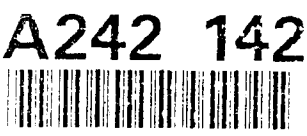
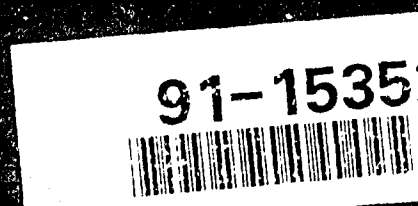


United States General Accounting Office

Report to the Chairman, Subcommittee on Defense, U.S. Senate

ARMORED SYSTEMS MODERNIZATION

Program Inconsistent With Current Threat and Budgetary Constraints



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GAO

United States
General Accounting Office
Washington, D.C. 20548

National Security and
International Affairs Division

B-244187

July 29, 1991

The Honorable Daniel K. Inouye
Chairman, Subcommittee on Defense
Committee on Appropriations
United States Senate

Dear Mr. Chairman:

This report on the justification, affordability, and priorities of the Army's Armored Systems Modernization program is in response to your request. It contains matters for congressional consideration and recommendations to the Secretary of Defense.

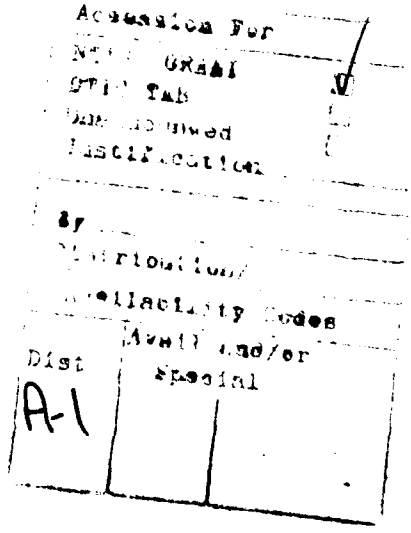
Unless you announce its contents earlier, we plan no further distribution of this report for 20 days from its issue date. At that time, we will send copies to the Chairmen of the Senate and House Committees on Armed Services and on Appropriations, the Senate Committee on Governmental Affairs, and the House Committee on Government Operations; the Director of the Office of Management and Budget; and the Secretaries of Defense and the Army. We will also provide copies to others upon request.

This report was prepared under the direction of Richard Davis, Director, Army Issues, who may be reached on (202) 275-4141 if you or your staff have any questions. Other GAO staff members who made major contributions to this report are listed in appendix I.

Sincerely yours,

Frank C. Conahan

Frank C. Conahan
Assistant Comptroller General



Executive Summary

Purpose

The Army is proposing to develop a new family of armored combat vehicles under its Armored Systems Modernization (ASM) program. The program, whose estimated total cost is $59 billion,[1] includes the Block III tank, the Army's next main battle tank. Concerned about the need for a program of this scale at a time when the threat to U.S. forces is changing and overall military spending is expected to decline, the Chairman of the Subcommittee on Defense, Senate Committee on Appropriations, asked GAO to examine (1) the justification for the ASM program to assess whether it is relevant to today's threat environment; (2) the program's projected funding requirements to determine whether it will be affordable, considering projected military funding reductions; and (3) the rationale for the Army's continued view that the Block III tank should be acquired before other new combat vehicles are acquired.

Background

Since 1980, the Army has planned to modernize its armored combat vehicles. To reduce costs, the current program structure calls for developing and fielding seven vehicles using common chassis systems. Four of these—the Block III tank, the Combat Mobility Vehicle, the Advanced Field Artillery System, and the Future Infantry Fighting Vehicle—will share a heavy chassis. Two others—the Line-of-Sight Antitank System and the Future Armored Resupply Vehicle-Ammunition—will be built on a common medium chassis. The seventh—the Armored Gun System—will be developed on a light chassis.

Results in Brief

U.S. military planning for the last 40 years has emphasized the need for combat systems designed to fight against a numerically superior, increasingly capable conventional threat from Soviet and Warsaw Pact forces. The Army used this threat scenario to justify the ASM program. However, military and intelligence officials believe that this threat has diminished considerably over the last 2 years and that the Soviet Union would have difficulty reversing its military reductions. Despite these changes and although the Army is reviewing a June 4, 1991, draft update of the ASM System Threat Assessment Report, the Army has not recognized the diminished Soviet threat in its justification for the ASM program.

The affordability of a massive modernization program such as the ASM program is questionable at a time when Army procurement appropria-

[1]This figure does not include the estimated cost of the Armored Gun System, one of the seven vehicles to be developed.

tions are expected to be constrained for the foreseeable future. The program as it is currently structured, along with all other projected procurement needs, would require significantly more funds than are expected to be available in fiscal years 1998 through 2008.

The Army continues to view the Block III tank as its top priority, even though a projected delay in the fielding of the Future Soviet Tank 3—the Soviet Union's future main battle tank, which the Block III will be designed to defeat—appears to make its requirement less urgent. This delay pushes the expected fielding to the middle of the next decade.

Adding to the uncertainty about the need for a new generation of tanks is the fact that the Army may have the opportunity to provide the existing M1A1 tank fleet the ability to defeat the Future Soviet Tank 3 by outfitting them with new electrothermal gun technology. The Army is currently developing this technology, and within the next 2 years it will know whether the technology is ready for application in tanks. According to Army developers and contractor officials, the electrothermal gun's goal is to increase the penetrating capability of a 120-millimeter gun to that of a 140-millimeter gun.

In contrast to the current tank, which can meet the threat well into the next decade, current Army artillery cannot meet the current threat. In addition, the Army's emerging battlefield doctrine emphasizes the need for improved long-range field artillery. The Advanced Field Artillery System is expected to meet this need.

GAO's Analysis

Army Has Not Reassessed the Need for the ASM Program

In its justification of the ASM program, the Army assumed that a powerful and massive armored enemy force would be prepositioned in Central Europe and be able to launch a European-wide strike. In the last 2 years, this threat declined as the Soviet Union began unilateral force reductions; the Warsaw Pact dissolved as a war-fighting coalition; and the Treaty on Conventional Armed Forces in Europe, limiting combat forces in the European theater, was signed.

According to U.S. and allied military officials, these events have significantly diminished the Soviet and Warsaw Pact threat. For example, the defense ministers of the North Atlantic Treaty Organization concluded

in May 1990 that under the limits imposed by the Treaty on Conventional Armed Forces in Europe, the Soviet Union will no longer have sufficient conventional forces and capabilities to launch a European-wide strike. Moreover, according to the Central Intelligence Agency, the Soviet Union would have great difficulty reversing its military reductions because of the country's current political situation and urgent domestic problems. The Secretary of Defense also has acknowledged that the conventional threat in Europe is fading.

