Army estimates that the effects of inflation account for about $400--$450 of the current estimated cost increase. Even at the $793 price, Viper is still a low-cost weapon. The program, however, calls for the procurement of about a million rounds over a 7-year period. In escalated dollars, Viper represents a $1.2 billion acquisition program and about $2 billion in terms of life-cycle costs. In essence, Viper's cost has gone up substantially while at the same time, due to the increase in the Soviet tank threat, its value has gone down from the level envisioned when it began development.

FOREIGN ALTERNATIVES TO VIPER

Several foreign light antitank weapons may offer higher armor penetration, substantially better probabilities of kill, and somewhat greater effective ranges than Viper. At the same time, however, these weapons are significantly heavier than Viper.

Foreign candidate weapons include the French ATILA (or APILAS), the German Panzerfaust III, and the United Kingdom LAW (or LAW 80). We cannot attest to the accuracy of contractor representations for the foreign systems.

Another foreign system, the German Armbrust, shows no more effectiveness than Viper, but the contractor is looking to a better probability of kill following completion of a product improvement program. The current Armbrust weighs about 14 pounds. The improved version is to be a little over 10 pounds and is expected to be available in 1983.

The Army user's position is that these weapons are not viable alternatives to Viper, basically, because of their weight.

In our opinion, the test results on Viper warrant an investigation of the foreign systems to confirm their capabilities, cost, and other specifications. If they prove to be as lethal as the above data indicate, the Army may wish to reconsider the weight penalty they carry to enhance its antitank kill capability.

VIPER TECHNICAL PROBLEMS NOT FULLY RESOLVED

Numerous earlier technical and safety problems encountered during the development phase have been resolved. However, as of June 17, 1981, the Army had not fully demonstrated solutions for Viper's accidental firings, firing mechanism failures, and water immersion problems. The first represents a potential safety hazard. The Army has tested two possible solutions to the water immersion problem but has not yet decided which one to adopt.

Regarding Viper's accidental firing problem, laboratory tests show that static electricity or radar waves may cause the Viper to accidentally fire. According to an Army official, if

unresolved, this problem will restrict transporting individual Viper rounds by helicopter due to the possibility of a static electricity buildup during flight and preclude deploying them around high intensity radars. This official also said that the Viper contractor had identified a possible solution to the accidental firing problem and had successfully demonstrated it in laboratory tests of develoment models. The Army plans to demonstrate the proposed solution on preproduction hardware before a production decision on Viper is made.

Firing mechanism failures may delay or prevent Viper firings. Recent operational tests showed that 20 of 368 Viper rounds failed to fire on the first attempt. Eight of these 20 failed to fire after additional firing attempts. An Army official provided the following reasons for the failures: (1) poor quality control caused two failures, (2) defective batteries caused six failures, and (3) gunner error caused seven failures. The causes of the remaining five were unknown. The Viper contractor is conducting a firing mechanism failure analysis, and the problem will be addressed at the In Process Review when the Viper is considered for production.

The water immersion problem may prevent warheads from detonating upon target impact. Viper is required to remain operable after being immersed in 3 feet of water for 2 hours, but early testing against this requirement showed an extremely high number of warhead failures. Limited tests have shown two potential solutions: (1) removing a safety interlock pin which now prevents premature firing of the weapon or (2) reducing the water immersion requirement to 5 minutes rather than 2 hours.

Removing the safety interlock pin, however, could reduce gunner safety because the weapon may be fired without fully extending the launch tube. Reducing the water immersion requirement may affect Viper's operational use. According to Viper project officials, the user will select the solution at the In Process Review.

In discussing a draft of this report, the Army generally agreed with the facts described above except to point out that if Viper is approved for production now it could begin becoming available in 1982, a year earlier than the European systems. The Army also believed that the European developers would first produce to fill the needs of European forces, delaying their availability for our own. This, however, overlooks the possibilities of coproduction or of buying the rights to produce the European weapon in the United States. The Army assured us that its decision at the In Process Review would not be a precipitous one and would consider the success shown in tests conducted in the last few days before the In Process Review in overcoming the remaining technical problems.

In summary, Viper's demonstrated effectiveness barely meets the low end of the Army's requirements and, at that, only against the older Soviet tanks.

Apparently, there is little prospect of achieving significant improvement in Viper's effectiveness in its present configuration. In our opinion, this warrants a decision not to produce the system. In lieu of producing Viper, we recommend that the Secretary of Defense direct the Army to

--evaluate the possibility of developing an improved version of Viper and/or

--determine the availability of the European systems and, through appropriate testing, their potential for meeting the Army's requirements.

Either alternative will likely require compromises on the system's weight. If this produces a better weapon than Viper is today, it may be worth the trade off.

Agency comments

On November 24, 1981, Defense informed us that it disagreed with our recommendation not to produce Viper. However, Defense did elect to limit Viper production until potentially more effective foreign weapons are evaluated and the Army seeks ways to lower production costs.

While Defense disagreed with our recommendation not to produce Viper, we believe that limiting production while alternatives are assessed is a positive step. We plan to monitor the Army's testing of foreign-developed systems scheduled for next year.

CHAPTER 5

NAVY PROGRAMS

THE NAVY'S NEW ANTISUBMARINE WARFARE STANDOFF WEAPON--AN UNCERTAIN FUTURE

The antisubmarine warfare standoff weapon will be a long-range, quick-reaction missile platform capable of delivering torpedoes or depth bombs. Until October 1981, the standoff weapon was being developed primarily for SSN-637 and SSN-688 class attack submarines.

In October 1981 the Navy restructured the program to provide for deployment aboard surface ships as well as submarines and renamed the weapon the Common Antisubmarine Warfare Standoff Weapon. However, revised cost, schedule, and quantity estimates for the restructured program were not available until after the President's fiscal year 1983 budget request was submitted to the Congress. Thus, this report deals exclusively with the submarine-launched aspect of the common standoff weapon program.

On April 17, 1981, the Navy awarded a $10.6 million sustaining engineering contract to Boeing Aerospace Company and Gould, Incorporated, to continue development work until the Secretary of Defense decides whether the weapon should proceed into the demonstration and validation phase. This decision, expected in November 1981, has been delayed to June 1982, as a result of the program restructuring.

Before restructuring the standoff weapon program, the Navy planned to follow the major acquisition cycle, including full-scale engineering development and production, with an initial operational capability which was estimated for the mid-1980s. Life-cycle costs for deploying 1,000 missiles aboard U.S. attack submarines were estimated at $2.6 billion.

WHY THE REVIEW WAS MADE

GAO has reported annually for several years to the Congressional Armed Services and Appropriations Committees on the status of selected major weapon systems. This report is one in a series that is being furnished to congressional committees for their use in reviewing fiscal year 1983 budget requests. It represents GAO's views on the major issues concerning the Navy's development of an antisubmarine warfare standoff

weapon, currently nearing the end of the concept formulation phase of the major acquisition cycle.

NAVY SEES AN ADVANCING SOVIET THREAT THAT WARRANTS IMPROVED ANTISUBMARINE WEAPONS

The Soviet Union's general purpose submarine force is a primary threat to the U.S. Navy's control of the seas. The Soviets are expected to continue improvements in submarine hull construction, speed, diving capability, and sensor capability. If the Soviets can successfully target their existing long-range weapons, they could attack U.S. submarines at standoff ranges. Thus, the Navy believes developing its new long-range antisubmarine standoff weapon is necessary.

RELATED PROGRAMS COULD LIMIT THE STANDOFF WEAPON'S CAPABILITY

Navy studies indicate that the standoff weapon will be effective at an adequate range to significantly improve the antisubmarine warfare capability of U.S. attack submarines. However, future improvements which are necessary to support the weapon's proposed range may not be achieved.

In a related program, GAO referred to problems encountered in developing the advanced lightweight torpedo. Continued improvements in Soviet submarine capabilities have raised questions and indications are that the weapon's effectiveness could be reduced.

The standoff weapon is intended to replace the Navy's only existing submarine-launched, long-range antisubmarine weapon, commonly known as SUBROC. The Navy is extending SUBROC's service life under a $41 million refurbishment program to improve reliability, maintainability, and system performance. But the Navy determined that SUBROC had exceeded its design life and is planning to retire SUBROC capability from the fleet.

Related to SUBROC's life extension program, in 1979 the Navy estimated that to develop and install a fire control system would cost an additional $15 million. The Navy rejected this option because it believes the money should be spent in higher priority areas.

POTENTIAL COST INCREASES AND DELAYS COULD AFFECT THE PROGRAM

The Navy estimates life-cycle program costs at $2.6 billion. However, this does not include some costs which are reported separately. More importantly, the Navy's decision to deploy the standoff weapon aboard surface ships may increase program costs by $2 billion or more primarily due to the increased number of missiles needed.

The Defense Systems Acquisition Review Council meeting to consider whether the system should enter the demonstration and validation phase has been delayed about 13 months to February 1982 or later. In the interim, the Navy awarded a contract to continue engineering development work. Project officials said the remaining phases of the standoff weapon's acquisition cycle would probably be affected.

The selected acquisition reporting system summarizes program highlights quarterly for Department of Defense and congressional review. The Navy believes using this reporting system is premature prior to the full-scale engineering development phase. GAO believes the Navy should begin using the selected acquisition reporting system now to provide increased management visibility to cost, schedule, and performance goals.

RECOMMENDATIONS TO THE SECRETARY OF DEFENSE

GAO recommends that the Secretary of Defense:

--Direct the Secretary of the Navy to develop accurate cost estimates and then reevaluate the fire control system option. If this option is cost effective, the Navy shold reconsider its priorities.

--Direct the Secretary of the Navy to begin selected acquisition reporting now to provide increased management visibility to cost, schedule, and performance goals.

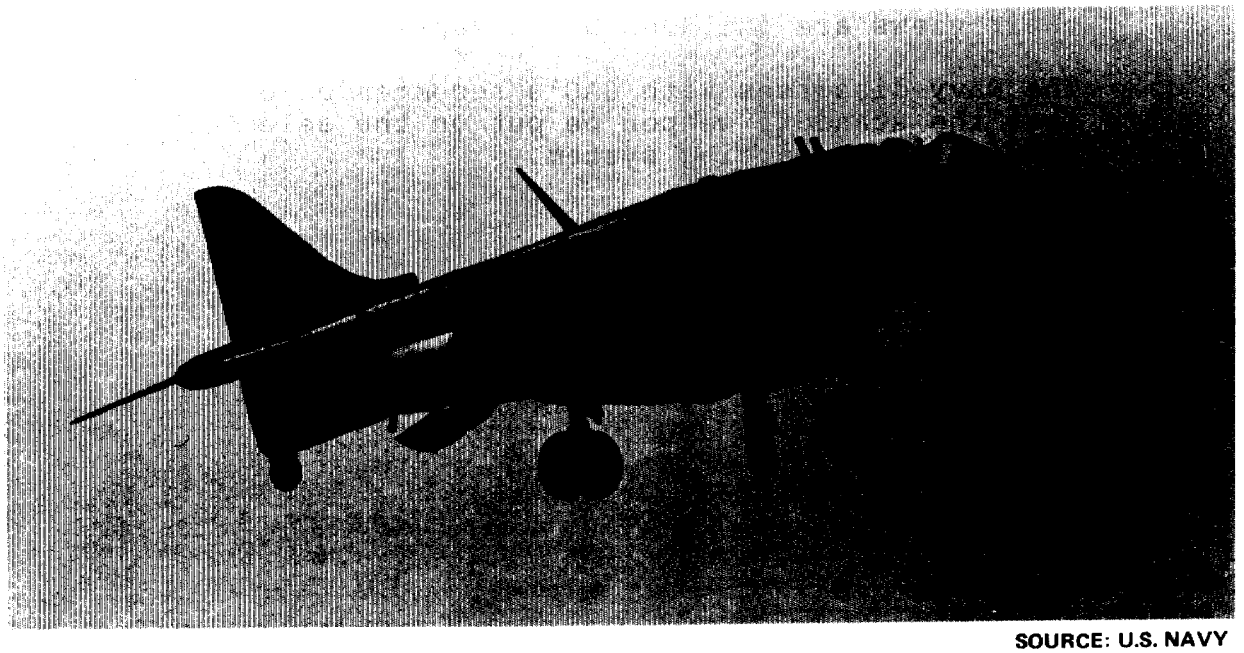
VIEWS OF AGENCY OFFICIALS

GAO did not request official comments on this report because of the need to issue it in time for congressional consideration of the fiscal

year 1983 defense budget requests. GAO did, however, discuss a draft of this report with high level officials associated with management of the program. These officials generally agreed with the facts presented in this report and their views are included as appropriate.

The Navy disagrees with GAO's recommendation that the standoff weapon be put on the selected acquisition reporting system.

MISSION EFFECTIVENESS OF THE AV-8B HARRIER II COULD BE IMPROVED IF ACTIONS ARE TAKEN NOW



SOURCE: U.S. NAVY

The AV-8B Harrier II is a light attack aircraft with vertical and short-takeoff and landing capability being developed by the Navy to provide close air support for Marine Corps amphibian forces. The AV-8B is designed to be a substantially improved version of the AV-8A currently used by the Marine Corps.

GAO reviewed this program to provide the Congress a report on the status of the AV-8B Harrier II development. Special emphasis was given to existing and potential problems related to program cost and schedule, aircraft technical performance, and AV-8B mission capability.

Potential maintenance personnel shortages, shipboard space constraints, limited repair capability, and inadequate ground-support equipment could adversely affect the ability of the AV-8B to perform its mission.

The Navy currently plans to purchase AV-8A trainer aircraft (TAV-8A) to use in training AV-8B pilots. The Navy proposed using TAV-8As for this purpose because developing an AV-8B trainer aircraft (TAV-8B) would be more costly. However, due to changes in production cost,

discontinuation of AV-8A production, major TAV-8A and AV-8B differences, and the ineffectiveness of the TAV-8A as a trainer for AV-8B pilots, the TAV-8A may not be the best choice for training AV-8B pilots. A better choice may be to develop a TAV-8B.

The AV-8B program cost is currently estimated at $9.1 billion for 342 prototype, development and production aircraft, a unit program cost of about $27 million. AV-8B program cost increased approximately $2.9 billion since 1979 and will continue to increase. The largest single reason for past growth has been inflation. Future increases in program cost will result because present estimates do not provide for the procurement of trainer aircraft (over $700 million), a 25-mm. gun system (over $300 million), and a stretched out production schedule which will result in purchasing more costly aircraft in the future.

Opportunities exist to improve AV-8B survivability. Major improvements could include reducing the AV-8B's vulnerability to enemy ordnance, adding fire or explosion suppression systems, and reducing the engine's infrared signature. Survivability improvements can be made, but at the expense of increased program cost and reduced aircraft performance.

RECOMMENDATIONS

GAO recommends that the Secretary of Defense:

--Require the Navy to develop adequate logistics support and support equipment to achieve the weapon system's operational mission. In addition, direct the Navy to plan for the quantity and skills of maintenance personnel needed to support the aircraft when it becomes operational.

--Direct the Navy to reevaluate its plan to purchase TAV-8As and consider developing a TAV-8B after examining the relative costs and benefits of the two trainer aircraft.

--Direct the Navy to determine the costs of developing and procuring a trainer aircraft, the 25-mm. gun system, and other aircraft changes and include these costs in the AV-8B program cost estimate.

