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Fact Sheet for the Chairman, Legislation and National Security Subcommittee, Committee on Government Operations, House of Representatives

October 1988

AIR DEFENSE INITIATIVE

Program Cost and Schedule Not Yet Determined

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National Security and
International Affairs Division

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October 28, 1988

The Honorable Jack Brooks
Chairman, Legislation and
National Security Subcommittee
Committee on Government Operations
House of Representatives

Dear Mr. Chairman:

In response to your September 1, 1987, letter, we have reviewed selected aspects of the Air Defense Initiative (ADI) Program. As requested, we examined the use of ADI funding for fiscal year 1988 and the planned use of funding for fiscal year 1989. We also surveyed Department of Defense (DOD) officials for their opinions on the advantages and disadvantages of, and possible alternatives to, the ADI management structure.

The purpose of the ADI Program is to develop an air defense system to defend North America against low-observable penetrating bombers and air- and sea-launched cruise missiles. The Office of the Secretary of Defense (OSD) manages the program, which is executed by the Air Force and the Navy.

The ADI Program is currently in the concept/exploration phase of the DOD acquisition process. OSD officials expect the program to enter the demonstration/validation phase during fiscal year 1990. Although an overall plan has not been finalized, they also expect the program to complete the demonstration/validation phase and enter the full-scale development phase at about the same time as the Strategic Defense Initiative Program, which is intended to defend North America against land- and sea-based ballistic missiles.

FUNDING

The Congress consolidated separate Air Force and Navy budget requests for fiscal year 1988 into a single OSD program element, thus making OSD responsible for determining the funding amount for each service.

According to OSD officials, the ADI Program received $49.2 million for fiscal year 1988. Of this amount, the Air Force received $30.8 million to undertake research and development activities in four areas (surveillance; engagement; battle management, command, control, and communications; and integration and architecture), the Navy received $12.0 million to undertake similar activities in three areas (surveillance, engagement, and integration and architecture), and a classified program received $6.4 million.

For fiscal year 1989, OSD requested $173.3 million and $40.2 million for the Air Force and the Navy, respectively, for the ADI Program. (See table I.1.) The ADI Program received $158.6 million. DOD has not yet finalized a spending plan for fiscal year 1989.

DOD officials told us that they had not yet finalized an overall plan on how long it will take or how much it will cost to reach full-scale development. Thus, the total research and development cost for ADI has not yet been determined.

ADI MANAGEMENT STRUCTURE

OSD is assisted in managing the ADI Program by an interagency steering committee that coordinates and integrates the various service and agency research efforts into an ADI technology development program. The committee also recommends to OSD the best use of ADI funds.

DOD officials are generally supportive of this management structure. They believe that a less centralized structure, one that would place responsibilities such as air defense with the services, would result in too little coordination of activities and make it more difficult to benefit from existing programs. On the other hand, these officials believe that a more centralized structure--a separate organization specifically created for ADI--might not receive adequate cooperation from the services. In addition, they believe that a more centralized structure would be more costly and would make it more difficult for ADI to benefit from existing programs.

LIMITED THREAT INFORMATION

DOD officials stated that contractors developing potential system concepts were not provided with complete classified threat information. Thus, the actual threat level may be different than the threat level the contractors are using to create their system concepts. DOD officials indicated that they are addressing this issue.

RELATIONSHIP WITH THE STRATEGIC DEFENSE INITIATIVE PROGRAM

The President has directed that ADI deployment decisions are to occur in the same time frame as deployment decisions for the Strategic Defense Initiative Program. Currently, the ADI schedule is behind that of the Strategic Defense Initiative Program. DOD authorized the Strategic Defense Initiative Program to begin the demonstration/validation phase of the acquisition process in September 1987. According to OSD officials, the ADI Program probably will not reach this phase until fiscal year 1990. However, the officials told us that ADI is still expected to begin the full-scale development phase at a time similar to that of the Strategic Defense Initiative Program.