Affordability of ASM Program Is Questionable

The Army is facing serious funding shortfalls beyond fiscal year 1997 for its development and procurement programs. Projected funding requirements for the ASM program are expected to peak between fiscal years 1998 and 2007, the same time frame that funding requirements for the Army's other major modernization efforts are expected to peak. A November 1990 Department of Defense estimate shows a $19 billion shortfall for these programs between fiscal years 1998 and 2008. This estimate appears low because it was based on steady funding levels and no cost growth. Since the estimate was made, Army appropriations have been reduced by 11 percent. At this lower rate, the Army would have a $39 billion shortfall. To solve its financial problem, the Army may have to scale back programs. The ASM program, which represents about one-third of the Army's projected funding requirements, is a logical candidate for some reduction in funding.

ASM Program Priorities Inconsistent With Threat

The Army has always viewed the Block III tank as its first priority in the ASM program and justified building the tank first by citing the need to counter the Future Soviet Tank 3. However, this prioritization appears inconsistent with the projected Soviet tank threat and with other Army requirements. First, Army officials have testified that reductions in Soviet tank production will effectively delay the fielding of the Future Soviet Tank 3 to the middle of the next decade. Second, the lack of urgency for the tank could give the Army time to allow the contractors to demonstrate the viability of the electrothermal gun as a possible lethality upgrade for the current M1A1 tank and the soon-to-be produced M1A2 tank and as a possible main gun for the Block III tank. The viability of this technology is expected to be demonstrated by the end of fiscal year 1992.

Although the M1A1 and M1A2 tanks can meet the threat at least to the end of the decade, Army artillery is inadequate on today's battlefield and cannot meet the current threat or the requirements of the Army's

emerging battlefield doctrine. The current artillery systems have limited ranges, firing rates, mobility, and survivability. The Advanced Field Artillery System to be produced under the ASM program is expected to be more agile, to have one-third more range, and to have a threefold increase in firing rate, thus making the system more survivable than the older howitzers.

Recommendations

GAO recommends that before seeking additional funds for the ASM program, the Secretary of Defense reassess the ASM program's justification, affordability, and priorities in light of the significant threat changes, the projected Army-wide funding shortfalls, and the greater need for ASM vehicles other than the tank. This reassessment should accompany any request for funding the ASM program.

GAO also recommends that if the 1992 tests demonstrate the viability of the electrothermal gun technology, the Secretary of Defense direct the Army to evaluate using the electrothermal gun to improve the lethality and survivability of the M1A1 and the M1A2 tank fleets. Putting the electrothermal gun on these tank fleets would further reduce the need for the Block III tank.

Matters for Congressional Consideration

Because of the numerous concerns about the program, GAO believes that Congress should not provide additional funding for the ASM program without an accompanying Department of Defense reassessment of the justification and affordability of the ASM program and of the priority of vehicles within the program.

Agency Comments

As requested, GAO did not obtain official comments from the Department of Defense on this report. However, GAO discussed the issues in this report with officials from the Office of the Secretary of Defense, the Department of the Army, and the Defense Intelligence Agency and has incorporated their comments as appropriate.

Army officials said that the ASM program is affordable as it is currently structured. Defense acquisition officials, on the other hand, said that they did not believe the program was affordable as it is currently structured. Army officials also said that the Block III tank needs to be the first vehicle developed because it is the most technologically challenging and poses the most stringent operational requirement. As a result, Army officials believe that the common chassis needs to be developed for the tank first.

Contents

Figures

Abbreviations

ASM	Armored Systems Modernization
GAO	General Accounting Office
NATO	North Atlantic Treaty Organization

Introduction

Armored Systems Modernization (ASM) is the Army's program to modernize its ground combat vehicles. The ASM program evolved during the mid-1980s, when the Army planned to simultaneously develop, produce, and field 24 new ground combat vehicles, including tanks, artillery, infantry vehicles, and other armored systems, under what was called the "Armored Family of Vehicles Program." The Army planned to base its armored modernization approach on a family of vehicles with a common chassis and common modular components. Army studies showed that using a common chassis and common components could reduce future operational and support costs. However, the Army's effort was dramatically scaled back because of the high costs involved in developing and producing so many different systems. In March 1985, the Army downsized the program to its six highest priority vehicles: four to be built on a heavy common chassis (weighing 55 to 62 tons) and two on a medium chassis (weighing up to 36 tons). The downsized program was renamed the "Heavy Force Modernization Program." In February 1990, the Army added a light, direct-fire weapon—the Armored Gun System—and again renamed the program to the "ASM Program."