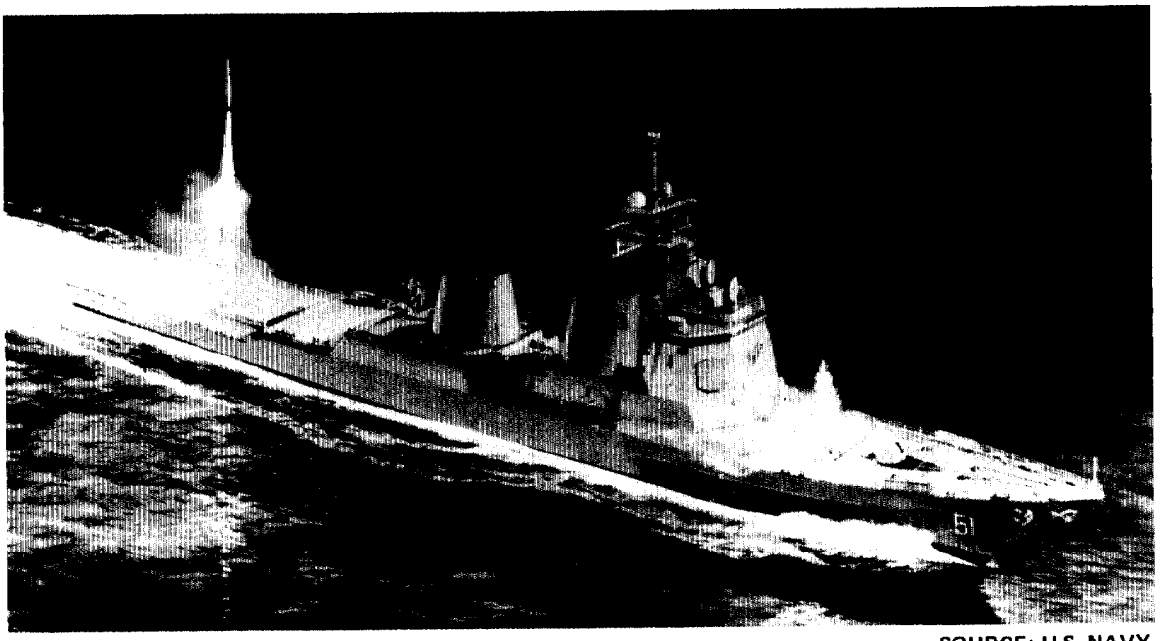
--Direct the Navy to reevaluate the current AV-8B program to determine whether reduced annual procurement rates will adversely affect the Marine Corps' ability to meet its mission objectives.

--Direct the Navy to evaluate the cost effectiveness of increasing AV-8B combat survivability. If cost effective, design changes should be made before aircraft production, if possible.

VIEWS OF AGENCY 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 the report with high level officials associated with the management of the program. These officials agreed with the facts presented in this report and their views are incorporated as appropriate.

OBSERVATIONS ON THE NAVY'S NEW GUIDED MISSILE DESTROYER--DDGX



ARTIST'S CONCEPT OF THE PROPOSED DDGX. SOURCE: U.S. NAVY

We have completed our review of the new class guided missile destroyer (DDGX). This letter discusses a matter that could possibly reduce total Navy expenditures in the coming years without adversely affecting the accomplishment of the Navy's mission.

The design of surface combatants involves numerous tradeoffs that affect their final size, capability, and cost. Your office has identified a design that it feels will meet the postulated threat while being constrained by cost and size considerations. In reviewing the proposed DDGX, we found that most of the DDGX's combat system elements, although quantitatively less capable, are common with that of the CG-47 class cruisers presently under construction. Proposed survivability and fuel efficiency features were stressed in support of the construction of a new hull.

In reviewing Navy assessments of the future operating environment, the projected threat, mission, and required capability of the DDGX, we learned that the Navy is designing the proposed DDGX to accommodate the AN/SQR-19 tactical towed array sonar (TACTAS). We question the need for a TACTAS equipped DDGX.

TACTAS, currently under development, is to provide a passive detection, classification, and tracking capability against enemy submarines. Specifically, it will be used as a long-range "trigger" to enable the LAMPS MK III helicopter and other antisubmarine warfare weapon systems to react for localization of and weapons delivery against the threat. Because the proposed DDGX will not

be LAMPS MK III equipped and it will be accompanied by LAMPS MK III equipped surface combatants in the various missions, we question whether having TACTAS equipped DDGXs would significantly add to the total antisubmarine warfare capability of a particular naval combat group. According to the recent TACTAS selected acquisition report, the estimated unit cost of TACTAS is $9.5 million. This includes a provision for inflation to the end of the acquisition. Thus, it would cost approximately $589 million to equip the entire projected buy of 62 new design DDGX destroyers with this sonar.

We plan to monitor the status of the DDGX program as its development progresses.

Agency comments

On March 16, 1982, the Navy told us that its goal is to provide the DDG-51 (formerly DDGX) with a balanced antisubmarine warfare capability. At this time, the Navy considers the installation of TACTAS to be a vital complement to the DDG-51's hull-borne sonar. The Navy believes that this capability, coupled with the other advanced combat systems will make it a powerful addition to the various naval combat groups. However, the Navy informed us that it will reassess the affordability and essentiality of having a TACTAS equipped DDG-51 during all major program decision points.

ISSUES CONCERNING THE NAVY'S EXPENDABLE RELIABLE ACOUSTIC PATH SONOBUOY AND ADVANCED SIGNAL PROCESSOR

An effective airborne antisubmarine warfare system includes the capability to detect, classify, localize, and destroy the enemy. This capability includes multimillion dollar weapon systems, such as the land-based P-3 patrol aircraft, the carrier-based S-3 aircraft, and the Light Airborne Multipurpose System helicopter.

Sonobuoys and their related signal processors are the keys to the effective use of these aircraft in combating enemy submarines. Sonobuoys are acoustic sensors which when dropped from aircraft into the water are designed to detect the presence of submarines. Signal processors are computers on board aircraft and ships which analyze sonobuoy data to enhance submarine detection, classification, and localization.

The effectiveness of about $40 billion worth of antisubmarine warfare platforms depends on how well sonobuoys and signal processors perform. History has shown that the significance of these complex and interrelated programs has not been fully recognized or understood. This report presents GAO's views on the major unresolved issues in developing and procuring the expendable reliable acoustic path sonobuoy (ERAPS) and the advanced signal processor.

THE ERAPS PROGRAM NEEDS CRITICAL REVALIDATION

The ERAPS development program is encumbered with many technical problems which are costly and complex. Cumulative development costs through fiscal year 1981 are $30 million and the Navy plans to spend at least $28 million more to complete its development by about 1985. Production costs are not known at this time. The Navy has established a unit cost goal of $5,000 in production quantities of 10,000, but at this stage, the Navy's confidence in the accuracy of these figures is low.

Regarding ERAPS, GAO found that:

--It is the most complex in design and operation of the Navy's tactical sonobuoys. It requires deploying a long cable and other factors which increase technical risk.

--It is not compatible with antisubmarine warfare aircraft without hardware and software modifications. Special handling, storage, safety, training, and maintenance procedures need to be developed.

--The Navy has not proposed a cost-effective mission for it relative to other available sensors or tactics.

--Depending on the quantities procured, its expense could significantly affect the annual sonobuoy budget by requiring the Navy to forego buying other needed sonobuoys.

THE NAVY SHOULD REASSESS THE ADVANCED SIGNAL PROCESSOR PROGRAM

The advanced signal processor was designed to be the Navy's standard processor and to improve antisubmarine warfare capability during the late 1980s and early 1990s. Production costs are not firm and could exceed $1 billion.

Regarding the advanced signal processor, GAO found that:

--The Navy could not provide a total cost estimate for the advanced signal processor. The basic acquisition plan shows about 1,700 planned units, but different configurations of the processor may be brought at prices which range from $466,200 to $1,525,000. The Navy could not provide GAO with estimates of total development and support costs because there are many users. According to Navy officials, these costs could be obtained only from the weapon system program managers.

--Operational testing with the larger memory module has not been completed.

--The concept has been under development for 13 years, but the full benefits of this processor will take several more years to materialize because the needed computer programs--software and advanced processing techniques--will not be available.

--Due to recent rapid advances in computer processing, the signal processor could become technologically obsolete. Also, the Navy predicts that these processors will be functionally inadequate within the next 10 years.

--The Navy has no analyses showing that the advanced signal processor is or can be cost effective in comparison to alternatives. Standardization offers advantages such as reduced development, production, and support costs. Some defense observers believe it inhibits new, lower cost technology and competition, prohibits tailoring to system requirements, and generally increases life-cycle costs.

RECOMMENDATIONS TO THE SECRETARY OF DEFENSE

The ERAPS program has many critical problems. Technical risks are high and it has been around for many years; but the Navy has not demonstrated a cost-effective mission for it. GAO recommends that the Secretary of Defense direct the Navy to provide convincing evidence and a sound justification that technology is at hand and ERAPS is needed. Otherwise, the program, as presently structured, should be terminated.

GAO's recommendation to terminate does not mean that research to advance the technology should not continue if Defense deems that it is essential to future antisubmarine warfare capability. In that case, sonobuoy research should continue and when technology is sufficiently in hand and the feasibility has been demonstrated, a decision can be made whether full-scale development should begin.

In view of acquisition program deficiencies and future Navy plans for signal processing, GAO recommends that, before millions of dollars are appropriated to procure the advanced signal processor, the Secretary of Defense direct the Navy to

--reevaluate and justify the quantity to be acquired and proposed uses for the advanced signal processors currently in the procurement plan;

--fully define the total cost to produce, operate, and support the advanced signal processor, including hardware and software acquisition and integration, software maintenance, integrated logistics support, and spares; and

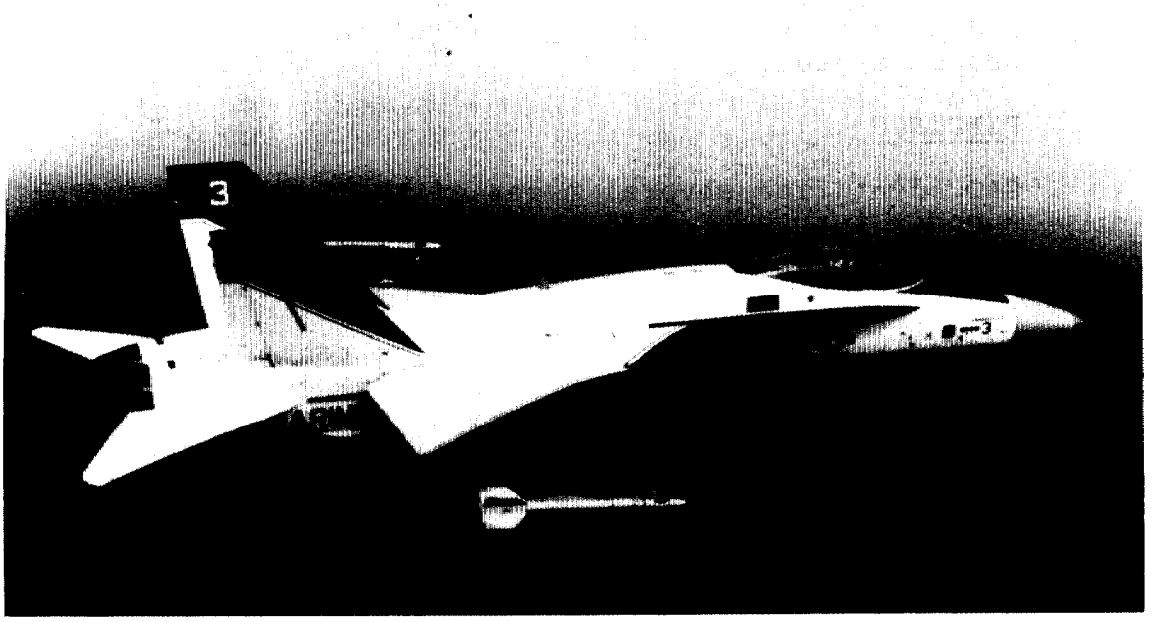
--provide conclusive evidence to demonstrate that the advanced signal processor is cost effective in comparison to alternatives.

VIEWS OF AGENCY 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 the management of these programs and they agreed with the facts presented. The Navy disagreed that ERAPs should be terminated, suggesting instead that it formally review the ERAPS program for technical and operational evaluation before procurement. However, the Navy has not offered tangible evidence in the form of studies, analyses, justifications, or other bases to support continued development of ERAPS. GAO still believes that, unless the Navy provides convincing evidence and a sound justification that technology is at hand and ERAPS is needed, the program should be terminated.

The Navy agrees with GAO's recommendations concerning the advanced signal processor; however, they note that weapon system program managers should be responsible for their implementation. GAO addressses issues critical to the Navy and expects the Navy to appropriately assign responsibilities for carrying them out.

NAVY'S F/A-18 EXPECTED TO BE AN EFFECTIVE PERFORMER BUT PROBLEMS STILL FACE THE PROGRAM



SOURCE: U.S. NAVY

The F/A-18 naval strike fighter is a multi-mission, carrier-suitable aircraft. This twin-engine aircraft will be used by the Navy and the Marine Corps for fighter and light attack missions such as strike escort, fleet air defense, interdiction, and close air support.

The Navy is concentrating on initial training, logistics, and support activities as the F/A-18 development program nears completion. All 9 pilot production aircraft have been delivered to the Navy as well as the first 4 of 25 limited production aircraft. Five aircraft were sent to the initial F/A-18 squadron which will begin training F/A-18 pilots and mechanics beginning in July 1982. The first class will be mostly Marine Corps personnel in preparation for the December 1982 initial operation capability, when the first Marine Corps F/A-18 squadron receives its full complement of aircraft.

The final major milestone, production decision for attack application, is scheduled for the fall of 1982.

At September 30, 1981, program cost to develop and build 1,377 F/A-18s was estimated at $35.3 billion. A $2.6 billion decrease during the past year resulted from lowered projected escalation rates.

WHY THIS REVIEW WAS MADE

GAO reviewed this program to provide the Congress a report on the status of the F/A-18 development. Emphasis was given to existing and potential problems related to the F/A-18 weapon system.

FINDINGS

GAO identified several areas of the logistics support for the F/A-18 that could adversely impact effective maintenance support and operational use of the aircraft. These included:

--F/A-18 pilot training device contractors lack necessary hardware and data to complete development on schedule. Delays in having the trainers available and operational means more flight time in the aircraft to offset the lack of trainer time.

--The pilot training device designed to simulate combat situations will simulate only air-to-air activity. Air-to-ground and electronic counter countermeasures simulations were deleted from the trainer's design. Lack of simulator capability means more flight time in the aircraft and/or a lack of training experience.

--Development problems have caused schedule delays in automatic testing equipment, including essential test program sets. Failure to field this equipment on time means less repair capability and the need for more spares.

During the past year, several Navy tests measured the operational suitability of the F/A-18. Although these tests identified some deficiencies, the overall conclusion drawn was that the F/A-18, with deficiencies corrected, should be able to meet the Navy and the Marine Corps' mission requirements.

Work to resolve technical problems nears completion. Test results indicate corrective actions have been effective for several major problems. Preliminary indications are that corrections to other problems resulted in some improvements, but partial deficiencies remain and actions to correct and test them are underway. The Navy plans to accept some deficiencies.

The F/A-18's program cost, although reduced over the last year by the Navy, is of continuing concern. There are indications that program cost will increase. Likely contributors to the increase are continued use of lower than projected inflation rates and contractors' manufacturing hours continuing at higher than estimated levels. In an effort to counter rising program cost, the Navy identified cost reductions, but significant hard savings have not been realized to date.

Other cost saving measures are available. Foreign sales of the F/A-18 have reduced the cost of the program. Also, GAO believes more competitive procurement, elimination of Board of Inspection and Survey Trials, and deletion of mission-essential equipment from training aircraft could reduce costs.