OBJECTIVES, SCOPE, AND METHODOLOGY

We conducted our review at the Department of Defense, Washington, D.C.; the Department of the Navy, Washington, D.C.; and the Department of the Air Force, at various locations. We interviewed officials from the Office of the Secretary of Defense, the Office of the Secretary of the Air Force, the Air Force Systems Command, the Air Force Electronic Systems Division, the Air Force Space Division, the Air Force Aeronautical Systems Division, the Office of the Chief of Naval Operations, the Space and Naval Warfare Systems Command, the Naval Air Systems Command, and the Naval Air Development Center. We also interviewed representatives to the Inter-Agency ADI Steering Committee. In addition, we reviewed management studies and agency records, including budget information. Our review was limited to developing information on ADI's budget and management structure. We did not evaluate the effectiveness of the overall ADI Program or the individual ADI technologies.

We conducted our review between October 1987 and August 1988 in accordance with generally accepted government auditing standards. As requested, we did not obtain official agency comments. However, we obtained the views of responsible agency officials during the course of our work, and we incorporated their comments as appropriate.

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Unless you publicly announce its contents earlier, we plan no further distribution of this fact sheet until 30 days after its issue date. At that time we will send copies to the House and Senate Committees on Appropriations and on Armed Services; the Secretary of Defense; the Director, Office of Management and Budget; and other interested parties.

Sincerely yours,

Harry R. Finley
Senior Associate Director

Contents

ABBREVIATIONS

ADI	Air Defense Initiative
ASW	anti-submarine warfare
DOD	Department of Defense
OSD	Office of the Secretary of Defense
UHF	ultra high frequency

INTRODUCTION

In July 1985 the President directed the Department of Defense (DOD) to begin an Air Defense Initiative (ADI) Program, leading to possible deployment decisions that would be compatible with the Strategic Defense Initiative's decision timetable. In 1985 DOD created the ADI research and development program as a means of developing the technologies necessary for a North American air defense system against low-observable penetrating bombers and air- and sea-launched cruise missiles. ADI is to complement the Strategic Defense Initiative Program, which is intended to defend North America against land- and sea-based ballistic missiles.

The ADI Program is currently in the concept/exploration phase of the DOD acquisition process. DOD officials expect the program to enter the demonstration/validation phase during fiscal year 1990.

ADI FUNDING

The program is managed by the Office of the Secretary of Defense (OSD) and is executed by the Air Force and the Navy. According to an OSD official, the Defense Advanced Research Projects Agency will also be involved with the ADI Program beginning in fiscal year 1989. According to the Army representative to the Inter-Agency ADI Steering Committee, the Army will become more actively involved in ADI after the concept/exploration phase has been completed and the desired level of defense has been determined. ADI received its first funding in fiscal year 1987. ADI's goal is to develop technologies to support a full-scale development decision in the early to mid-1990s.

According to DOD officials, ADI is needed to detect and identify low-observable aircraft, low-observable cruise missiles, and quieter cruise missile capable submarines that will evolve in the late 1990s and beyond. DOD officials stated that in some areas the developing low-observable technology will only require the improvement of some of the present defense systems, and in other areas ADI will have to explore revolutionary technologies.

ADI will concentrate on developing technologies in three areas--surveillance; engagement; and battle management, command, control, and communications. As a first step in developing these technologies, ADI has awarded contracts to four teams of contractors to develop preferred system architecture concepts, identify critical technical issues, and provide recommended strategies for resolving these issues. ADI's initial emphasis has been in surveillance technologies. According to program officials, the first priority is to develop technologies capable of detecting and tracking cruise missiles and cruise missile carriers. Engagement activities will require research into the

enhancement of existing weapons as well as the development of new weapons systems. Battle management, command, control, and communications research will identify and develop the technologies needed to provide a multimedia, mobile, distributed, survivable communications system.

Table I.1 shows ADI's funding for fiscal years 1987 and 1988 and DOD's request for fiscal year 1989. For fiscal year 1987 DOD requested $53.4 million for four Air Force research and development program elements. According to OSD officials, these program elements received $32.9 million. For fiscal year 1988 DOD requested $171.9 million for four Air Force program elements and one Navy program element. According to OSD officials, the program received $49.2 million, and the Congress consolidated the funding into one ADI program element managed by OSD. OSD then allocated the funds to the Air Force and the Navy. For fiscal year 1989 OSD requested $213.5 million, and received $158.6 million. DOD has not yet finalized a spending plan for fiscal year 1989.