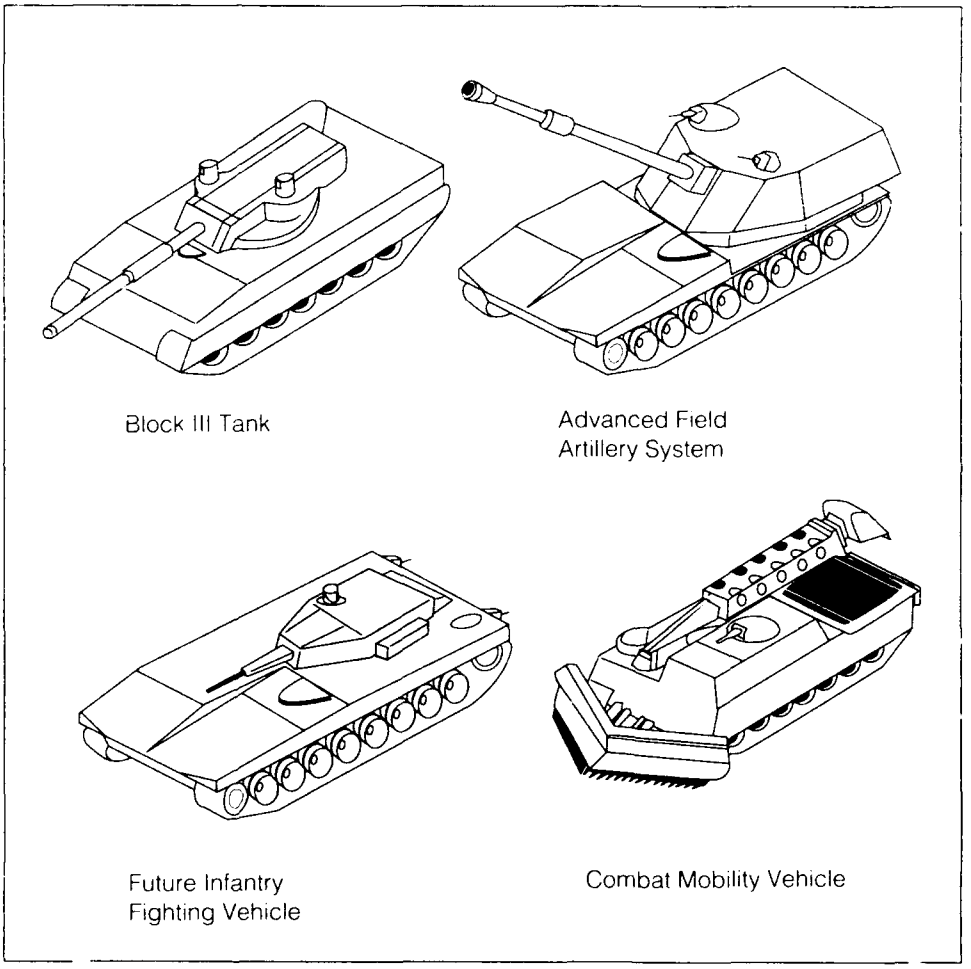
The Army will likely face serious funding shortfalls for all its development and procurement programs in the years beyond fiscal year 1997. A recent Department of Defense estimate, for example, shows a $19 billion funding shortfall for these programs between fiscal years 1998 and 2008. As a result of this estimate, the Defense Acquisition Board, which must review the Department of Defense's major weapon systems, reviewed the Army's ASM program and directed that the Army develop an acquisition program that would be more realistic in light of anticipated levels of military spending. As of June 19, 1991, the Army's response to the Board was that the ASM program was affordable as it was and that no revision to the acquisition program was needed.

Acquisition Strategy for the Heavy Chassis

The four systems to be built on a common heavy chassis are the Block III tank, a new main battle tank; the Combat Mobility Vehicle, an engineering vehicle for clearing mines and other engineering tasks; the Advanced Field Artillery System, a self-propelled howitzer; and the Future Infantry Fighting Vehicle, a troop carrier. The fact that these vehicles will have a "common" chassis does not mean that the chassis will be identical. Rather, the chassis will have certain common elements such as engines, transmissions, suspensions, modular armor, and tracks. In fact, the ASM common heavy chassis may actually be two chassis—one with the engine in the rear and one with the engine in the front—because tanks traditionally have had the engine in the rear, while self-

propelled artillery and infantry fighting vehicles have had the engine in the front. However, the chassis must be sufficiently similar to permit production on a single assembly line. Figure 1.1 shows the Army's conception of these vehicles.

Figure 1.1: Heavy Chassis Systems



The Army's initial development priority is the Block III tank, with the other heavy chassis systems to follow. The Army is developing the heavy chassis using a two-pronged development strategy: an in-house Army component development and test program and a competitive contractor development phase.

In fiscal year 1990, the Army began work on the in-house phase when it began to develop a "test bed," a modified M1 tank chassis that will be

used to test components for the common heavy chassis, such as the engine, transmission, and suspension, and for the Block III tank's weapon system, including the fire control, new gun, and autoloader. This effort is scheduled to continue through fiscal year 1993.

In December 1990, the Army awarded contracts to Teledyne Continental Motors and to Armored Vehicle Technologies Associated (a joint venture of General Dynamics Land Systems Division and FMC Corporation) for the competitive design and development of a common heavy chassis. This effort is scheduled to continue through the first quarter of fiscal year 1994. The contractors may use either the components being developed by the Army or independently developed components.

After the chassis is developed, the Army plans to select one of the contractors to develop the tank. This selection is scheduled for fiscal year 1994, and the selected contractor will be required to develop a prototype tank integrating the common heavy chassis with the tank weapons components. The contractor will be allowed to choose which weapons components to use. The prototype tank phase is scheduled to end in 1997, and full-scale tank development is scheduled to begin later that year. Block III tank production is scheduled to start in the fourth quarter of fiscal year 2001, with the first unit to be equipped in the second quarter of 2003.

The Army added the prototype tank phase at the direction of the Defense Acquisition Board in August 1990. The Board wanted the prototype phase to minimize integration risks brought about by the separate development of the common chassis and individual weapon components. The Army also added a prototype phase to the development plan of each of the other vehicles.

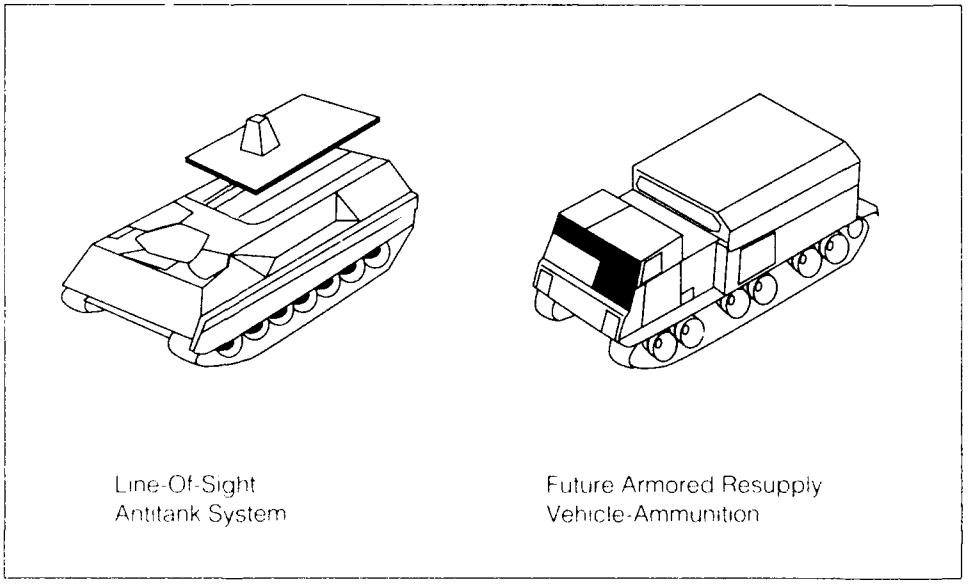
The Army plans for each of the three remaining heavy chassis systems to go through a technology demonstrator phase prior to the start of prototype development. The award of the demonstrator contracts are scheduled for the Combat Mobility Vehicle and for the Advanced Field Artillery System in fiscal year 1991 and for the Future Infantry Fighting Vehicle in fiscal year 1993. The demonstrator for the Combat Mobility Vehicle will integrate obstacle-breaching components on a surrogate tank chassis. The demonstrator for the Advanced Field Artillery System will integrate a new artillery cannon and fire control system on a surrogate chassis. The demonstrator for the Future Infantry Fighting Vehicle will integrate a new cannon and fire control system on a modified existing chassis.