RECOMMENDATIONS

GAO recommends that the Secretary of Defense direct the Navy to:

--Allocate aircraft hardware between production and trainer development and ensure transfer of flight control system data to permit timely trainer development.

--Incorporate both air-to-ground and electronic counter-countermeasures capability into the operational flight trainer as part of its current development.

--Preclude future reductions in F/A-18 operational readiness due to delayed automatic test equipment. The Navy should (1) evaluate the cost to accelerate development of automatic test equipment versus cost of additional spares to offset the lack of test capability, (2) select the most cost-effective alternative, (3) and budget to adequately support the selected course of action.

--Accelerate implementation of the Navy's proposed cost reduction initiatives, estimated to save $1.2 to $4.6 billion.

--Determine the value to be derived from Board of Inspection and Survey Trials. Unnecessary redundancy between the trials and testing already accomplished should be eliminated.

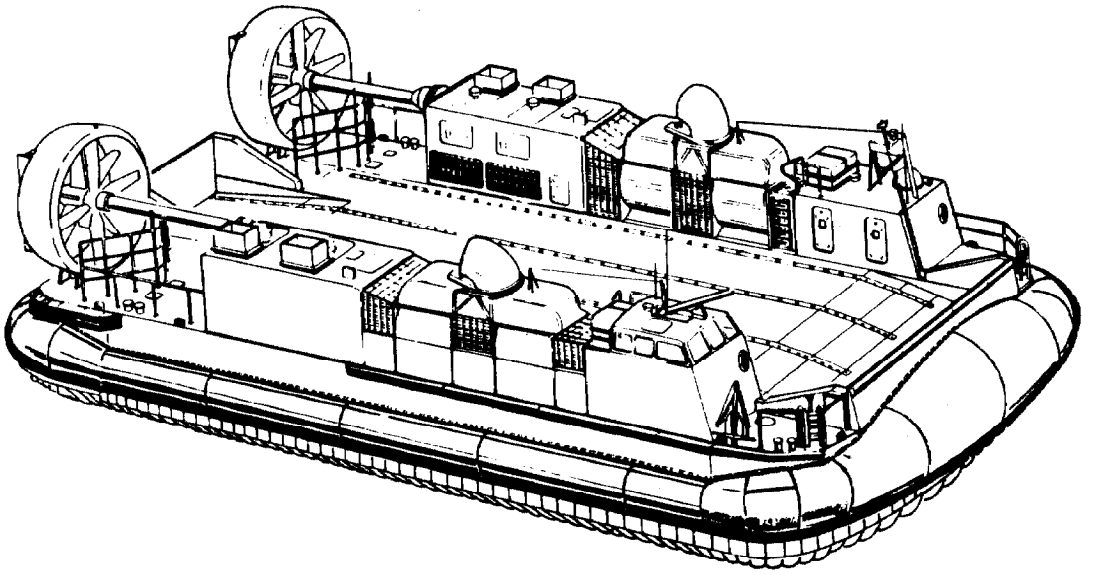
--Delete, to the extent possible, mission-essential equipment from training aircraft, thereby saving substantial procurement (as well as maintenance) cost. For example, if just 40 fewer radars were procured, the Navy could save $50 million.

--Implement competitive procurement of test program sets for an estimated savings of $70 million and explore other situations where competition could be used.

VIEWS OF AGENCY OFFICIALS

GAO did not request official written comments on this report because of the need to issue it in time for congressional consideration of this weapon system. GAO did, however, discuss a draft of this report with high level officials associated with the management of the program and they agreed with the facts presented. Their views are incorporated as appropriate. The Navy disagreed with our recommendation to delete, to the extent possible, mission-essential equipment from training aircraft. They felt such a recommendation would not be feasible or effective. GAO disagrees with the Navy's position. GAO believes the proposed concept is feasible and is supported by the Marine Corps' decision not to include mission-essential equipment on their Harrier trainer aircraft.

THE NAVY'S LANDING CRAFT AIR CUSHION--UNCERTAINTY OVER HOW IT WILL BE USED WITH AMPHIBIOUS FORCES



CONTRACTOR'S DRAWING OF THE SELECTED LANDING CRAFT AIR CUSHION DESIGN. SOURCE: BELL AEROSPACE TEXTRON

The Landing Craft Air Cushion (LCAC) is an advanced design, high-speed air cushion vehicle being developed by the Navy for use in conducting amphibious operations. A $38.6 million contract for long-lead items and detailed design was awarded to Bell Aerospace Textron in June 1981. Total program acquisition costs are estimated at about $3.2 billion, in escalated dollars, for 107 craft.

This review was conducted to provide the Congress with an assessment of the LCAC program as it approaches the start of production in 1982 and to identify important issues which should be considered in progressing to full production in 1985.

LCAC is being developed to replace current landing craft which possess a number of operational performance limitations. Although still being designed, studies conducted and testing completed on full-scale advanced development air cushion vehicles supports LCAC's potential to improve the Navy's surface assault capability.

LCAC is expected to possess a number of operational advantages, such as high overwater speed

and the ability to cross the beach and discharge cargo on firm ground. Navy studies have also identified disadvantages associated with its introduction. These are high cost, increased maintenance requirements, and modifications to ships that will transport LCAC.

There are a number of additional matters which will require special attention and monitoring as the program progresses to the full-scale production decision scheduled for 1985. These are:

--To take full advantage of LCAC's potential operational capabilities, the Navy and the Marine Corps have determined that a revised operational concept and changes to current amphibious operations tactics and doctrine is necessary. It is uncertain as to how the revised concept will affect LCAC's current mission, performance requirements, the number of craft ultimately required, the planned acquisition of a future Marine Corps assault system, and the planning and conduct of future LCAC test and evaluation. The Secretary of the Navy has directed a program review no later than November 1, 1982, to review the LCAC performance thresholds, revised operational concept, and other issues.

--Problems identified during testing of advance development air cushion vehicles which need to be resolved and incorporated in to the LCAC design include propeller and lift fan erosion, corrosion of electrical and electronic components, and the need to decrease craft vulnerability.

--The use of demonstrated, low-risk technology has been used to support LCAC limited production. However, the Navy has identified compressor problems associated with the TF-40B engine under consideration for craft use. Although the Navy believes the engine problem can be solved, an alternative engine, the LM-500, is being studied. Selection of the latter would introduce an additional risk into the program.

--As a result of tests of the advanced development air cushion vehicles, the Navy's Commander, Operational Test and Evaluation Force, stated that LCAC has the potential to be operationally effective. However, the Test Force

cannot comment on LCAC operational suitability, such as reliability, maintainability, and availability, until test and evaluation of a representative craft scheduled for 1985. The Test Force believes LCAC's operational suitability represents an area of risk because it has not been tested.

--Prior to test and evaluation of a representative craft scheduled in 1985, the Navy plans limited production of 12 LCACs at a cost of $343 million. This increases the importance of maintaining a low-risk program and conducting periodic reviews to monitor and ensure the timely resolution of program issues.

--In October 1980 the Deputy Secretary of Defense, citing low risk as a basis, waived the first scheduled LCAC major milestone review at full-scale development. Then in June 1981 the program was designated a nonmajor acquisition because the dollar threshold criteria used for designating major systems increased. The Secretary of the Navy was then designated the decision authority for future program reviews. While this delegation of authority is consistent with current Defense initiatives, recent decisions have increased the program size to where cost is now estimated to be $3.2 billion. As such, it should be a high visibility program necessitating close monitoring.

--LCAC is not presently on the Selected Acquisition Report system. As a result, high-level visibility by top Office of the Secretary of Defense management and congressional oversight committees is not available in the same way as Selected Acquisition Report-designated systems. This lack of visibility deprives key decisionmakers of a useful management tool.

COMING EVENTS

The first major program review, to be held no later than November 1, 1982, will be extremely important in ensuring that LCAC's acquisition strategy is appropriate and can be achieved.

RECOMMENDATIONS TO THE SECRETARY OF DEFENSE

Although the Secretary of the Navy has been designated the decision authority for future

LCAC program reviews, the Secretary of Defense is the ultimate decisionmaker on all weapon system acquisitions, in that he has the final say over the budget preparation in the Department of Defense. Because the Secretary of Defense will not be directly involved in detailed reviews of the program, and in accordance with the new Defense acquisition initiatives, GAO recommends that the Secretary, as a minimum, closely scrutinize the Navy's acquisitions plans for LCAC during the Program Objective Memorandum and the Program, Planning, and Budgeting System reviews. This would include determining how

--the revised LCAC operational concept will influence craft performance requirements, system design, number to be procured, and program cost;

--LCAC will interface with and influence the composition of future surface assault forces, such as the Marine Corps LVT-X program; and

--the LCAC test program is being structured to ensure that any changes in the craft's performance thresholds as a result of agreements reached on the operational concept have been incorporated into the future test plan.

GAO also recommends that the Secretary of Defense direct the Secretary of the Navy to make sure the ongoing lead production effort, regardless of its size, provides adequate milestones for monitoring cost, schedule, and performance progress. Special attention should also be given to those matters not specifically planned for the Secretary of the Navy review scheduled for no later than November 1, 1982, including

--the effect engine selection will have on the program as currently structured;

--accumulation of assessable reliability, maintainability, and availability data; and

--the incorporation into the LCAC design of solutions to problems identified during testing of advance development air cushion vehicles, including propeller and lift fan erosion, corrosion of electrical and electronic components, and the need to decrease craft vulnerability.

GAO further recommends that the Secretary of Defense require preparation of Selected Acquisition Reports on LCAC beginning with the April 1982 quarter. This would provide decisionmakers and the Congress with valuable information.

MATTERS FOR CONSIDERATION BY THE CONGRESS

Although LCAC has been designated as a nonmajor acquisition, GAO believes the program demands high visibility by top Department of Defense management and congressional oversight committees. The Congress should pay particular attention to the actions surrounding the acquisition of this multibillion dollar program. The critical management actions identified in this report and the forthcoming decisions to acquire LCAC will have significant budgetary implications for years to come.

VIEWS OF PROGRAM OFFICIALS

GAO did not request official comments on this report because of the need to issue it 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 incorporated as appropriate.

ALTERNATIVES ARE AVAILABLE WHICH CAN REDUCE COSTS OF THE LAMPS MK III PROGRAM

A LIGHT AIRBORNE MULTI-PURPOSE SYSTEM (LAMPS) MK III HELICOPTER LANDING ABOARD A GUIDED MISSILE FRIGATE. SOURCE: U.S. NAVY

A January 27, 1981, letter from the chairman, House Committee on Appropriations requested that we review the program cost and, because of the inordinate cost growth experienced over the years, examine potential cost reduction alternatives to the Light Airborne Multipurpose System (LAMPS) MK III antisubmarine warfare system. We agreed to determine whether current estimates of the program's total cost are complete or whether additional cost increases can be expected.

In conducting this review, we examined Navy and contractor cost data, reviewed Navy and Army studies related to program and contractor costs, and interviewed Navy officials. Also, through an examination of LAMPS MK III mission requirements, technical capabilities, operating tactics, force levels, and the present and projected threats, we identified management actions and program alternatives which could be taken to reduce costs. Through discussions with Navy and Department of Defense (DOD) officials and reviews of various Navy and contractor studies, we analyzed these alternatives to determine their effect on mission capabilities and performance characteristics. We estimated the potential cost savings of each alternative based on the current program schedule and procurement rate. Because we could not foresee whether any or all of these alternatives would be undertaken, we did not attempt to evaluate what effect they would have on unit costs as determined by the current program schedule.

Program uncertainties still exist which could result in further cost increases of up to $1 billion. On May 1, 1981, the Navy released a report on the causes of cost growth and indicated that program costs may still be underestimated. They identified potential growth of $925 million due to underestimated helicopter and ship construction costs, contractor overhead, subcontractor costs, and use of optimistic inflation rates. The report also warned that an additional $140 to $300 million growth could result depending upon manufacturing learning curves experienced; the prices of critical metals, avionics, and shipboard electronics items; manufacturing control; and stability of production rates.

Several management actions which could be taken by DOD offer potential for cost reductions in the LAMPS MK III program. One such action is the use of multiyear contracting, while other actions relate to the consideration of lower cost alternatives to the system at some sacrifice in total mission capability.

The LAMPS program exhibits certain characteristics such as large quantity, high cost, and an extended procurement schedule which should make it a candidate for multiyear contracting. The LAMPS helicopter airframe and engines are derivatives of the Army's Black Hawk helicopter which is presently being considered as a candidate for multiyear contracting. While there presently are statutory restrictions which preclude multiyear contracting on a program of this magnitude, legislation has been approved with differing language in both the House and Senate authorization bills which would permit use of this practice. DOD indicates that multiyear contracting could result in average dollar savings of 10 to 20 percent in unit production cost. Based on DOD's most conservative estimate, a cost reduction of approximately $388 million could be achieved if the LAMPS MK III airframe and engines were procured under multiyear contracting.

Regarding other actions which can be taken to reduce LAMPS MK III program costs, we analyzed a series of alternatives both in and outside of the program. Among the alternatives we considered were (1) purchasing fewer LAMPS MK III weapon systems, (2) purchasing less costly radar and electronic support measures equipment, (3) reducing the number of LAMPS MK III ships scheduled for retrofitting, and (4) eliminating the LAMPS MK III system from the CG-47 class cruisers. If these alternative actions were implemented, reductions in terms of reduced procurement costs of $970 to $1,850 million could be achieved. We feel that several of these alternatives deserve close scrutiny by both the Congress and DOD when contemplating the future scope and funding of the LAMPS MK III program. However, when considering these alternatives, it is essential that the trade-off of overall antisubmarine warfare capabilities and individual performance characteristics be carefully weighed against the potential cost savings.

We also analyzed other alternatives such as eliminating the LAMPS MK III procurement entirely or replacing it with the LAMPS MK I or Westland Lynx helicopters. In view of the identified

threat, either one of these alternatives would be unacceptable because of the severe effect on antisubmarine warfare capability.

Although not directly related to the chairman's request, we are including a discussion of the updated threat the LAMPS MK III system will encounter when it is fully deployed. Recent threat analyses indicate the system will face a significantly greater threat than that which was envisioned when it was originally authorized. We believe recent threat developments could seriously alter the antisubmarine warfare effectiveness of the LAMPS MK III system, and if so, may result in the need for fewer systems than presently planned. Also, because of changes in the threat, it appears that the balance between antisubmarine warfare and antiair warfare assets needs to be reassessed.

RECOMMENDATIONS TO THE HOUSE COMMITTEE ON APPROPRIATIONS

We recommend that the House Committee on Appropriations:

--Require DOD, if multiyear contracting is approved by the Congress, to make a determination regarding the appropriateness of LAMPS MK III for multiyear contracting. If cost savings can be validated, LAMPS MK III could then be funded on a multiyear basis.

--Explore with DOD the other cost reduction alternatives and encourage a final decision be made as to the future course of the LAMPS program.

Additional information on these issues is included in a classified supplement to this letter provided to the chairman's office under separate cover. (C-MASAD-81-20S)

Agency comments

On February 12, 1982, Defense informed us that multiyear contracting was discussed and viewed with favor during a recent major review within the Department of the LAMPS MK III program. Although much remains to be done to determine the payoff, the Navy and the Army have begun to quantify the advantages of joint multiyear procurement of common components.

Regarding the other cost reduction alternatives, Defense considers all to be candidates for consideration, with the exception of changing the radar and electronic support measures equipment. They believe the planned radar and electronic support measures equipment are more capable than the alternatives suggested in the report and will enhance the flexibility of the LAMPS MK III system.