Table I.1: Summary of ADI Funding by Program Activity for Fiscal Years 1987 Through 1989

Program activities	FY 1987 funding	FY 1988 funding	FY 1989 request
	---------(millions)--------		
Integration and architecture			
Air Force	$ 3.5	$ 2.7	$ 15.2
Navy	0.0	5.0	5.2
Surveillance			
Air Force	28.3	25.4	131.8
Navy	0.0	5.0	30.0
Engagement			
Air Force	0.5	0.5	12.0
Navy	0.0	2.0	5.0
Battle management, command, control, and communications			
Air Force	0.6	2.2	14.3
Classified activities	0.0	6.4	0.0
Total	$32.9	$49.2	$213.5

DOD officials told us that they had not yet finalized an overall plan on how long it will take or how much it will cost to reach full-scale development. Thus, the total research and development cost for ADI has not yet been determined.

Details of the Air Force's and the Navy's programs are discussed in appendixes II and III, respectively.

ADI MANAGEMENT STRUCTURE

The consolidated ADI Program is managed by the Under Secretary of Defense for Acquisition through the Deputy Director for Defense Research and Engineering for Strategic and Theater Nuclear Forces and the Assistant Deputy Director for Defensive Systems. OSD determines the level of funding for each service and agency. The Air Force program is under the jurisdiction of the Air Force Systems Command through its Electronic Systems Division, Space Division, and Aeronautical Systems Division. The Navy program is managed by the Office of the Chief of Naval Operations through the Space and Naval Warfare Systems Command and the Naval Air Systems Command.

OSD is assisted in overseeing the ADI Program by the Inter-Agency ADI Steering Committee, which was established to coordinate and integrate the various service and agency research efforts into an ADI technology development program. The committee is also responsible for recommending to OSD the best use of ADI funds. The committee is chaired by an Air Force Major General and consists of general officer level representatives of the Navy, the Army, the Strategic Defense Initiative Organization, the Defense Advanced Research Projects Agency, the Defense Support Project Office, and the Office of the Joint Chiefs of Staff.

Officials from OSD, as well as representatives to the steering committee, generally believe that the current management structure has advantages over one that is either more or less centralized. According to several of these officials, the ADI Program does not exclusively involve new research programs. The program also is expected to benefit from ongoing research being conducted in other programs. Officials told us that the use of a steering committee maintains research continuity by allowing each service and agency to conduct the research related to its primary mission while the steering committee provides interservice coordination of the research. Several officials told us that this coordination is cost effective because ADI is able to benefit from existing programs without disrupting them while it targets its own resources to those areas that are not addressed by other programs.

Officials told us that a decentralized ADI Program in which air defense is left to each service would lessen coordination between the services and make it more difficult to benefit from existing programs. According to one official, because of competing intraservice requirements, a decentralized program could cause ADI-sponsored programs to receive less priority within individual service budgets.

On the other hand, the representatives to the steering committee did not favor the creation of a separate Air Defense Initiative Organization. Several representatives told us that the creation of an independent organization would be costly and could lessen coordination between ongoing ADI-related programs in the services; thus it could be more difficult to benefit from these programs. Some representatives did not believe that current funding levels warrant a separate organization.

In addition, the officials were not in favor of consolidating the ADI Program with the Strategic Defense Initiative Program. Several told us that the two programs deal with distinctly different threats and different levels of technological risk. Some officials stated that consolidation with the Strategic Defense Initiative Program could lessen coordination with existing air defense programs.

The Strategic Defense Initiative Organization representative to the steering committee agreed that the programs, although complementary, should not be merged. He said that ADI is taking an existing comprehensive air defense research effort and providing a sharper focus and clearer definition to the research programs. Each of these programs is related either to an existing deployed system or to the development of a replacement or adjunct system. On the other hand, he told us that the Strategic Defense Initiative Organization is exploring the feasibility of establishing a totally new defensive system against a substantially different threat.

ADI AND THE STRATEGIC DEFENSE INITIATIVE DEPLOYMENT TIME FRAMES

As noted earlier, the President directed that the ADI Program take place concurrently with the Strategic Defense Initiative Program. Future deployment decisions for an ADI System are to occur in the same time frame as deployment decisions for the Strategic Defense System.

Currently, the ADI schedule is behind that of the Strategic Defense Initiative. To meet Milestone I, the decision point at which DOD will decide whether or not to begin the demonstration/validation phase of the acquisition process, a

program must have defined and selected system concepts worthy of further development. The Strategic Defense Initiative Program reached Milestone I in September 1987. The ADI Program, according to OSD officials, probably will not reach Milestone I until fiscal year 1990, rather than the scheduled date of March 1989.