The Army plans to award prototype development contracts for all three vehicles in 1994. The prototypes will integrate each system's unique weapons on the common heavy chassis. The full-scale development phase will begin in 1998 for the Advanced Field Artillery System and the Combat Mobility Vehicle and in 1997 for the Future Infantry Fighting Vehicle. Vehicle production is scheduled to begin in 2001 for the Advanced Field Artillery System and Future Infantry Fighting Vehicle and in 2002 for the Combat Mobility Vehicle. The scheduled first-unit-equipped dates are 2003 for the Advanced Field Artillery System and 2004 for the remaining two vehicles.

Strategy for the Medium Chassis

ASM program plans call for two systems to be built on a common medium chassis: the Line-of-Sight Antitank System, a vehicle carrying a high-speed, kinetic-energy antitank missile, and the Future Armored Resupply Vehicle-Ammunition, an artillery resupply vehicle. However, because the Army has not established a date for initiating the development of a medium chassis, these systems will initially be integrated on a modified Bradley Fighting Vehicle chassis. Figure 1.2 shows the Army's conception of these vehicles.

Figure 1.2: Medium Chassis Systems



The Army initiated development of the Line-of-Sight Antitank System prior to formulation of the ASM program and is proceeding with advanced development of the missile mounted on a surrogate chassis.

The Army tested the missile during 1990 and 1991. On December 5, 1990, the Defense Acquisition Board approved continued development of the missile. The Army plans to begin full-scale development of the system in early 1992, with production scheduled for 1997.

The Army plans to initiate advanced development of the Future Armored Resupply Vehicle-Ammunition in fiscal year 1991. The advanced development phase will demonstrate technologies for ammunition stowage and advanced material handling on a modified Bradley chassis. In 1994, the Army plans to begin the prototype development phase for the vehicle, with full-scale development to follow in 1997 and production in 2002. However, this schedule may slip, as the advanced development of the Future Armored Resupply Vehicle-Ammunition is currently unfunded. The Army hopes to find the needed funding before the end of fiscal year 1991.

Acquisition Strategy for the Armored Gun System

Planned as a 105-millimeter gun on a lightly armored chassis, the Armored Gun System is to replace the M551 Sheridan tank. The Army's preliminary plans call for the procurement of 300 vehicles: 70 that are for airborne units and that must be air droppable and 230 vehicles that are for other Army contingency forces and that need not be air droppable but can be rolled on and off aircraft.

Initially, the Army planned to buy an existing gun system. However, an Army market survey showed that no current "off-the-shelf" system was capable of meeting all gun system requirements. The Armored Gun System Program Office is revising its acquisition plan and making plans to award a contract in 1992.

The Marine Corps is also planning to acquire a light armored gun system but is not participating in the Army program. Instead, the Marine Corps plans to modify its current Light Armored Vehicle by adding a 105-millimeter gun. The Army is considering the modified vehicle to satisfy its gun system requirements.

On November 9, 1990, the Defense Acquisition Board authorized the Army to proceed with development of the Armored Gun System. In its recommendation, however, the Board directed the Joint Chiefs of Staff to review the Marine Corps' light gun system requirements to determine whether the Marine Corps could use the Army system.

Objectives, Scope, and Methodology

The Chairman of the Subcommittee on Defense, Senate Committee on Appropriations, requested that we examine the Army's ASM program, including (1) the justification for the ASM program to assess whether it is relevant to today's threat environment; (2) the program's projected funding requirements to determine whether it will be affordable, considering projected military funding reductions; and (3) the rationale for developing the Block III tank to determine why it is to be acquired before the other new combat vehicles.

We examined Army and Department of Defense documents and analyses that supported the program, including current defense threat projections, the Army's emerging battlefield doctrine, the Cost and Operational Effectiveness Analysis, the Strategic Threat Assessment Report, and the Baseline Cost Estimate. We reviewed various program requirements/priorities documents, transportability studies, and Army and ASM program funding projections. Also, we reviewed past studies of cost growth on major weapons systems.

We discussed the ASM program with officials at the Department of Defense and Army headquarters, Washington, D.C.; the ASM Program Executive Office, Warren, Michigan; the Tank-Automotive Command, Warren, Michigan; the Army Combined Arms Center, Fort Leavenworth, Kansas; the Army Artillery School, Fort Sill, Oklahoma; the Army Armament Research, Development, and Engineering Center, Picatinny Arsenal, Dover, New Jersey; the Defense Intelligence Agency, Washington, D.C.; and the Military Traffic Management Command, Falls Church, Virginia.

Because of the Army's electric gun program's potential in meeting future tank threats, we discussed this program with Army and contractor officials at the Electric Armaments Program Office, Picatinny Arsenal, Dover, New Jersey; the Army Ballistic Research Laboratory, Aberdeen Proving Ground, Maryland; the Naval Systems Division, FMC Corporation, Minneapolis, Minnesota; and the Land Systems Division, General Dynamics Corporation, Warren, Michigan.

We performed our work from November 1989 to May 1991 in accordance with generally accepted government auditing standards.

Justification for ASM Program Outdated by Changing Threat

U.S. military planning for the last 40 years has emphasized the need for combat systems designed to fight against a numerically superior, increasingly capable conventional threat from Soviet and Warsaw Pact forces. Continuing with this emphasis, the Army justified the need to upgrade its armored forces on the basis of the requirement to defeat a projected threat that assumed a powerful and massive Soviet and Warsaw Pact force prepositioned in Central Europe. In this threat scenario, the Soviet and Warsaw Pact forces had great superiority in numbers over the U.S. and North Atlantic Treaty Organization (NATO) forces. The Pact also had the capability to mount a deep, quick, decisive offensive into Western Europe with highly lethal and modern weapons.

Over the last 2 years, however, unprecedented changes in Europe and the Soviet Union have diminished this threat. These changes include the Soviet Union's unilateral force reductions, the disintegration of the Warsaw Pact, and the signing of the Treaty on Conventional Armed Forces in Europe. Despite these changes and even though the Army is reviewing a June 4, 1991, draft update of the ASM System Threat Assessment Report, the Army has not recognized the diminished Soviet threat in its justification for the ASM program.