Finally, Defense noted that our principal alternatives all involve reducing the number of LAMPS MK III systems to be procured. Defense believes this would result in a reduction in aggregate capability of which the impact has not been determined. In view of this, they took issue with the report's handling of battle group defense and the Soviet threat. Defense stated that these matters are being reviewed and will be considered in arriving at a full-scale production decision at Defense Systems Acquisition Review Council III, scheduled for July 1982, and in the planning, programing, and budgeting cycle as appropriate.

DEFENSE PLANS TO DEPLOY SOME CRUISE MISSILES BEFORE THEY ARE READY

Tomahawk cruise missiles--subsonic, jet-powered airframes designed to deliver nuclear or conventional warheads--can be launched from the air, sea, and ground. Five variants of the missile are being acquired for use against various land and sea targets. The Department of Defense has placed a high national priority on the deployment of cruise missiles, which military analysts believe can be more cost effective than aircraft in attacking some heavily defended targets.

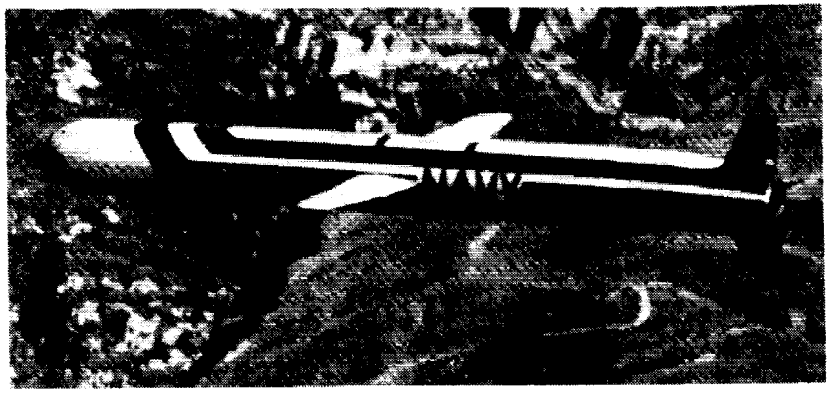
Full-scale production decisions for the submarine launched Tomahawk conventional land attack and antiship missiles are currently scheduled for May 1982, with initial deployment of missiles produced during limited production scheduled for June 1982--full-scale production decisions for these missiles were previously scheduled for December 1981. Initial deployment of other Tomahawk variants are scheduled between 1983 and 1985. Together, the five Tomahawk variants represents a program cost of over $10 billion.

This report is part of GAO's annual review efforts to provide the Congress with an independent evaluation of certain weapon system programs and with information to consider when making judgments concerning some cruise missile programs.

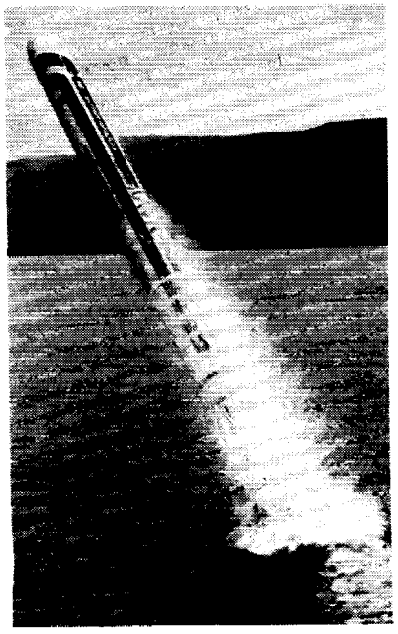
TOMAHAWK CONVENTIONAL LAND ATTACK CRUISE MISSILE MAY BE DEPLOYED WITH LIMITED CAPABILITIES

Because of problems during operational testing, the Tomahawk conventional land attack cruise missile full-scale production decision has been delayed to May 1982 and initial deployment to June 1982. If deployed as currently scheduled, the missile will not be fully capable because:

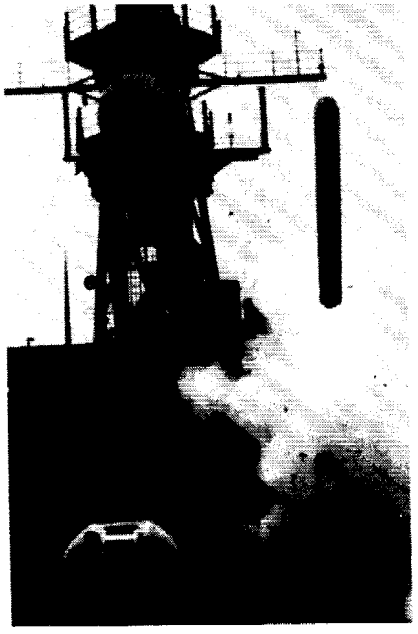
--It can not effectively attack certain important targets with the attack options and conventional warheads currently available.



AGM–109 TOMAHAWK CRUISE MISSILE



SUBMARINE LAUNCHED



SHIP LAUNCHED

GROUND LAUNCHED

--It will not be able to attack most potential targets in certain geographical areas because guidance maps have not been prepared.

--Questions concerning the missile's survivability remain unresolved.

TOMAHAWK ANTISHIP CRUISE MISSILE MAY ALSO BE DEPLOYED WITH LIMITED CAPABILITIES

Because of problems and delays in operational testing, the Tomahawk antiship cruise missile production decision has also been delayed to May 1982, and initial deployment to June 1982. Unless improvements are made, the missile's effectiveness will be limited when it is initially deployed and the numbers required could increase significantly. Specifically:

--Recent test results show problems in accurately targeting the missile. Unless soon to be released evaluations or future testing show improvements, the antiship missile's effectiveness may be limited when deployed.

--Questions concerning the missile's survivability could have a significant impact on its effectiveness.

--If the missile is used against secondary targets and current missile limitations are considered, the number of missiles currently approved may not be adequate to satisfy mission needs.

--Recent Navy studies indicate that disabling a target is not a simple matter.

GROUND LAUNCHED AND MEDIUM RANGE AIR-TO-SURFACE MISSILES

Apart from its performance as an integrated system, which has not yet been tested in an operational environment, the principal issue in the ground launched cruise missile program is the total number which will eventually be required. Both the location and number of missiles eventually deployed could be affected by such matters as the recently resumed arms talks between the United States and the Soviet Union.

The latest Tomahawk variant--the medium range air-to-surface missile--is to be used by both the Navy and the Air Force. Since the development of the missile began, in March 1980, the Navy has repeatedly attempted to avoid funding its portion of the program's cost. This raises possible questions about the Navy's need as well as their commitment to procure this missile.

Also, the Department of Defense has not yet begun to include the medium range air-to-surface missile in the Selected Acquisition Reporting system. The program is currently in full-scale engineering development and is expected to cost $4.5 billion.

CONCLUSIONS AND RECOMMENDATIONS

Because of two test flight failures, the Tomahawk conventional land attack cruise missile's full-scale production decision has been delayed to May 1982 and initial deployment to June 1982. If deployed as scheduled, the types and geographical locations of targets it will be able to effectively attack will be limited. These limited attack capabilities could become critical if certain improvements are not made before the missiles are deployed in significant numbers. These include the development of improved software, alternative warheads, and additional guidance maps. Since initial deployment will involve a small number of missiles, the limited capabilities of the missile may not be a problem because there should be a sufficient number of targets available which it can effectively attack. However, if deployed in significant numbers with its current limitations, the result could be the proliferation of missiles which cannot be fully used against a wide spectrum of high value targets. Thus, an approach needs to be taken which would tailor the production and deployment of the Tomahawk conventional land attack missile to the availability of targets it can effectively attack.

GAO, therefore, recommends that the Secretary of Defense direct the Secretary of the Navy to limit fiscal year 1983 and later year production rates of the Tomahawk conventional land attack missile to those which can be effectively used against a wide spectrum of high value targets.

Because of problems and delays in operational testing, the Tomahawk antiship missile's full-scale production decision has also been delayed to May 1982. Nevertheless, the Navy still expects to meet its scheduled initial deployment date of June 1982. Unless improvements are made, the missile's effectiveness will be limited when it is initially deployed. These limitations, in addition to the possibility of expanding the missile's target base, raise questions about the number of missiles required and the eventual cost of the program.

The eventual cost of the program cannot be determined until an inventory objective is established which takes into consideration the missiles' limitations and potential additions to its target base. Accordingly, GAO recommends that the Secretary of Defense direct the Secretary of the Navy to establish a total inventory objective for the missile which is based upon its limitations and potential additions to its target base. GAO further recommends that any changes which result, in terms of numbers needed and its affect on program cost, be included in the Selected Acquisition Reporting system.

GAO also recommends that the Secretary of Defense:

--Reevaluate the Navy's need for the medium range air-to-surface missile. If the need for the missile is reaffirmed, the Secretary should ensure that adequate funding is provided by the Navy to meet the missile's projected deployment date or revise the scheduled deployment date as appropriate.

--Require that the medium range air-to-surface missile be included in the Selected Acquisition Reporting system.

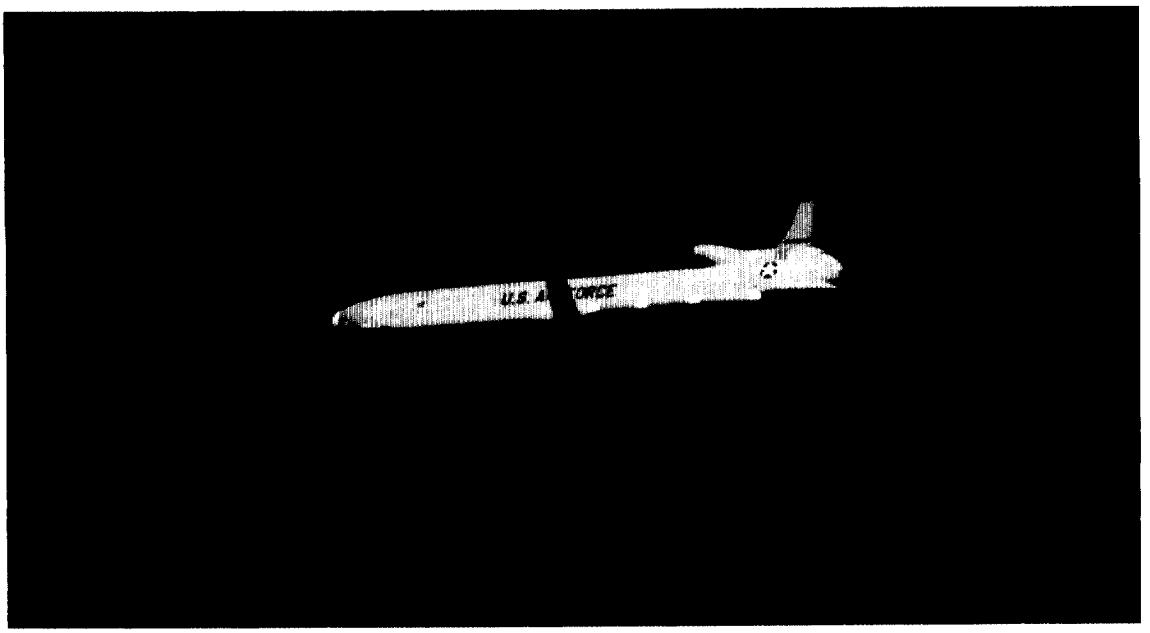
VIEWS OF PROGRAM OFFICIALS

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 the report with high level officials associated with management of the program and they agreed with the facts presented. Their views are incorporated as appropriate.

CHAPTER 6

AIR FORCE PROGRAMS

AIR LAUNCHED CRUISE MISSILE SHOWS PROMISE BUT PROBLEMS COULD RESULT IN OPERATIONAL LIMITATIONS



SOURCE: U.S. AIR FORCE

The Air Launched Cruise Missile (ALCM) is a subsonic, jet-powered airframe armed with a nuclear warhead for use against a variety of targets. ALCM uses sophisticated navigational aids for flying at low altitudes, avoiding detection, and for obtaining a high degree of accuracy in striking targets. ALCM is to be used with the bomber component of U.S. strategic offensive forces.

This report is part of GAO's annual review efforts to provide the Congress with an independent evaluation of certain weapon system programs, and with information to consider when making judgments concerning the ALCM program. The Department of Defense has placed the highest national priority on the deployment of ALCM to preclude shortfalls in strategic weapons in the 1980s.

On September 30, 1981, ALCM attained first alert capability status, a major program milestone leading to initial operational capability planned for December 1982. First alert capability refers to 1 B-52G bomber capable of alert status and

equipped with (1) an offensive avionics system, (2) 12 external ALCMs, and (3) internal short-range missiles and/or gravity bombs. Initial operational capability requires a B-52G squadron--16 aircraft--similarly equipped.

Meeting initial operational capability in December 1982 with a fully operational missile may be achievable, albeit difficult. There are problems to be resolved, solutions to be evaluated, and considerable testing to be performed. The seriousness of current and potential problems and the speed with which they can be resolved will determine whether this date can be successfully met.

PROBLEMS IDENTIFIED IN OPERATIONAL TESTING

Although the first alert capability milestone was met, the program has not been an unqualified success. While recent testing has been successful and has demonstrated that ALCM has the potential to perform its mission, problems have been identified which require corrective action to realize its full potential. Specifically:

--Operational testing completed prior to first alert capability was insufficient to provide a complete evaluation. Based on the testing completed, the Air Force's independent test unit rated operational effectiveness and operational suitability deficient.

--Testing has not been operationally realistic. The Air Force intends to implement testing in a more realistic environment in late 1982 or early 1983. However, this allows no time to implement corrective actions, if needed, prior to initial operational capability planned for December 1982.

--The uploading of ALCM pylons to the B-52 is rated deficient by the Air Force's independent testers. The process takes excessive time even when performed by highly trained personnel. If not corrected, this could reduce the number of aircraft which can be successfully readied in an emergency situation.

TESTING IS BEHIND SCHEDULE

Testing is behind schedule and has delayed the identification of possible additional problems.

This is characteristic of highly concurrent programs and underlines the necessity to further complete the development process and avoid deploying ALCMs in significant numbers with operational limitations which may require costly modifications. Much testing remains to be done before the initial operational capability milestone to ensure that the deficiencies identified during testing can be adequately resolved. Specifically:

--Two ALCM test launches which were to have been completed by March 1981 were deferred until after first alert capability in September 1981. Air Force officials said that these tests were recently completed and were considered successful. GAO however, did not have sufficient time to review and comment on the test results. Offensive avionics system testing, including testing integrated with a B-52, is also behind schedule.

--Engine performance is a serious concern. Its reliability and the effects of long-term dormant storage are still unknown. Initial testing of engine storage reliability is not scheduled to be completed until about mid-1983, nearly 2 years after initial deployment and 1/2 year after initial operational capability.

--The mission planning system has experienced development problems and is also behind schedule. This system must work well if ALCM is to be used as planned. Testing, however, of the fully integrated system is not to occur until after initial operational capability.

MATTERS FOR CONSIDERATION BY THE CONGRESS

It is questionable whether ALCM can meet its initial operational capability in December 1982 and it appears the risk is increasing that initial operational capability may not be met with a fully operational missile. The initial operational capability milestone seems to have been the driving force in the premature completion of other milestones and has raised concern. GAO believes that unless this matter is resolved, ALCM could be deployed in significant numbers with operational limitations which may require costly modifications.

The Congress should consider funding only limited quantities of ALCMs unless the problems have been resolved or at least minimized to the point where there is little risk that missiles with limited capabilities will not be deployed in significant numbers.