Soviet Union's Unilateral Force Reductions

In December 1988, President Gorbachev announced that by 1991 the Soviet Union would reduce its armed forces by 500,000 men, 10,000 tanks, 8,500 artillery pieces, and 800 combat aircraft. These unilateral withdrawals from Eastern Europe alone were to include six tank divisions and 5,300 tanks. The Soviet President said the remaining forces in Eastern Europe would be restructured as a defensive force. At about the same time as this announcement was made, the Warsaw Pact nations announced their own unilateral reductions, totaling five divisions and 2,700 tanks.

In its September 1990 report on Soviet Military Power 1990, the Department of Defense recognized that the Soviet Union was reducing its military forces in Eastern Europe. However, it added that the Soviet Union was not disbanding entire tank divisions, but was reshuffling them as it restructured the remaining forces. The main feature of this restructuring was to transform the divisions away from an overtly offensive character by reducing the number of tanks per division by 20 to 40 percent, converting one tank regiment in each division to a motorized rifle regiment, and increasing the number of defensive systems within the division. While these divisions would have fewer tanks, they would have more armored personnel carriers and artillery pieces. A senior defense

analyst at the Rand Corporation calculated that the effect of these withdrawals on the remaining forces would be significant—the forces would have 20 to 25 percent less combat power and would be less capable of mounting offensive operations.

However, as discussed in the next section, the Soviet Union will likely remove all its military forces from Eastern Europe because of the disintegration of the Warsaw Pact.

Disintegration of the Warsaw Pact

During the 1980s, the Soviet Union's allies in Eastern Europe provided almost half the Warsaw Pact forces deployed in Central Europe. But in the last half of 1989, communist regimes began to fall as it became clear that Soviet forces would not intervene to maintain their rule. This spelled the end of the Warsaw Pact as a military alliance. In early 1990, the Soviet Union agreed to withdraw all its troops from Czechoslovakia and Hungary by mid-1991 and half its forces from Poland by the end of 1991. East Germany no longer exists, following its reunification with West Germany, and Soviet troops are expected to be withdrawn by the end of 1994. On March 20, 1991, the Under Secretary of Defense for Policy testified before the Subcommittees on Procurement and Military Nuclear Systems and on Research and Development of the House Committee on Armed Services that "despite temporary delays the Soviet Union will very likely complete the withdrawal of its military forces from Eastern Europe."

As a result of these events, NATO's defense ministers concluded in May 1990 that there was no Warsaw Pact threat, just a Soviet threat. In addition, in January 1990, the Director of the Defense Intelligence Agency testified before the Senate Committee on Armed Services that the Soviets would consider large-scale operations against NATO with only their forces as highly risky, if not impractical.

The Treaty on Conventional Armed Forces in Europe

The Treaty on Conventional Armed Forces in Europe, signed by 22 nations on November 19, 1990, will alter the balance of conventional weapons. The treaty is predicated on the principle of parity between NATO and Warsaw Pact forces between the Atlantic Ocean and Ural Mountains. NATO's defense ministers concluded in May 1990 that at treaty-imposed levels of combat equipment, the Soviet Union will no longer have sufficient forces and capabilities for launching a European-

wide attack, assuming that NATO maintains the levels of combat equipment permitted by the treaty. Table 2.1 illustrates the magnitude of weapons reductions set by the treaty.

Table 2.1: Limits to Weapons Imposed by the Treaty on Conventional Armed Forces in Europe

Weapon	Current force[a]	Treaty limit	Reduction needed
Tanks			
NATO	22,224	20,000	2,224
Warsaw Pact	51,500	20,000	31,500
Artillery			
NATO	17,328	20,000	0
Warsaw Pact	43,400	20,000	23,400
Armored combat vehicles			
NATO	28,800	30,000	0
Warsaw Pact	53,500	30,000	23,500
Combat aircraft			
NATO	6,700	6,800	0
Warsaw Pact	13,500	6,800	6,700
Attack helicopters			
NATO	2,200	2,000	200
Warsaw Pact	3,500	2,000	1,500

[a]Current force numbers are NATO estimates.

Source: Developed by GAO from NATO estimates and the Treaty on Conventional Armed Forces in Europe limits.

Change in Soviet Threat Does Not Appear to Be Easily Reversible

U.S. intelligence officials believe the Soviet Union would have difficulty reversing its reductions in military forces because of the country's political situation and urgent domestic problems. The Director of the Central Intelligence Agency in March 1990 testified before the House Armed Services Committee that the reduction in the Soviet threat would "be increasingly difficult to reverse." He cited several reasons for his conclusion:

- A major reversal of President Gorbachev's policies could come only after his removal from office, which did not seem likely because of his strong political position.
- If reactionary forces did move against President Gorbachev and prevailed, they would find it difficult to reimpose traditional military doctrine and procurement policies because of the expense and the risk of a backlash from a populace "weary of shortages and sacrifice."

- Moreover, a new hard-line regime would face the same economic and political pressures as President Gorbachev faces and would be largely preoccupied with urgent domestic problems. As a result, they would have "little incentive to engage in major confrontations with the United States," would be "unlikely to indulge in a major military buildup," and "would probably continue to pursue arms control agreements" with the West.

The Director added that the end of Soviet dominance in Eastern Europe was "probably already irreversible" and that there was no chance that reactionary forces could regain power in Czechoslovakia, East Germany (now reunified with West Germany), Hungary, and Poland.

Finally, in the forward to the 1991 Joint Military Net Assessment, the Secretary of Defense stated that the threat of a short-warning, global war starting in Europe is now less likely than at any time in the last 45 years.

Conclusions

The ASM program requirements are based on threat projections that do not recognize the unprecedented changes that have occurred and continue to occur in Europe and the Soviet Union. The Army has not reassessed the requirements for this massive modernization program based on threat projections that recognize the diminished Soviet threat.

Affordability of ASM Program Is Questionable

Funding requirements for the ASM program are projected to more than triple after fiscal year 1997, peaking between 2003 and 2007. The funding requirements for all the Army's other modernization efforts are also projected to peak during that time. When considered together, these programs will require significantly more funds than can be expected to be available during fiscal years 1998 to 2008.

ASM Development and Production Cost

The Army's cost estimate for the 6,080 heavy and medium vehicles planned to be acquired under the ASM program is about $59 billion. The estimated development and production costs by system are shown in table 3.1.

Table 3.1: Army's Cost Estimate for the ASM Program (as of April 1991)

Escalated dollars in millions

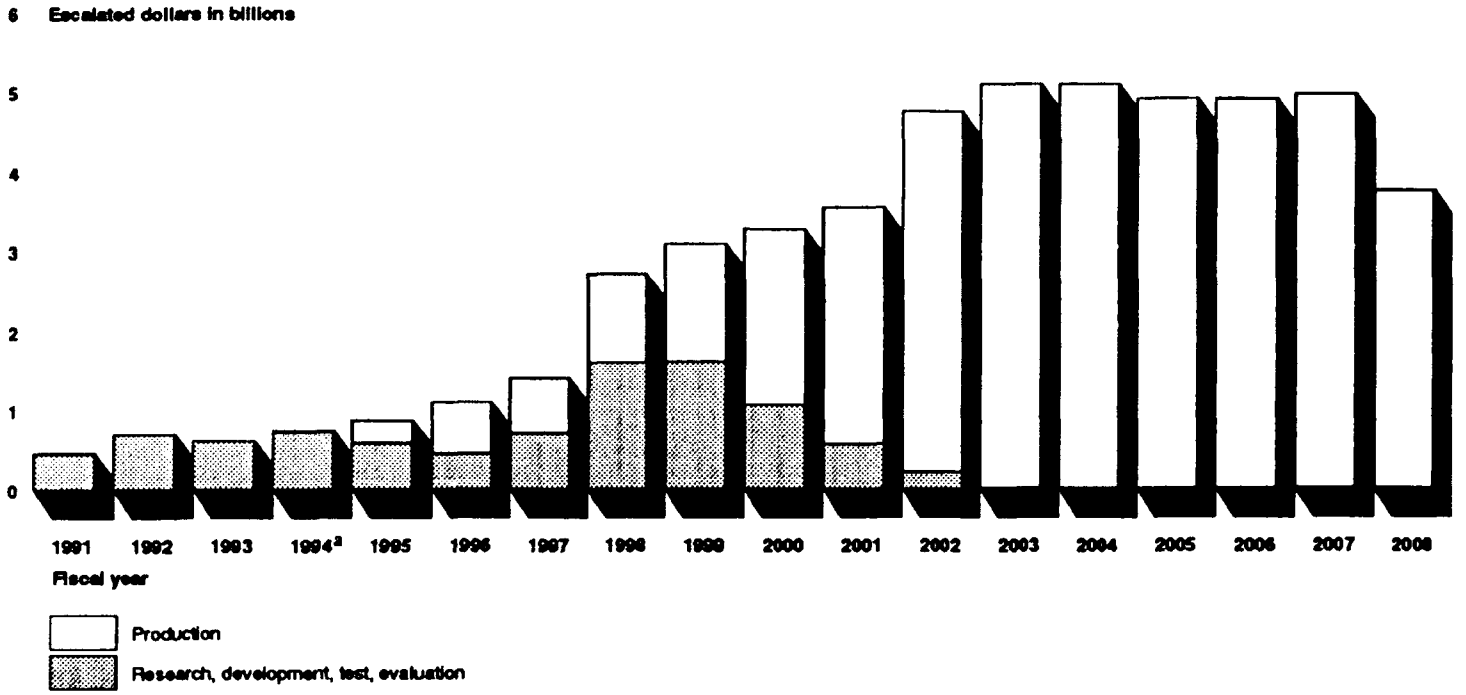
Vehicle type[a]	Vehicle quantity	Development cost	Production cost	Total cost
Block III tank	1,946	$3,731	$15,838	$19,569
Future Infantry Fighting Vehicle	1,321	1,383	10,742	12,125
Combat Mobility Vehicle	258	844	1,974	2,818
Advanced Field Artillery System	824	1,797	6,625	8,422
Future Armored Resupply Vehicle	824	382	3,433	3,815
Line-of-Sight Antitank System	907	718	9,024	9,742
Production start-up costs	0	0	2,692	2,692
Total	**6,080**	**$8,855**	**$50,328**	**$59,183**

[a]The estimate for the Armored Gun System is not included because at the time these estimates were made the Army was not sure whether the system would be acquired through purchase of an existing system or developed as a new system

Source: Office of the ASM Program Executive Officer, U.S. Army Tank-Automotive Command

The Army projects that over the next 6 years (fiscal years 1992 through 1997), ASM program spending will be relatively low because most of the planned vehicles will be in development. Projected spending begins to significantly increase in fiscal year 1998 and will peak in the fiscal year 2003 to 2007 time frame, when all ASM vehicles are expected to be in production. The Army's projected funding pattern for the ASM program is depicted in figure 3.1.

Figure 3.1: Army's Projected Funding Pattern for the ASM Program (as of October 3, 1990)



[a]In fiscal year 1994, production was estimated at $18 million.
Source: Office of the ASM Program Executive Officer, U.S. Army Tank-Automotive Command.

These estimates likely understate the actual final cost of the ASM program because the Army was projecting costs for many ASM vehicles that still require substantial advances in technology and that were relatively immature at the time the Army made the estimates. For example, the Army plans to put an autoloader in the Block III tank. This will be the first modern Army tank to have an autoloader. In addition, as we have previously reported,[1] most of the Army's major weapons systems incur substantial cost increases during the first few years of production, after the weapon system has been delivered in some numbers in the field.

[1]Budgetary Pressures Created by the Army's Plans to Procure New Major Weapon Systems Are Just Beginning (GAO/MASAD-82-5, Oct. 20, 1981) and Why Some Weapons Systems Encounter Production Problems While Others Do Not: Six Case Studies (GAO/NSIAD 85-34, May 24, 1985).

Army's Funding Requirements Exceed Projected Funding

Given the expected decline in Army appropriations, the Army will face serious funding shortfalls for all its development and procurement programs in the years beyond fiscal year 1997. The Army's total obligational authority declined from $79 billion in fiscal year 1990 to $73 billion in fiscal year 1991. Also, in addition to the ASM vehicles, the Army projects that other new systems, such as the Comanche attack helicopter, will be entering production after that year. Funding requirements for these systems show the same pattern as those of the ASM program—they grow rapidly after fiscal year 1997 and peak in the fiscal year 2003 to 2007 time frame. According to Department of Defense officials, the ASM program accounts for nearly one-third of the Army's planned investment during these peak production years.