SURVIVABILITY IS A CONCERN

ALCM's survivability against Soviet defenses is a concern to the U.S. intelligence community and others in the Department of Defense when calculating the longevity of the weapon as a credible deterrent. The Soviet Union may at some time in the future devise threat systems that place the current generation of ALCM at risk, diminishing its effectiveness to an unacceptable level. Survivability is a complex issue; therefore, estimates of the missile's survivability are highly dependent on several assumptions, such as the number of enemy defenses deployed, the effectiveness of these defenses, and the success of U.S. forces in neutralizing these threats. The Department of Defense has begun efforts to improve the survivability of both the missile and its carrier aircraft.

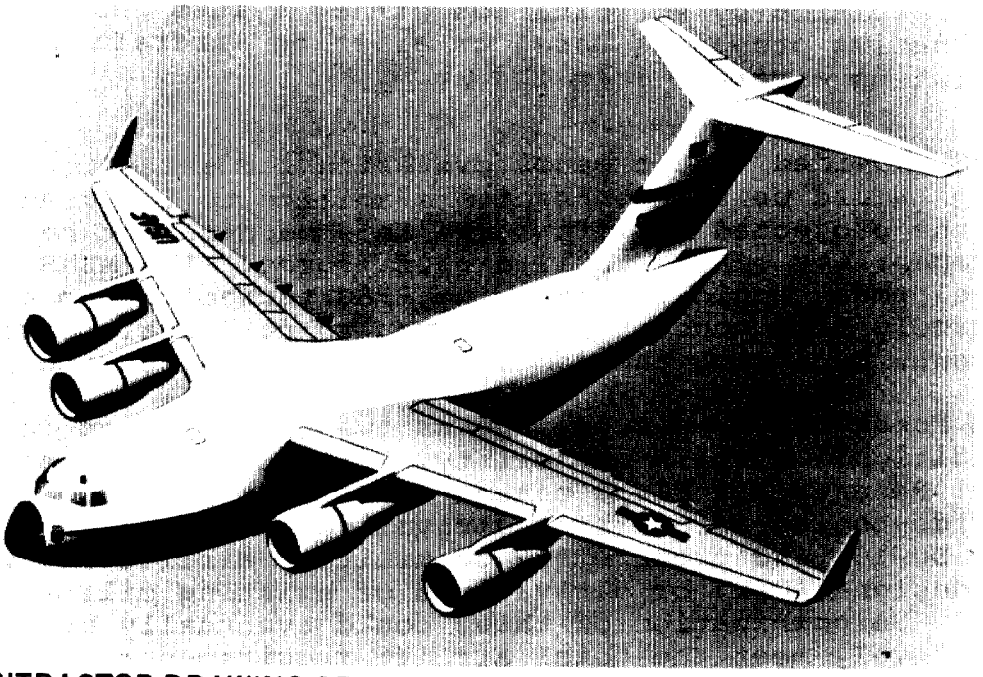
VIEWS OF PROGRAM OFFICIALS

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 the management of the program and they agreed with the facts presented. Their views are included as appropriate.

They disagreed that the Congress should consider funding only limited quantities of ALCMs unless the problems have been resolved or at least minimized to the point where there is a minimal risk that missiles with limited capabilities will not be deployed in significant numbers. Specifically, they disagreed because testing to date has shown that many of the problems experienced early in the ALCM test missions have been resolved and that the Air Force is committed to procure ALCM at a rate consistent with force structure requirements to preclude shortfalls in U.S. strategic capabilities. They further stated that any interruption in ALCM quantities would adversely impact these capabilities.

Although GAO agrees that recent testing has been successful, and shortfalls in strategic capabilities are an important concern, problems have been identified which require corrective action to realize the missile's full potential. Also, testing is behind schedule and has delayed the identification of possible additional problems. This is characteristic of highly concurrent programs and underlines the necessity to further complete the development process and avoid deploying ALCM in significant numbers with operational limitations which may require costly modifications. Much testing remains to ensure that the deficiencies identified during testing can be adequately resolved before initial operational capability.

U.S. AIRLIFT REQUIREMENTS SHOULD BE SATISFIED THROUGH COMPETITION



CONTRACTOR DRAWING OF THE SELECTED CX AIRCRAFT DESIGN.

SOURCE: U.S. AIR FORCE

Our review of the Air Force's C-X airlift aircraft program shows that the Department of Defense may not solicit the maximum practicable competition if an airlifter other than the C-X is to be selected to meet U.S. airlift requirements. Failure to do so could result in sole-source awards for multibillion dollar systems without permitting industry the opportunity to make proposals for an aircraft with different size and capabilities than the C-X. Realizing there are trade-offs, every effort should be made to obtain the best mix of modern, capable, and economical systems possible since they will probably be in the Air Force inventory well into the next century.

In conducting our work we reviewed program documents, proposals, correspondence, and other pertinent records and information. We discussed the program with officials within the Office of the Secretary of Defense; Headquarters, United States Air Force; and the Air Force Systems Command's Aeronautical Systems Division.

BACKGROUND

The need for additional airlift capability is documented in a Mission Element Need Statement (MENS) which was approved by your office on November 28, 1980. The MENS provides that a small austere airfield capability is a desirable feature but "the feasibility of requiring this capability will depend upon the extent of its penalty to the primary mission, which is intertheater airlift."

With regard to the acquisition strategy to be followed in acquiring a new airlift aircraft, the MENS stated that the intent was to maximize early competition by solicitation of new system designs as well as alternative proposals based on existing aircraft and derivatives of existing aircraft from industry.

The MENS provided that a major criterion for selection of the winning design would be the contractor's ability to integrate its design with the projected airlift force in a manner that best enhanced the capability of the total airlift force. The MENS stated that the development would use existing 1980 technology to allow movement directly from concept formulation to full-scale engineering development, bypassing the demonstration and validation phase.

The Air Force has been studying various alternatives for obtaining additional airlift capability. Alternatives considered include Civil Reserve Air Fleet enhancements; the procurement of commercial wide-bodied aircraft or derivatives thereof, such as the B-747 or DC-10; and procurement of military airlifters, which include new designs (C-X) or derivatives of existing military airlifters (C-5). A combination of these could eventually be acquired to most effectively meet the total airlift requirements. The Air Force, however, has recommended procurement of the C-X as the desired military airlifter.

The Congress did not appropriate funds for the C-X program for fiscal year 1982. Instead, $505 million was appropriated to initiate the procurement of wide-bodied aircraft.

ADDITIONAL COMPETITION MAY BE NEEDED

The acquisition of additional military airlift capability has centered largely around the C-X aircraft and the C-5 aircraft. The C-X Request For Proposal (RFP) was released to industry in October 1980. It provided for consideration of both a newly designed aircraft as well as alternate proposals for derivatives of existing aircraft if these proposals met the basic RFP requirements, which included a small austere airfield capability. Boeing, Lockheed, and McDonnell-Douglas submitted proposals for a newly designed C-X aircraft. Lockheed also submitted an alternative proposal for the C-5 aircraft.

In April 1981 the Secretary of the Air Force announced that Lockheed's alternative C-5 proposal did not meet the minimum C-X RFP requirements and would not be considered any further in the C-X competition. The Secretary announced that the C-5 would be considered by the Air Force as a separate alternative for the acquisition of an airlifter. Lockheed subsequently submitted several unsolicited C-5 proposals to both the Air Force and your

office. The September 1981 C-5 proposal is known as the C-5N. Also, Boeing has proposed the B-747 wide-bodied aircraft as an alternative.

The Air Force completed its evaluation of C-X proposals and in August 1981 the Secretary of the Air Force announced that McDonnell-Douglas was the winner of the C-X competition. The McDonnell-Douglas design was then designated as the C-17 by the Air Force.

The Air Force performed a comparative evaluation of several airlift options and concluded that the C-17 was the most cost-effective military airlifter to meet the airlift requirements identified in the Congressionally Mandated Mobility Study. The study was prepared as a result of the Department of Defense Authorization Act of 1981. The Air Force advised your office in August 1981 that a combination of the C-17 and the Civil Reserve Air Fleet was the recommended solution to best meet airlift needs. The Air Force also advised you on September 22, 1981, that the C-17 could better meet airlift requirements than the C-5N. We understand your office is still considering the C-5N and other aircraft for acquisition as a military airlifter.

CONCLUSIONS AND RECOMMENDATIONS

The Air Force analyzed both new and existing military airlifter designs and determined over an extended period of time that the C-X (C-17) is the most cost-effective choice between new or existing military airlifter designs to meet most of the airlift shortfalls. If an aircraft other than the C-X is to be selected, as indicated by recent congressional appropriations and the continued consideration of the C-5N and other alternatives, then industry should be given the opportunity to compete on aircraft of that size and capability. Failure to do so could constitute sole-source awards for multibillion dollar systems without permitting industry to submit proposals for an aircraft with different size and capabilities than the C-X.

In light of recent actions by the Congress to not fund the C-X but to appropriate $50 million for initiating procurement of existing wide-bodied aircraft, the procurement of an airlifter other than the C-X will probably be initiated in the near future. There has not been, however, any recent indication on the part of the Department of Defense to introduce competition among the potential suppliers of these other airlifters. To avoid unduly restricting competition, we recommend that the Secretary of Defense direct the Air Force to solicit the maximum competition practicable for airlifters being considered to satisfy mission shortfalls.

Agency comments

Defense rejected our recommendation for competition on airlifters being considered to satisfy mission shortfalls. In its March 12, 1982, response, Defense concluded that competition in this instance would unduly delay satisfying a critical requirement, would likely result in additional costs to the Government, and is not practicable.

Defense's justification for sole-source acquisition of the C-5 is based on many conclusions about the extent and nature of airlift requirements and cost effectiveness of alternative solutions. One conclusion implicit in the decision is that near-term airlift enhancement must include acquisition of increased outsize airlift capability and another is that other alternative acquisitions would not be as cost effective in meeting the Administration's goals in the near term. We are reviewing the validity of these and other key conclusions leading to the near-term acquisition proposal.

QUESTIONABLE USE OF THE C-X AND OTHER AIR FORCE WEAPON SYSTEM FUNDS

In our letter of March 9, 1981, we advised the Secretary of Defense of our plans to review 21 weapon systems, including the Air Force's C-X airlift aircraft program. The objective of these reviews is to provide the Congress with reports on key issues peculiar to each system. Reporting on these systems depends on the significance of the matters disclosed and the timing of critical decisions to be made by the Congress or the Department of Defense.

The C-X is one of several weapon systems being managed by the Deputy of Airlift and Trainer Systems (Deputy for Airlift), Aeronautical Systems Division (ASD), Air Force Systems Command (AFSC), Wright-Patterson Air Force Base, Ohio. Some matters concerning the Air Force's use of weapon system funds came to our attention during our review of the C-X which we believe warrant your attention. Specifically, about $531,000, or 36 percent, of the C-X funds released by AFSC to ASD's C-X System Program Office (SPO) as of July 1, 1981, had been allocated for a building renovation, purchase of general-purpose automatic data processing equipment, and a management information system study. In our opinion, we question whether these funds have been used in a manner contrary to the intent of the congressional approval of the C-X program. Also, the continuing use of C-X funds in this manner may be inappropriate because the costs for such general-purpose projects, which are necessary for ASD to carry out its basic mission of developing and acquiring weapon systems, are normally charged to acquisition and command support funds rather than mission program funds.

Although our review was primarily limited to the C-X program, we also obtained some information on other systems (C-5, KC-135, and companion trainer aircraft) managed by the Deputy for Airlift. These practices were also being applied to these other systems.

At this time, we do not know what practices are followed on other Air Force services' programs, but we plan to look into that in the future. This matter is being brought to the attention of the Secretary of the Air Force in order that a determination can be made concerning whether these practices whether these practices are appropriate and whether new policies and procedures should be implemented to preclude these practices from continuing.

INTRODUCTION

In November 1979 the Air Force formed a task force with Army and Marine Corps participation to define future airlift requirements for the worldwide deployment of U.S. forces. The task force documented significant shortfalls in long-range intertheater as well as intratheater airlift capabilities. To meet these requirements, the Air Force has proposed the C-X, an aircraft which can carry larger loads than the C-141 but about half as much as the C-5.

Limited congressional approval of the C-X program

Only $35 million of the Air Force's request of $81 million for the C-X was approved by the Congress in the Department of Defense Authorization Act for Fiscal Year 1981. Both the House and Senate Armed Services Committees were not convinced that the C-X was a good approach to meeting stated requirements. Furthermore, the House committee felt that the C-X was not adequately justified, was not sequenced with sealift deficiencies, and did not address near-term lift deficiencies. The act required the Secretary of Defense to review U.S. strategic mobility capabilities in more detail in the Congressional Mandated Mobility Study (CMMS). The CMMS, due February 1, 1981, was to consider capabilities and requirements in the Indian Ocean and Persian Gulf regions as well as the North Atlantic Treaty Organization theater. It was also to make cost comparisons. The act authorized up to $35 million for the C-X program, but expressly stated that none of the funds were to be used for full-scale engineering development of the aircraft until the Secretary of Defense made certain certifications regarding such matters as airlift requirements and technical feasibility. The act provided that no more than $15 million could be obligated or expended before February 1, 1981, and that the remaining $20 million could not be obligated or expended before 60 days following the submission of the CMMS to the Congress.

Both the House and Senate Appropriations Committees concurred with the CMMS requirements and limited funding for the program. The House conferees made it clear, however, that their conditional approval did not constitute an agreement to start a several billion dollar program to develop a new airlifter.

Although the fiscal year 1981 Defense Appropriation Act did not expressly provide for the C-X, the act did contain the aforementioned CMMS and certification requirements. In response, the CMMS was submitted on May 21, 1981, but the required certifications have not yet been submitted.

Funding categories

The Department of Defense allocates its research, development, test, and evaluation appropriations into two major categories:

mission programs and management and support programs. Each category is comprised of many individual program elements (PEs).

Mission programs include all the research, development, test, and evaluation work performed under contract or in-house for the purpose of developing and acquiring weapon systems. The C-X (PE 64231F) is one of many mission programs. Management and support programs include acquisition and command support (PE 65806F) which provide the support resources for AFSC and ASD scientists, engineers, and managers who actually develop and acquire future Air Force weapon systems. Support resources includes civilian pay, rents, heat and lighting, computer time, printing services, travel and transportation, supplies, equipment, and contract services. Contract services include, among other things, facility maintenance, repair, and minor construction projects and installation of related equipment.

QUESTIONABLE USE OF C-X AND OTHER AIR FORCE WEAPON SYSTEM FUNDS

Of the $35 million authorized for the C-X, $1.47 million had been released as of May 1, 1981, to the C-X SPO within the ASD Deputy for Airlift. About $531,000, or 36 percent, of these mission program funds have been allocated for projects which are normally funded with acquisition and command support funds--a building renovation, purchase of general-purpose automatic data processing equipment, and a management information system study.

Building renovations

Building 17 at Wright-Patterson Air Force Base is being renovated to house the new C-X SPO. The DD Forms 1391 (Military Construction Project Data) for the renovation showed that fiscal year 1980 acquisition and command support funds (PE 65806F) were to be used. The most current (August 1980) DD Forms 1391 for the renovation showed that the total estimated cost was $720,000. The Deputy for Airlift was directed by ASD to do the renovation, and the deputy agreed to fund $365,000 of the renovation with C-X mission program funds, while the balance of $355,000 was to be funded with ASD acquisition and command support funds.

A contract was awarded to the lowest bidder in January 1981 to renovate Building 17 at a cost of $437,256. The contract includes $145,973 for minor construction, $273,469 for maintenance and repair, and $17,814 for equipment. The contract cited fiscal year 1981 C-X funds (PE 64231F) totaling $126,956 and $310,300 of fiscal year 1980 acquisition and command support funds (PE 65806F). As of July 1, 1981, the renovation was about 31-percent complete.