These Army programs, as currently planned, will require a substantial increase in outyear funding. A November 1990 Department of Defense estimate shows a $19 billion funding shortfall for these programs between fiscal years 1998 and 2008. However, this estimate may be understated, as it was calculated before the 1990 budget summit and assumed that the Army development and procurement appropriations would increase to cover all its requirements through fiscal year 1997, steady funding at the fiscal year 1997 levels thereafter, and no program cost growth.

The budget summit agreements have reduced Army funding requests by 11 percent in fiscal year 1991, and Department of Defense analysts believe that these reductions can be expected to lead to proportionately lower Army funding in the future. Therefore, if projected fiscal year 1997 funding were reduced by 11 percent and that funding level were continued in the outyears, we calculate, using the Department of Defense's method for estimating, that the Army would have a $39 billion shortfall in meeting its projected requirements during fiscal years 1998 through 2008.

In November 1990, the Defense Acquisition Board reviewed the Army's ASM program. The Board approved full funding for the ASM program for fiscal year 1992; however, it also concluded that the Army should develop, by May 15, 1991, an acquisition program that is realistic in light of anticipated levels of military spending. As of June 19, 1991, the Army's response to the Board was that the ASM program was affordable as it was and that no revision to the acquisition program was needed.

Conclusions

The Army's projected outyear funding requirements for all its development and procurement programs, including the ASM program, are not affordable within current acquisition plans and projected funding levels. To make its programs more affordable, the Army may have to scale them back. The ASM program, which represents about one-third of the Army's projected funding requirements, is a logical candidate for some reduction in funding.

ASM Program May Not Be Properly Structured

The Block III tank has remained the Army's top ASM priority, but the following factors raise questions about whether it should remain so:

- Along with the overall decline of the Soviet threat, the projected fielding of the Future Soviet Tank 3[1]—the primary threat the Block III tank is to counter—has been delayed about 10 years.
- There are concerns about affordability, which we discussed in chapter 3, given that the Block III tank is the most expensive ASM vehicle.
- New gun technology, which may make the Army's current tank capable of defeating the Future Soviet Tank 3, could further reduce the need for the Block III tank.
- Army artillery and upgrades do not meet the current threat. Neither do they meet the needs of the Army's future battle doctrine.

Fielding of New Soviet Tank Is Delayed

The Army justified the requirement and priority for the Block III tank by citing the need to defeat the Future Soviet Tank 3 when that tank is fielded in sufficient quantities to have a major impact on the battlefield. The projected fielding of the Future Soviet Tank 3, however, has been delayed until the middle of the next decade. If the Block III tank is required to meet the threat from the Future Soviet Tank 3, then the M1A1 tank and the soon-to-be produced M1A2 tank meet the current threat and will meet the threat from the Future Soviet Tank 2,[2] which is projected to be fielded in the late 1990s and is the immediate predecessor of the Future Soviet Tank 3. However, the Defense Intelligence Agency believes that the Soviets may upgrade the armor on the Future Soviet Tank 2 at the end of this decade, making it a more capable tank than initially expected.

The Soviet Union, however, is drastically cutting tank production in an effort to improve its economy. These cuts are delaying the projected fielding date of the Future Soviet Tank 3 and slowing its rate of fielding. President Gorbachev announced in January 1989 that the Soviet Union would cut its defense spending, and published Defense Intelligence Agency data shows a subsequent decline in Soviet tank production. In 1989 the Soviet Union produced 1,700 tanks, less than half its 1988 output of 3,500 tanks. According to the Army, the initial fielding date for the Future Soviet Tank 3 has been delayed until the middle of the next decade. Further, the number of tanks that will be in the field at any

[1]Some threat projections call the Future Soviet Tank 3 "the Tank of 2000."

[2]Some threat projections call the Future Soviet Tank 2 "the Tank of the Late 1990s."

given time is expected to be significantly lower than initially anticipated. This newly projected number is only about one-third the number used in Army war-gaming scenarios to justify the urgent need for the Block III.[3]

New Gun Technology May Further Reduce the Need for a New Generation Tank

The Army is currently developing an electrothermal gun, which, according to Army development and contractor officials, has the potential for making the M1A1 and M1A2 tanks capable of defeating the Future Soviet Tank 3, thereby further reducing the need for the Block III tank in the foreseeable future. Army intelligence officials project that the Block III tank will need a 140-millimeter gun to defeat the armor of the Future Soviet Tank 3. The electrothermal gun program has the goal of providing the performance of a 140-millimeter conventional gun from a 120-millimeter gun tube. The electrothermal gun has not yet reached this performance goal. Army officials said that once developed, the electrothermal gun could be adapted to the M1A1 tank by modifying its gun and changing the engine mounting to provide space for the electronics required to fire it.

An electrothermal gun works somewhat like a conventional gun in that the propellant is ignited, rapidly turning into a gas that expands and drives the projectile out of the gun tube. In the conventional gun the igniting mechanism is a spark generated when a percussion cap is crushed, whereas the igniting mechanism for the electrothermal gun is a short, strong pulse of electricity. Unlike a conventional gun, the electrothermal gun needs a "prime mover," such as a vehicle engine, to produce electric energy and a pulsed power unit to store the energy and provide it to the gun.

The expected advantages of the electrothermal gun over a conventional gun are that it would increase the velocity of projectiles and the survivability of the tank in battle. The increased velocity would provide faster flying time and either greater range at the conventional gun's penetration capability or greater penetration at the conventional gun's range. Survivability would be increased by the gun's ability to use a less explosive propellant than conventional gun propellants. The electrothermal gun's recoil is expected to be less than that of a conventional gun, providing a softer launch that would cause less stress on the sensors in "smart" munitions.

[3]Specific quantities of the Future Soviet Tank 3 to be fielded are classified.

The Army has been exploring the potential of the electrothermal gun since the late 1970s. From November 1989 to February 1990, the Army tested the gun technology of two contractors. These tests demonstrated the theoretical potential of the technology but also revealed substantial areas of technical and engineering uncertainty in turning that technology into weapons. A major task in developing the gun for tank use is to reduce the size of the pulsed power unit so that it will fit into a tank and still provide the required amount of electrical power.

Within the next 2 years, the Army should have a better idea of whether it will be able to turn the electrothermal gun technology into a tank gun. The Army has established two decision points at which the contractors must demonstrate the viability of their approaches. The first decision point is scheduled for September 30, 1991, when the contractors must demonstrate the successful performance of at least a 30-millimeter electrothermal gun. The second decision point is scheduled for September 30, 1992, when the contractors must demonstrate similar performance for at least a 120-millimeter electrothermal gun for a future tank application.