In March 1981, after the release of additional C-X mission funds by AFSC, the Deputy for Airlift provided an additional $238,044 of C-X funds, bringing the total C-X funding up to $365,000 for the renovation of Building 17. We were advised in

May 1981 that the remaining $72,256 of Building 17 renovation cost would remain funded with acquisition and command support funds.

It was originally intended that the $238,044 of C-X funds would be used for the renovation contract, thus releasing an equal amount of fiscal year 1980 acquisition and command support funds for use on other fiscal year 1980 projects. After receiving a draft of this report, the ASD Comptroller initiated action that resulted in a decision to restore the $238,044 to the C-X account. In July 1981, the Air Force said that the $238,044 had been restored to the C-X account because there were no approved fiscal year 1980 projects which could be initiated within the few months remaining in the fiscal year to obligate the released acquisition and command support funds.

The Deputy for Airlift also provided $130,000 of companion trainer aircraft funds for the renovation of Building 91 at Wright-Patterson Air Force Base. The deputy also plans to provide funds from the KC-135 reengining program to renovate a portion of Building 56.

Purchase of general-purpose automatic data processing equipment

ASD is in the process of acquiring an automated management system (AMS). The AMS concept was developed to enhance the working capability of each SPO through the use of common systems on standard hardware. AMS is a family of minicomputers consisting of a central site (supermini) with eight minis at various SPOs. The system is to provide an interface to the large ASD computers, commercial time-sharing systems, and contractor systems. Each SPO is to provide funding for its remote site. The central site is to be funded on a prorated basis with SPO mission program funds and not with acquisition and command support funds.

The total AMS project costs for fiscal years 1981-86 are estimated to be $30 million. In February 1981 ASD directed its various offices to provide $3,283,000 for the initial hardware and application software. The Deputy for Airlift's share was $285,950, and in March 1981 it provided $121,950, or 43 percent of its share, with C-X funds. The balance of funding was provided from C-5, KC-135, and companion trainer aircraft mission programs.

Management information system study

The Deputy for Airlift is planning to contract for a management information system to document how its workload can best be computerized. The contractor is to identify and document the data flow and automation capabilities/requirements necessary to manage this data flow. This task is intended to complement the AMS effort and define a system of information processing which should also provide maximum use of AMS. This system should also provide a

solution to those information processing problems specific and unique to the Deputy for Airlift. In April 1981 the Deputy for Airlift approved $115,000 for this effort, of which $44,035, or 38 percent, is C-X funds. The balance is to come from the KC-135 and other mission programs.

AGENCY COMMENTS

In commenting on an initial draft of this report, the Deputy for Airlift and ASD Comptroller stated that the renovation of Building 17 is a direct support cost which should be funded with mission program funds in accordance with AFSC Regulation 172-2. Direct support costs are defined in the regulation as any support, including civilian pay, feasibly identifiable to an activity or job order when the receiving activity must pay for the goods or services received.

We question whether it is the intent of the regulation to permit facility projects such as the Building 17 renovation to be charged to mission programs. The regulation states that mission program funds are for accomplishing the overall AFSC goals of developing and acquiring weapon systems as opposed to operating and maintaining facilities. Also, the regulation states that costs which are routinely incurred and attributable primarily to the basic decision to have the research and development installation in being, such as ASD, are common support costs which should be funded on an institutional nonreimbursable basis. One of the basic missions of ASD is to develop and acquire major weapon systems. A basic requirement needed to meet this objective is adequate building space. Therefore, it seems that the renovation of buildings for this purpose should be considered common support costs and funded with acquisition and command support funds rather than mission program funds.

We were advised on August 10, 1981, by an AFSC offical that ASD will now be directed to fund the entire Building 17 renovation contract with C-X funds. This reverses the decision made earlier to partially fund the renovation with mission funds and partially with acquisition and command support funds.

CONCLUSIONS

The Congress granted only limited approval for the C-X program which required the submission of a CMMS and certain certifications by the Secretary of Defense. Although the complete CMMS was submitted in May 1981, the certifications have not yet been submitted. Nevertheless, the Air Force had allocated about $531,000, or 36 percent, of the funds released to the C-X SPO as of July 1, 1981, for a building renovation, purchase of general-purpose computers, and a related study. Although these allocations do not violate the applicable statuatory provisions of the fiscal year 1981 authorization and appropriation acts, they may have been used in a manner contrary to the intent of the limited congressional approval

of the C-X program. Also, the planned use of C-X funds in this manner may be inappropriate because the costs for such general-purpose projects which are necessary for ASD to carry out its basic mission of developing and acquiring weapon systems are normally charged to acquisition and command support funds rather than mission program funds.

We would appreciate receiving an explanation from the Secretary of the Air Force as to whether the practice of using C-X and other mission program funds for such purposes is appropriate and whether new policies and procedures should be implemented to preclude these practices from continuing.

We would also like to receive an explanation of the rationale for funding the Building 17 renovation with both C-X mission program funds and acquisition and command support funds. Further, we would like to receive an explanation as to why it has now been decided to fund the entire Building 17 renovation contract with C-X mission program funds.

Agency comments

On February 1, 1982, the Department of the Air Force informed us that its use of both C-X mission program funds and acquisition/command support funds for Building 17 was incorrect stating the entire project should have been charged to the C-X. The Air Force stated that action has since been taken to use C-X funds for the full cost.

The Air Force stated that the primary issue (that is, funding directly identifiable support costs entirely from either mission program funds or from acquisition/command support funds) is complex and will require a thorough examination before a judgment can be made as to whether or not the practice is appropriate. The Air Force plans to study this matter further; we will monitor their efforts.

THE AIR FORCE LANTIRN PROGRAM MUST SURMOUNT SOME FORMIDABLE DIFFICULTIES

The Air Force's Low Altitude Navigation and Targeting Infrared System for Night (LANTIRN), began full-scale engineering development in August 1979. It has experienced considerable cost growth and major technical difficulties serious enough for the Air Force to have recently lengthened the weapon's development and flight testing schedules by more than a year. The estimated program cost has increased over 70 percent from about $1 billion to almost $1.8 billion in slightly more than a year.

The LANTIRN program provides for the development of two major subsystems--a head-up display and a fire control system. These are to be used with the A-10 and the F-16 aircraft. If successfully developed, LANTIRN could provide these aircraft with improved navigational and targeting capability that would enable them to be used in night operations and under low cloud ceilings. This capability could considerably increase the number of sorties and provide more time in which to conduct tactical operations.

LANTIRN MAY NO LONGER BE COST EFFECTIVE

Two major assumptions, which were the basis for the Air Force concluding in early studies that LANTIRN was cost effective, no longer appear to be valid. It is still uncertain that single-seat aircraft, such as the F-16 and the A-10, can be operated at the low altitudes envisioned by the studies without creating an excessive workload for the pilot. This matter is still under study. Second, costs assumed in the Air Force studies have more than tripled. The acquisition and installation costs of the LANTIRN pods now exceed $5 million for each aircraft.

The Air Force is making another cost-effectiveness study that is assessing LANTIRN's performance at altitudes considered more manageable for the pilot. The study is also assuming higher LANTIRN costs. Air Force officials believe, based on preliminary study results, that LANTIRN is still cost effective.

LANTIRN'S FUTURE UNCERTAIN

Although LANTIRN could considerably enhance tactical air operations, questions have been raised about continuing LANTIRN's development in view of its mounting cost and technical problems. The program sustained funding cuts in the fiscal year 1982 defense budget review in the Office of the Secretary of Defense. Concerns about LANTIRN also surfaced in congressional hearings on the budget. The Air Force itself, concerned about the considerable program risks, elected to slow its development. One component, the automatic target recognizer, experienced particular difficulty and a decision on producing it has been set back almost 2 years.

Following the fiscal year 1982 budget hearings, the Air Force received conflicting directions from two congressional committees. The House and Senate Armed Services Committee conferees, in their November 3, 1981, conference report, directed the Air Force to conduct a competitive development program to include in addition to LANTIRN, an improved F/A-18 forward looking infrared pod or other existing electro-optical pods that could meet the LANTIRN performance requirements within the LANTIRN program's schedule. The House and Senate Appropriations Committee conferees, in their December 15, 1981, conference report, directed that funds appropriated for LANTIRN be used only to continue the ongoing LANTIRN development program. The Air Force has said it will comply with the Appropriations Committees' instructions but will also consider reprograming funds to apply to the competitive development directed by the Armed Services Committees.

CONCLUSIONS

It was predictable that the LANTIRN program would run into difficulties. Until recently, the program had not been subjected to critical reviews normally accorded systems of this magnitude. It was not included in quarterly reports submitted for congressional review where its progressive cost increases and its technical problems could have been noted. Under its original compressed schedule, LANTIRN skirted the initial development phases of the acquisition process where program risks might have been fully considered.

MATTERS FOR CONSIDERATION BY THE CONGRESS

The Congress should take the results of the most recent LANTIRN cost-effectiveness studies into account before providing further funds for the LANTIRN program. If the studies show that LANTIRN is not cost effective, the Congress should end the program or direct the Air Force to consider alternative systems.

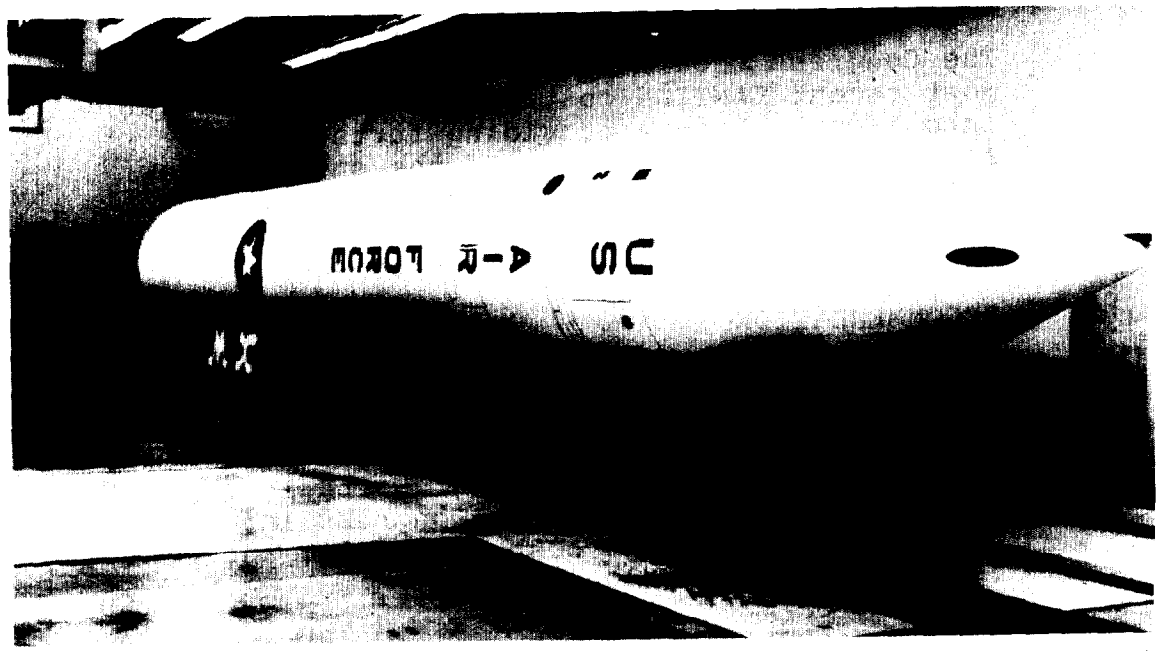
RECOMMENDATION

If the Congress continues to provide funds for the LANTIRN program, GAO recommends that the Secretary of Defense designate LANTIRN as a major acquisition program requiring quarterly reports to the Congress to keep the Congress informed on how it is meeting its cost, schedule, and performance goals.

VIEWS OF AGENCY 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. These officials agreed with the facts presented in this report and their views have been incorporated as appropriate.

THE MX REENTRY VEHICLE WARHEAD OPTIONS



FULL-SCALE MOCKUP OF THE M X MISSILE. SOURCE: U.S. AIR FORCE

We recently examined the Department of Defense's (DOD's) reentry vehicle and warhead options for the proposed MX missile system. Although much uncertainty exists in the MX program and several major program decisions are pending, we were told in July 1981 that DOD selected the Advanced Ballistic Reentry Vehicle/Insensitive High Explosive (ABRV/IHE) as the baseline reentry vehicle and warhead. The reentry vehicle, however, will not be available to meet the currently planned initial operational capability (IOC) date. As a result, the Air Force is considering achieving the IOC date with the already existing MK-12A/W78 reentry vehicle and warhead as an interim step until the baseline reentry vehicle and warhead becomes available.

We are concerned that the present commitment to the IOC could unnecessarily force a decision that would increase program costs by $400 million to approximately $1 billion by deploying a mixed reentry vehicle and warhead system or possibly require a retrofit. We are making our observations available to you at this time to point out the high cost associated with this one aspect of the MX program in maintaining the current IOC.

We reviewed the two reentry vehicle and warhead options evaluated in the Air Force's Phase 2A Cost Study and the Department of Energy's (DOE's) Weapon Design Cost Report to assess the merits of the various options and to identify any potential problems. To update and clarify the data reported in the Cost Study, we met with Air Force personnel in the Ballistic Missile Office, Air Force Weapons Laboratory, Strategic Air Command, and the Air Staff. DOE's Albuquerque Operations Office personnel provided warhead related data. We did not review possible costs

associated with an IOC slippage because it was being developed and was not available for our review.

BASELINE ABRV/IHE CANNOT MEET THE IOC

Because the ABRV reentry vehicle will not be developed in time for the planned IOC, the Air Force is considering two options to meet this date. Both include using the MK-12A/W78 for initial deployment.

The first option includes initially fielding one-third of the MX system with MK-12A/W78s and completing the force with the baseline ABRV/IHEs. The second option involves the same deployment as the first, followed by a complete retrofit of the fielded MK-12As with the baseline ABRV/IHE. These options could increase program costs by $400 million to about $1 billion depending upon the number of missiles retrofitted.

Our cost estimates include total development, production, and stockpile maintenance for 200 missiles over a 10-year period. The Reagan administration recently announced an interim MX deployment plan that would field only 100 missiles rather than the 200 previously indicated. Total program costs may be different, but the issue is still valid since we are concerned with only a portion of the warheads to be deployed in either case. The options presented mainly concern meeting IOC and whether retrofit with the ABRV/IHE warhead is to be considered. This issue is still valid even with a reduction in the total number of missiles to be deployed. Should ongoing deliberations maintain the decision for a smaller scale MX program or a change in the scheduled date for initial deployment, the reentry vehicle and warhead options would require additional review. For example, deploying fewer missiles while maintaining IOC could mean that the initial force mix would be 2/3 MK-12A/W78.

Air Force officials commenting on our observations before the administration's recent decision generally agreed with the thrust of this letter. Although the Assistant to the Secretary of Defense (Atomic Energy) told us by letter, dated July 29, 1981, that a new baseline reentry vehicle and warhead had been selected for MX, Air Force officials said that until the MX deployment decision is made, all warhead options are open, including the MK-12A/W78.

OBSERVATIONS

The Air Force cannot meet the IOC date with its baseline ABRV/IHE reentry vehicle and warhead combination. The IOC issue, coupled with the higher costs of producing and deploying a mixed system or making a reentry vehicle and warhead retrofit, suggests that DOD should further consider whether deployment benefits offset the additional costs that would be incurred. If the IOC date is stretched, the ABRV/IHE reentry vehicle and warhead may be able to meet the new IOC date.

Agency comments

On January 29, 1982, Defense informed us that the Air Force has determined that the current MX initial operational capability date can be met with the baseline ABRV/IHE warhead/reentry vehicle combination. The interim substitute options costing from $400 million to $1 billion that were under consideration to meet the initial operational capability are no longer required.

MX PROGRAM COST AND SCHEDULE MILESTONES COULD BE ADVERSELY IMPACTED IF CERTAIN MATTERS ARE NOT RESOLVED

We recently completed our review of the MX weapon system program and identified certain matters which we would like to bring to your attention. If these are not resolved in a timely manner, they could adversely affect the program's cost and schedule milestones for the first test missile flight in January 1983 and its initial deployment in late 1986. These matters fall into the following three areas.

First, there have been delays in the development and demonstration of the liquid propellant tank for stage IV of the MX missile's propulsion system. Delays have also occurred in the construction of the integrated test facility at Vandenberg Air Force Base and in the delivery of software for test program's instrumentation and the flight safety system. Although Air Force officials have been concerned that these delays have increased the risk of not meeting future milestones, they believe the scheduled milestones will be achieved as planned.

Second, there appears to be a limited production capacity for certain critical materials needed for constructing the MX missile. These materials include ammonium perchlorate, beryllium, carbon/carbon, and nuclear materials for the warhead. Specifically:

--There are only two manufacturers of ammonium perchlorate, an essential propellant ingredient. There are indications that there may be difficulties in meeting MX propellant production needs if the MX program does not maintain its acquisition priority over that of the Space Transportation System program.

--There is only one manufacturer of beryllium, an essential material used in the manufacture of the MX missile's guidance and control system. There have been indications that the manufacturer may have to cease operations because of the health hazards associated with beryllium production.

--There are only two manufacturers of carbon/carbon materials used in certain MX missile components such as the stage I propulsion nozzle. Air Force officials said that an adequate supply of these materials can only be assured if funding supports sufficient acquisition leadtimes.

--There has been some degree of uncertainty about the availability of nuclear materials in part because of the production requirements of other nuclear weapon systems.

Third, Air Force and contractor officials at Vandenberg Air Force Base have said that there is a concern over the shortage

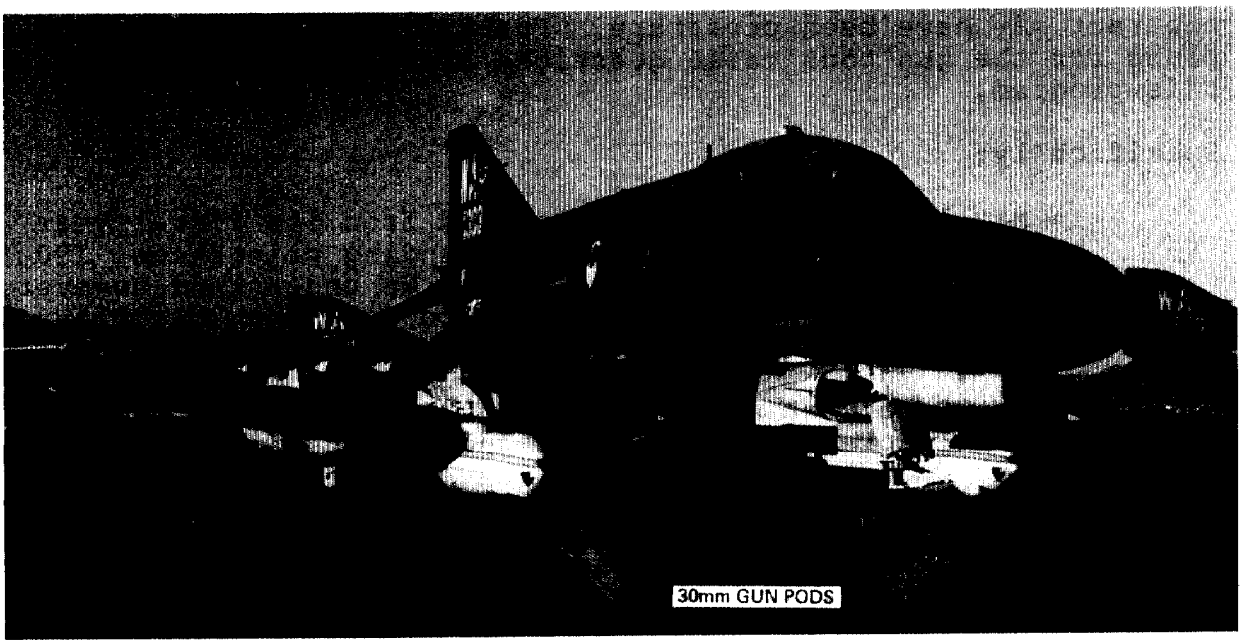
of affordable housing near the base. This could preclude contractors from being able to hire sufficient numbers of technicians to support currently scheduled MX missile and Space Transportation System launches. This concern is not unfounded as current Space Transportation System delays have been directly attributed to the housing situation by Air Force and contractor officials.

We understand that the Air Force is aware of the matters addressed in this letter, and they have indicated that steps are being taken to resolve them.

Agency comments

On March 25, 1982, Defense informed us of its agreement with our findings. Defense also emphasized its awareness of the problems and expressed confidence that the first research and development missile would be launched in early 1983 and achieve initial operational capability in late 1986.

AIR FORCE PURCHASE OF 30MM GUN POD SYSTEM



SOURCE: U.S. AIR FORCE

We are concerned that the Air Force has entered into a highly concurrent development and production program for a 30mm gun pod when there appears to be a questionable urgency for it.

The 30mm gun pod is a self-contained pneumatic driven four-barrel gun system to be externally mounted on high performance aircraft such as the F-4, A-7, and F-16. The system will also include an ammunition loading system. The weapon system is to provide the Tactical Air Force with an increased capability to attack numerous and varied ground targets and provide a low cost, low complexity alternative to several existing systems to meet near term requirements.

In April 1980, the Office of the Under Secretary of Defense, Research and Engineering, in an attempt to improve the antiarmor capability of the Rapid Deployment Force (RDF), requested that the Air Force undertake the development of a 30mm gun pod with a target initial operational capability date of June 1982, or at least, no later than fiscal year 1983. Having previously flight tested two engineering test pods in 1979, the Air Force in July 1980 entered into a full-scale development contract to correct problems identified in the tests. The contractor, General Electric Company, is to provide two pods in January 1982, and two in April 1982, for environmental, developmental, and operational testing. In August 1981, the Air Force entered into a $32 million production contract for (40) 30mm gun pods. In November 1981, it exercised a $42 million option for 104 additional pods.

With the environmental, developmental, and operational testing not scheduled to begin until January 1982, it would

appear that the Air Force's action to enter into a production contract may have been premature. Further, certain events and plans for the gun pods raise questions about the urgency of this program.

Specifically:

--in May 1981, the Air Force deleted from its fiscal year 1983 program plan due to higher funding priorities, 180 gun pods designated for the F-16. We understand however, that the pods are to be designed to be compatible with the F-16.

--about 70 percent of the total of 340 production pods currently planned will be assigned to the Air National Guard. About 30 percent will be assigned to the RDF.

In our view, these plans strongly indicate that the 30mm gun pod program does not warrant the level of concurrency involved in this program, and that, perhaps, the entire procurement ought to be reassessed.

Agency comments

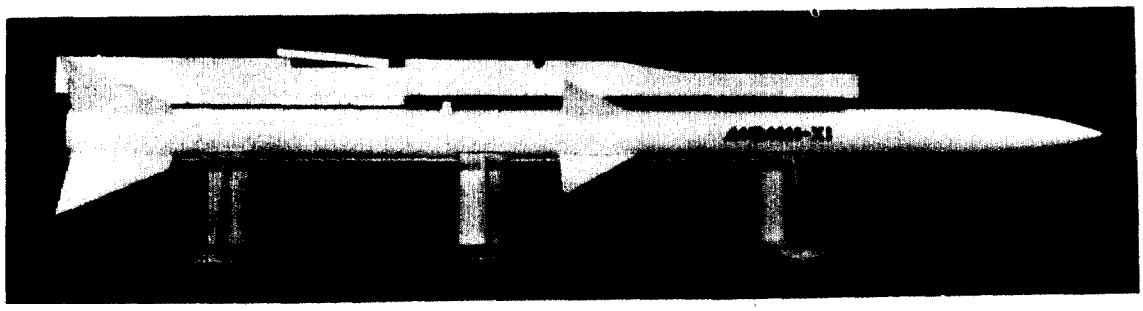
Defense responded to our report by letter dated January 20, 1982. Defense stated that a serious deficiency for 30mm gun pods exists and the urgency is sufficient to justify a highly concurrent program and that allocating these assets to the Air National Guard is justified. Also, Defense stated that if the major threat is the Warsaw Pact armored vehicles and the Air National Guard is assigned the air-ground mission upon mobilization, it makes sense to provide them a modern weapon.

In our view, the sense of urgency appears misdirected. If there is an urgent need for the 30mm gun pod and if the Warsaw Pact is the major threat, it would appear that those Air Force units permanently assigned in Europe would be the first to be equipped with the weapon. Apparently, the Air Force has some reservations as to the utility of the weapon in that its deployment priorities were inconsistent with the sense of urgency.

CHAPTER 7

JOINT PROGRAMS

EFFECTIVENESS OF THE ADVANCED MEDIUM RANGE AIR-TO-AIR MISSILE IS UNCERTAIN



SOURCE: U.S. AIR FORCE

In February 1981 we issued an interim report 1/ on the status of the Advanced Medium Range Air-to-Air Missile (AMRAAM) program. Our review for that report was limited because much of the cost, schedule, and performance information was considered competition sensitive and was not made available to us at the time. The information was subsequently provided, and this report completes our assessment.

As part of our latest effort, we reviewed an Institute for Defense Analyses (IDA) study, "System Options for NATO Area Air Defense and Options for Air-to-Air Armament Capability for U.S. and NATO Aircraft," December 1980, which questions whether AMRAAM will provide an appreciable improvement in effectiveness over the existing Sparrow AIM-7M missile if enemy aircraft use certain tactics and electronic countermeasures (ECM). The study was prepared for the Deputy Under Secretary of Defense, Tactical Warfare Programs, Office of the Under Secretary of Defense for Research and Engineering.

Officials of the Office of the Under Secretary of Defense for Research and Engineering and the Air Force believe that the IDA study is misleading in many areas. They questioned many study assumptions, including tactics assumed for both friendly

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1/"Progress and Problems of the Advanced Medium Range Air-to-Air Missile Program" (C-MASAD-81-6, Feb. 23, 1981).

and enemy forces and strongly disagreed with conclusions on AMRAAM's effectiveness. Moreover, Air Force officials said that the study did not recognize advanced technology in AMRAAM, such as computer advances that will permit development of electronic counter countermeasures (ECCM) now being designed by the AMRAAM contractors, and give AMRAAM improved capability over the Sparrow AIM-7M.

The Air Force Systems Command stated that neither the IDA study conclusions nor the Air Force position can be substantiated with actual performance data until AMRAAM's tactical seeker and associated software are developed and tested during full-scale development.

The estimated cost to develop and procure AMRAAM increased from $3.4 billion to $6.1 billion, in then year (escalated) dollars during the period January 1979 to April 1981, and the unit procurement cost of the AMRAAM missile increased 69 percent from $134,000 to $226,000, based on a procurement quantity of 20,000 missiles. The increase is attributed to changes in inflation projections, design changes and better understanding of the design, and changing the base year of the estimate from fiscal year 1977 to fiscal year 1978. In fiscal year 1978 constant dollars, the development and procurement cost increased from $2.1 billion to $2.7 billion, and the unit procurement cost increased from $74,000 to $96,100. Furthermore, some interim validation phase milestones have slipped and planned validation phase guided flight tests have been significantly reduced from 16 flights to 10 flights for each contractor. The reduced testing was due to technical problems and to enable the contractors to do more work on their tactical seeker designs. The Air Force, however, plans to conclude the validation phase and award the full-scale engineering development contract in November 1981 as scheduled.

We believe the IDA study raises major questions about possible reductions in AMRAAM's projected effectiveness due to ECM and whether AMRAAM will be more cost effective than AIM-7M unless ECCM is successfully developed. Furthermore, we believe the issues identified by IDA should be resolved during AMRAAM's current development phase. We are concerned that the Air Force does not plan to validate ECCM concepts until full-scale development. We are also concerned about the 69-percent increase in AMRAAM's unit cost estimate and about the reduced validation phase flight test program.

For the AMRAAM full-scale development decision, we recommend that the Secretary of Defense determine and consider

--the degree to which proposed ECCM concepts need to be and will have been validated before selection of the full-scale development contractor;

--the adequacy of available test data in view of the reduced flight test program;

--the usefulness of AMRAAM's multiple target attack and increased range capability if range and raid assessment information is denied to the extent postulated by IDA;

--the validity of the current AMRAAM cost estimates and the potential for continued increases; and

--the projected cost effectiveness of AMRAAM compared to AIM-7M, considering the questions raised by IDA.

We did not request official comments on this report because of the tight reporting deadline. Instead, a draft of this report was discussed with high level officials associated with management of the program to assure that the report is accurate and complete. Their points of view are included where they differ with ours.

Agency comments

On October 13, 1981, Defense informed us that it concurred with all five of the report's recommendations and is taking various actions to address our concerns.

CRITICAL CONSIDERATIONS IN DEVELOPING IMPROVED CAPABILITY TO IDENTIFY AIRCRAFT AS FRIEND OR FOE

Systems to identify friendly or enemy air targets are installed on various types of weapons to avoid the risk of mistakenly attacking friendly aircraft. Identification systems can be categorized as

--cooperative, which depend on the deliberate participation of the target aircraft to provide information that can be used for identification or

--noncooperative, which do not require the overt participation of targets to obtain identification data.

Primary users of these systems are tactical aircraft with an air-to-air mission, air defense surface-to-air missiles, ships, and certain elements of the command and control system.

GAO conducted this review to provide the Congress with information on the Department of Defense programs to improve U.S. capabilities to identify aircraft as friend or foe. These programs, for which the Congress will be asked to provide funds, could potentially involve significant expenditures.

LIMITATIONS OF EXISTING COOPERATIVE IDENTIFICATION SYSTEMS

The primary systems in use today by the United States and some other forces in the North Atlantic Treaty Organization (NATO) are the Mark (MK) X and XII cooperative systems. Current U.S. capability to identify aircraft is limited.

Consequently, missiles with capabilities of attacking targets beyond visual range cannot be used to their full potential. Aircraft, for example, that could ordinarily stand off at relatively safe distances to fire these missiles, frequently have to close within

visual range to positively identify air targets. Not only is some of the missile's effectiveness lost, but the launch aircraft are rendered more vulnerable to enemy fire. Better identification would permit relaxing current restrictive rules of engagement which have been instituted to minimize the risks of mistakenly attacking friendly aircraft.

PLANS TO IMPROVE EXISTING CAPABILITY

There are plans to improve the MK XII. The improvements are in two categories--those involving minor changes and others expected to provide considerable enhancement.

DEVELOPING NEW SYSTEMS

Also under consideration is the development of the next generation identification system, the MK XV. There are several matters to resolve, the principal one being the frequency band in which the MK XV should operate. Other NATO countries are working on a new identification system and are coordinating their efforts with the Department of Defense. Up to now, however, the NATO countries have been unable to agree on a common frequency band.

There are problems of interference with existing telecommunications and traffic control systems to consider, as well as questions of affordability.

In addition the MK XV, certain other technologies appear to have the potential of contributing to the overall improvement of U.S. identification capability.

However, several of these technologies are in the early stages of development and have not been tested to determine their performance. Overall, progress has been slow.