Current Artillery Meets Neither the Current Threat Nor the Needs of the Army's Future Battle Doctrine

The Advanced Field Artillery System to be produced under the ASM program is expected to meet the needs of the Army's emerging battlefield doctrine—needs that the current M109 howitzer and planned improvements to it will not meet. Also, existing howitzers do not meet the current threat.

Emerging Doctrine Places a Premium on Long-Range, Agile Artillery

The AirLand Battle doctrine has driven the Army's war-fighting concepts for the last decade, shaping the force structure needed on the battlefield. However, the Army is using a group of studies collectively entitled "AirLand Battle Future" to determine what changes are needed in its doctrine, organization, and equipment.

The AirLand Battle Future doctrine is the result of significant technological advances, coupled with projected fiscal constraints. Technological advances make it feasible to field surveillance systems that allow the Army to know where large enemy forces are almost all the time. With the increases in lethality, range, and accuracy of modern weapons

systems, the Army will be able to bring long-range fire, such as artillery, down on any large enemy forces identified. However, the enemy may be able to do the same, with the result that U.S. forces will have to disperse to survive. The need to disperse the forces to allow them to survive will result in a future battlefield that will frequently have large gaps between forces. The Army calls this a "nonlinear battlefield."

The Army's emerging doctrine places a premium on intelligence-gathering and target acquisition systems that provide greater accuracy at greater ranges and on weapon systems that are able to provide accurate and lethal fire from long ranges, such as artillery. These weapon systems must also be able to move and generate combat firepower quickly to evade enemy counterfire.

Current Field Artillery Has a Short Range and Is Not Agile

Neither the Army's current M109 howitzers nor planned improvements to them meet the current artillery threat or the requirements of the nonlinear battlefield as spelled out in the AirLand Battle Future doctrine because of their relatively short range. In addition, the current howitzers do not meet the nonlinear battlefield requirement because they are unable to establish a position and fire quickly. The current Soviet howitzers can shoot longer ranges than the Army's current howitzers. In fact, in the recent Desert Storm operation, because the Iraqis, using Soviet and other artillery, could shoot longer ranges, the U.S. artillery had to position itself well within the Iraqi artillery range in order to fire.

The Army's current howitzers' inability to establish a position and fire quickly stems from the fact that they must be connected to a fire control center that positions them and provides them with target information, ballistic computations, and firing instructions. In addition, Army artillery doctrine requires at least four rounds to reach a designated target at nearly the same time to be within the acceptable lethality limits. Because the howitzers are manually loaded, their rate of fire is such that four howitzers must operate as a group to deliver the required four rounds, making their position large and easily detected. The length of time it takes to establish a position and the size of the area occupied by four howitzers make them vulnerable to enemy counterfire.

Because of these and other deficiencies, the Army in 1986 initiated improvements to the M109 howitzer. In addition to increasing the firing range, the improvements are to include a fire control system that would allow the howitzers to operate in pairs and move quickly away from

their positions after firing to evade counterfire. The Army plans to build 824 improved howitzers, with fielding to begin in May 1993.

Even with these improvements, however, the Army does not believe the M109 howitzer will be adequate in the nonlinear battlefield because its rate of fire is still too low and it requires connection to a separate fire control center. The Advanced Field Artillery System is planned to correct these deficiencies. It is expected to incorporate several advanced technologies, including an advanced cannon propellant, an on-board fire control system, and automated ammunition-handling equipment. These features are expected to increase the firing range to 40 kilometers, increase the amount of on-board ammunition by 50 percent, and increase the firing rate threefold. The increased firing rate means that one vehicle should be able to provide the required four rounds on target, allowing the artillery system to operate autonomously, which in turn will enhance its survivability on a nonlinear battlefield.

Conclusions

The urgent need for the Block III tank has faded with the decline in the Soviet threat and Soviet tank production. With the delay in the projected fielding of the Future Soviet Tank 3, the M1A1 and M1A2 tanks should be capable of defeating the Soviet tank threat into the next decade. Further, the lack of urgency for the Block III tank could give the Army time to allow the contractors to demonstrate the viability of the electrothermal gun as a possible lethality upgrade for the M1A1 and M1A2 tanks and as a possible main gun for the Block III tank.

In contrast, current artillery systems are considered inadequate today and will not meet the needs of the emerging Army battlefield doctrine, which stresses more effective long-range, agile artillery. The Advanced Field Artillery System, unlike the current M109 howitzer and its planned improvement, is expected to meet this need.

Recommendations

We recommend that, before seeking additional funds for the ASM program, the Secretary of Defense reassess the ASM program's justification, affordability, and priorities in light of the significant threat changes, the projected large funding shortfalls, and the greater need for ASM vehicles other than the tank. This reassessment should accompany any request for funding the ASM program.

We also recommend that if the 1992 tests demonstrate the viability of the electrothermal gun technology, the Secretary of Defense direct the

Army to evaluate using the electrothermal gun to improve the lethality and survivability of the M1A1 and M1A2 tank fleets. Putting the electrothermal gun on these tank fleets would further reduce the need for the Block III tank.

Matters for Congressional Consideration

We believe that Congress should not provide additional funding for the ASM program without an accompanying Department of Defense reassessment of the justification and affordability of the ASM program and of the priority of vehicles within the program.

Views of Agency Officials

As requested, we did not obtain official comments from the Department of Defense on this report. However, we discussed the issues in this report with officials from the Office of the Secretary of Defense, the Department of the Army, and the Defense Intelligence Agency and have incorporated their comments as appropriate.

Army officials said that the ASM program is affordable as it is currently structured. They said the current 5-year defense plan has adequate funds for the program and they believed the Army would find the required funds in the outyears. Defense acquisition officials, on the other hand, said that they did not believe the program was affordable as it is currently structured.

Army officials said that the Block III tank needs to be the first vehicle developed because it is the most technologically challenging and poses the most stringent operational requirement. As a result, Army officials believe that the common chassis needs to be developed for the tank first.

Major Contributors to This Report

National Security and International Affairs Division, Washington, D.C.

Henry Hinton, Associate Director
F. James Shafer, Assistant Director
Lawrence Gaston, Senior Evaluator

Detroit Regional Office

Glen Trochelman, Assistant Regional Manager
Robert Herman, Regional Management Representative
James Owczarzak, Evaluator-in-Charge
David Ehrlich, Evaluator
Lawrence Kubiak, Evaluator
Teresa Ledoux-Totte, Evaluator