The total investment in identification systems is difficult to calculate because several are in the early stages of development and costs are spread over numerous accounts. The investment will be substantial, however, as evidenced by the MK XV program whose 15-year life-cycle costs are estimated to approach $4 to $5 billion. The Department of Defense plans to spend about

$48 million for researching and developing identification technologies in fiscal year 1982.

CONCLUSIONS

There are several major issues to be considered. A key consideration is the time it will take to develop and deploy the next generation MK XV system as it relates to MK XII improvements. If the MK XV will not be available for another decade, it could justify MK XII improvements. On the other hand, if a MK XII improvement program could not be completed until shortly before the MK XV can be made available, a major investment in MK XII improvements--such as type B modifications--is of a doubtful value.

There is also the difficulty up to now of obtaining agreement among the NATO governments on a common frequency band allocation to promote effective military operations. The divergent requirements of the United States and its NATO allies and other influencing factors, such as affordability and interference with other systems--both military and civilian--are difficult to reconcile.

RECOMMENDATIONS

GAO recommends that the Secretary of Defense should make the amount to be invested in MK XII improvements contingent on how soon the MK XV can reasonably be expected to become available. We also recommend that the Secretary determine the priority that the MK XV interoperability with other identification systems in NATO should have relative to the other factors to be considered in selecting the frequency allocation band in which the MK XV is to operate.

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 the report with high level officials associated with the management of the program and they agreed with the facts presented. Their views are incorporated as appropriate.

OPPORTUNITIES EXIST TO ACHIEVE GREATER STANDARDIZATION OF AIRCRAFT AND HELICOPTER SEATS

We reviewed the efforts of DOD and the services to standardize flight life-support equipment. While formal management structures and informal agreements have resulted in several standardized life-support items, we found a proliferation of tactical aircraft and helicopter seat systems, the most expensive items of life-support equipment. We believe the past methods of acquiring seats have been costly; that standardization opportunities have not been adequately defined; and that for the most part, standardization efforts undertaken have not been adequately organized, planned, and supported either by DOD or the services. Increased management emphasis by the Under Secretary of Defense (Research and Engineering) and the services could increase standardization of aircraft seats and lower acquisition and support costs. Implementation of the Deputy Secretary of Defense's April 30, 1981, initiatives, which recognized that increased standardization of subsystems and support systems cannot only reduce life-cycle costs but also increase reliability, should result in additional economies.

BACKGROUND

Standardization of subsystems and support systems requires definition of the opportunities, organization of programs to coordinate user needs, and support by the using services and the Office of the Secretary of Defense. Benefits of a successful program can include reduced acquisition costs through a reduced number of individual development programs; longer, more efficient production programs; and lower support costs through reduction of the number of items in inventory.

Since the services often have similar requirements for flight life-support equipment, the joint logistics commanders began promoting standardization of that equipment in the early 1970s. In the mid-1970s, the Under Secretary of Defense (Research and Engineering) established a triservice approach for standardizing life-support equipment to foster standard procedures, decrease training costs, and save on maintenance and other costs. The Under Secretary directed each service to prepare an integrated, multiservice plan for standardization of life-support equipment in their functional environments; that is, Army--ground, Navy--sea, and Air Force--flight. Several years later, in July 1980, a steering committee and working groups were established and a formal agreement was completed by the Assistant Secretaries for Research of the services. As of early 1982, no integrated, multiservice standardization plans had been produced.

Despite the absence of such plans, several items of life-support equipment have been standardized within each service and occasionally across service lines. These items have normally been

the somewhat less complex and less costly items, such as helmets, oxygen masks, fire retardant clothing, and rafts.

MINIMAL STANDARDIZATION OF TACTICAL AIRCRAFT SEATING SYSTEMS

Little has been accomplished across service lines in standardizing ejection seats for tactical, high performance aircraft or for helicopter crashworthy seats, the most expensive items of life-support equipment for aircraft. Ejection seat systems have proliferated and strategies have not been developed for triservice standardization.

High performance aircraft seat systems

Over a period of time, the Navy and the Air Force have developed a number of different ejection seats for attack and fighter aircraft so that the Navy now has 14 ejection seats and the Air Force has 7 ejection seats that are not interchangeable. (See enc. I.) Such proliferation points to a lack of concerted efforts extending over some time to define and capitalize on standardization opportunities for seats, particularly on an interservice basis. However, in a major development effort, the Air Force showed that intraservice standardization is feasible and cost effective when it developed and installed the same Advanced Concept Ejection Seat (ACES II) in three of its tactical aircraft, the A-10, F-15, and F-16. The Air Force estimated a savings of $46 million in life-cycle costs by using the same basic seat in those three aircraft.

The fact that the Air Force Life Support System Program Office was responsible for developing the ACES II seat and that coordination between that office and the aircraft program offices was mandatory for life-support items undoubtedly was largely responsible for the ability of the Air Force to use the same seat on three different aircraft. In contrast, aircraft program offices in the Army and the Navy are not required to coordinate their life-support development activities with their respective life-support program offices, and further, nearly all Army and Navy seat systems have been acquired through the aircraft prime contractor rather than by the life-support offices.

We inquired but did not identify any concerted efforts to develop a common or standard ejection seat for high performance aircraft for use across service lines. The only ejection seats used by more than one service are found on aircraft common to both the Air Force and the Navy, the F-4, and A-7. Aircraft with similar performance capabilities like the Navy F-14 and Air Force F-15 have different ejection seats. (See enc. I.) Acquisition costs range from about $42,000 per seat for the F-15 to about $102,000 per seat for the F-14. No concerted effort was made to develop a seat for use in both the F-15 and the F-14; therefore,

against these potential consequences. However, we also believe the undesired consequences can often be minimized or eliminated by appropriately managing the standardization effort and developing a sound acquisition strategy.

Although each of the services has established an office to coordinate development and acquisition of flight life-support equipment, the emphasis and control varies. The Air Force's Life Support System Program Office has the authority to require that aircraft program managers coordinate their plans for development and acquisition of life-support equipment with that office. That process aids in defining standardization opportunities and controlling proliferation of life-support systems. Army and Navy aircraft program managers are not required to coordinate life-support equipment needs with the life-support offices established in those services.

By funding and supporting a development program for a standard seat, opportunities are available to avoid multiple seat development programs for individual aircraft; concentrate on the most advanced technology; and obtain the benefit of longer, more efficient seat production programs.

CONCLUSIONS

The success that has been achieved in standardizing some items of life-support equipment is encouraging, but the most expensive items of life-support equipment, aircraft seating systems, have proliferated. We recognize, as pointed out by the Deputy Secretary of Defense, that there are barriers to achieving increased standardization. Nevertheless, greater standardization of aircraft seating systems could substantially lower acquisition and support costs of modern aircraft. To accomplish greater standardization and realize the savings, increased emphasis by the Under Secretary of Defense, the Tri-Service Life Support Equipment Steering Committee, and the services is required. This includes defining oppportunities and developing master plans, insisting that life-support equipment plans for each aircraft be coordinated with the service life-support program office, assigning responsibility for development and acquisition of standard equipment, and supporting funding when development of standard items is determined appropriate. Further, a current assessment of planned ejection and crashworthy seat use in ongoing or emerging aircraft or helicopter programs may surface opportunities to achieve near-term standardization or use of existing seats.

RECOMMENDATIONS

To effectively achieve standardization of life-support equipment, we are recommending that the Secretary of Defense

--require that the Tri-Service Committee define the opportunities and prepare plans for standardization of tactical aircraft seats, to be approved by the Under Secretary for

Research and Engineering, before submission of the fiscal year 1984 budget to the Congress;

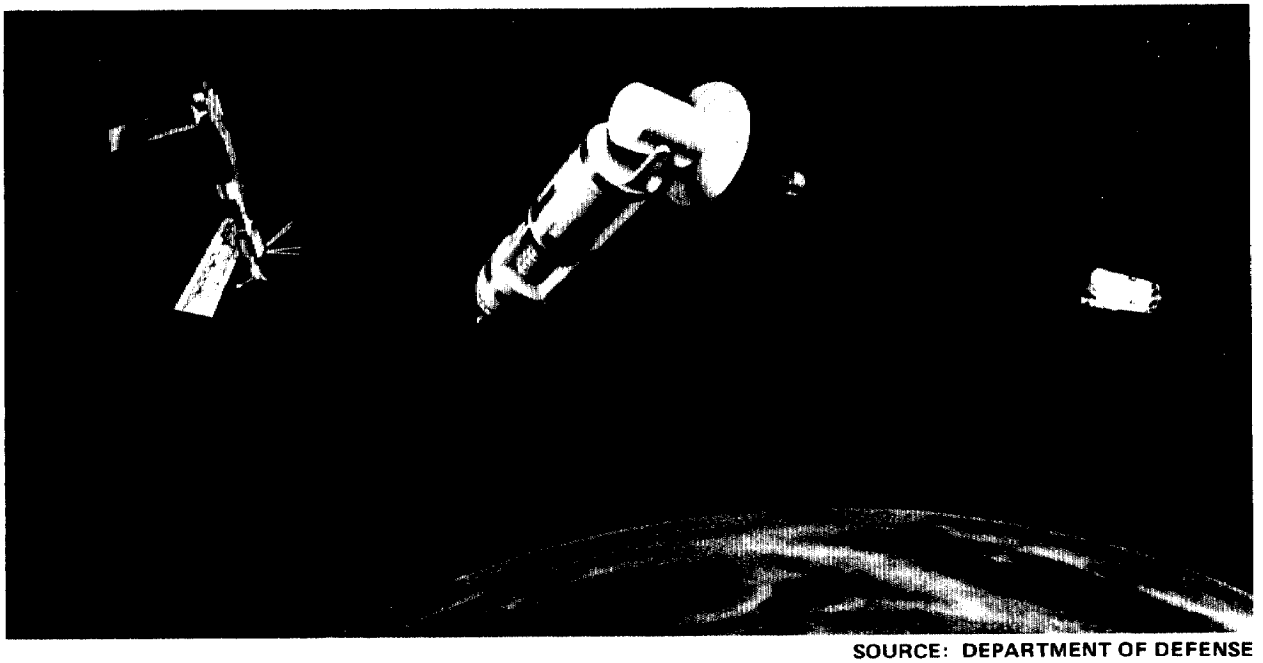
--review aircraft programs near the completion of development, or in early production, to determine if existing or standard seats have been or could be incorporated;

--determine if use of an existing or standard seat design would be cost effective on a life-cycle basis for those aircraft in which the service is planning to develop or procure a peculiar seat;

--emphasize the need for service support of development programs that may be initiated for standard items; and

--require that the Secretaries of the Navy and the Army provide for mandatory coordination of life-support equipment plans with the services' life-support program office.

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



SOURCE: DEPARTMENT OF DEFENSE

ARTIST CONCEPTION OF SPACE LASER WEAPON STATION IN ACTION.

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 (DOD) 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, DOD, and the media. The review assessed program progress, examined the issues associated with demonstrating SBL weapons potential, and assessed the existing SBL management structure.

FEASIBILITY OF SBL WEAPONS UNCERTAIN

While effective SBL 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 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.

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.

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.

--Future prospects to augment the present program above that recommended by the Defense Science Board appear bleak. As a result, all SBL feasibility issues will not be fully addressed before a demonstration decision.

--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.

--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.

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 SBL 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.

APPENDIX I

LISTING OF OTHER RELATED REPORTS ISSUED FROM APRIL 1, 1981, THROUGH MARCH 26, 1982

Report title	Report number	Report date
Need to Extend the Period of Availability for Navy Shipbuilding Funds	MASAD-81-22	04/01/81
DOD's Use of Remotely Piloted Vehicle Technology Offers Opportunities for Saving Lives and Dollars	MASAD-81-20	04/03/81
Major Issues Concerning the C-X Range and Payload Remain Unresolved	MASAD-81-24	04/06/81
An Assessment of the Navy's Mine Warfare Mission (SECRET)	C-MASAD-81-13	04/30/81
Acquiring Weapon Systems in a Period of Rising Expenditures: Implications for Defense Management (note a)	MASAD-81-26	05/14/81
Navy Tactical Computer Development--Limited Competition and Questionable Future Software Savings	MASAD-81-28	05/15/81
Improving the Weapon Systems Acquisition Process	MASAD-81-29	05/15/81
NORAD's Missile Warning System: What Went Wrong?	MASAD-81-30	05/15/81
DOD's Satellite Communications Requirements Process: Three Critical Weaknesses in a $750 Million A Year Program (CONFIDENTIAL)	C-MASAD-81-14	06/22/81
Development of the MLQ-33 to Jam Close Air Support Communications (SECRET)	C-MASAD-81-15	08/03/81
Countervailing Strategy Demands Revision of Strategic Force Acquisition Plans (Unclassified and SECRET versions)	MASAD-81-35 C-MASAD-81-16	08/05/81 08/05/81

a/This report summarizes the principal issues and potential impact of recommendations contained in 24 reports issued on major weapon systems from September 1980 through April 1981.

APPENDIX I

Report title	Report number	Report date
Adoption of Preplanned Product Improvement Techniques Can Reduce Cost of Improving Effectiveness of Systems During Their Lifetime	MASAD-81-39	08/13/81
The British Sting Ray Torpedo: Information Should be Obtained to Determine Potential Benefits to U.S. Antisubmarine Warfare Programs	MASAD-81-43	09/14/81
Evaluation of the Army's Advanced Field Artillery Tactical Data System	MASAD-81-44	09/15/81
An Integrated Approach to U.S. Air Defense of Central Europe Should Result in More Effective Mission Accomplishment (SECRET)	C-MASAD-81-18	09/18/81
Department of Energy's Weapons Complex--Increased Demand on Aging Plants (SECRET)	C-MASAD-81-21	09/25/81
Need for Three New Fleet Satellites Is Not Justified (SECRET)	C-MASAD-81-22	09/29/81
The World Wide Military Command and Control Information System--Problems in Information Resource Management	MASAD-82-2	10/19/81
Budgetary Pressures Created By The Army's Plans To Procure New Major Weapon Systems Are Just Beginning	MASAD-82-5	10/20/81
Redirection of Air Force's Tactical Radio Program Could Save Millions (SECRET)	C-MASAD-82-1	10/29/81
Operational Electronic Intelligence: Major Changes Needed to Improve Its Usefulness (TOP SECRET)	C-MASAD-82-3	11/09/81
DOD Should Defer Buying New TACAN Equipment and Evaluate Other Alternatives	MASAD-82-6	11/12/81
The Operational and Costly Benefits Expected by Expanding the Navy's ELF System Have Only Been Partially Demonstrated (SECRET)	C-MASAD-82-4	11/30/81
DOD Instruction 5000.5X, Standard Instruction Set Architectures for Embedded Computers	MASAD-82-16	01/27/82

APPENDIX I

Report title	Report number	Report date
The Consolidated Space Operations Center Is Not Supported by Adequate Defense Department Planning	MASAD-82-14	01/29/82
Rushing Production of Pershing II Missile Could Reduce Its Effectiveness (SECRET)	C-MASAD-82-5	02/22/82
Issues Concerning the Survivability and Capability of the ICBM Force	MASAD-82-21	02/25/82
Need to Examine ALR-74 Radar Warning Program Schedule	MASAD-82-23	03/10/82
Review of the Impact of A-109 on Weapon System Acquisition	MASAD-82-10	03/17/82
Reduced Performance and Increased Cost Warrant Reassessment of the Multiple Stores Ejector Rack	MASAD-82-26	03/26/82
Request to Fully Fund Two Nuclear Aircraft Carriers	MASAD-82-27	03/26/82

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