However, OSD officials told us that the slippage in Milestone I does not necessarily mean that Milestone II will slip. They said that ADI is still expected to meet Milestone II at a time similar to that of the Strategic Defense Initiative Program. Milestone II is the decision point at which DOD will decide whether or not to begin the full-scale development phase after firm and realistic performance specifications have been established.

ADI ACTIVITIES MANAGED BY THE AIR FORCE

The Air Force has been responsible for executing over three-fourths of the ADI Program to date. Table II.1 shows the funding for ADI activities managed by the Air Force.

Table II.1: Funding Status of the Air Force's ADI Program

Program activities	FY 1987 Funded	FY 1987 Obligated	FY 1988 Funded	FY 1988 Obligated	FY 1989 request
	(thousands)				
Integration and architecture					
Architecture studies	$ 2,400	$ 2,400	$ 1,400	$ 1,400	
Technical Evaluation Facility	533	533	1,077	700	
Technical, engineering, and management support	500	500	187	0	
Other activities	67	67	0	0	
FY 1989 activities	0	0	0	0	$ 15,200
Subtotal	3,500	3,500	2,664	2,100	15,200
Surveillance					
Ultra high frequency and L-band radars	2,700	2,700	8,472	8,472	
Space-based radar	12,736	12,730	6,200	6,058	
Airborne surveillance and tracking	400	400	1,140	600	
Multi-spectral sensor fusion processor	1,400	1,400	1,039	510	
Performance evaluation	480	480	1,375	925	
Active electro-optical surveillance	100	100	177	177	
Measurement and data collection	500	500	875	100	
Identification, infrared technology	572	572	190	0	
Medium wavelength infrared and long wavelength infrared demonstration	300	300	160	0	
Radar concept analysis	0	0	30	0	
Dual-band radar	0	0	100	0	
Support to government	9,100	9,100	5,648	5,648	
FY 1989 activities	0	0	0	0	131,800
Subtotal	28,288	28,282	25,406	22,490	131,800
Engagement	484	484	475	212	12,000
Battle management, command, control, and communications					
Simulation for command and control	200	200	1,599	1,200	
Communications system design	200	200	400	400	
Intelligence support	84	84	0	0	
Carlspan optics link	84	84	0	0	
Salaries and travel	0	0	240	0	
FY 1989 activities	0	0	0	0	14,300
Subtotal	568	568	2,239	1,600	14,300
Total	$32,840	$32,834	$30,784	$26,402	$173,300

INTEGRATION AND ARCHITECTURE

As shown in table II.1, the integration and architecture activities received nearly $2.7 million for fiscal year 1988, and DOD requested $15.2 million for fiscal year 1989.

The major effort in fiscal year 1988 was the contractors' system architecture studies. Four contracts for ADI system architecture studies were awarded in September 1987, costing about $900,000 each, which are expected to be completed in October 1988. Each contractor was tasked to determine the functional requirements of future air defense systems, develop candidate force structures, and identify the performance shortfalls of existing systems against both the current and the projected threat. Each of the four contractors is supposed to provide up to 12 architecture concepts to the Air Force.

According to Electronic Systems Division officials, beginning in fiscal year 1989, the Air Force will analyze and evaluate the contractors' architecture concepts according to a number of criteria such as cost, affordability, feasibility, and survivability. They estimate that in March 1989, this will result in one or more integrated reference architectures that will identify specific technologies that are needed to produce such an ADI system and that will be further developed during the demonstration/validation phase. The Air Force Electronic Systems Division ADI Technical Director said that about $6.2 million would be needed for the Air Force evaluation leading to the reference architectures.

OSD's fiscal year 1989 budget request also contained $3.0 million to begin the development of a Technical Evaluation Facility at the Electronic Systems Division that will further evaluate and refine the reference architectures. This facility, according to Electronic Systems Division officials, will have simulation capabilities beyond what is currently available. It will simulate various air-breathing threats (i.e., airplanes and cruise missiles) to test, evaluate, and analyze the air and land defenses included in the candidate architectures. DOD also needs to decide whether this facility will be capable of simulating the threat beyond the secret level. According to Electronic Systems Division officials, if data above the secret level are to be used in the simulation facility, then Special Compartment Information Facilities will have to be developed. Another option, according to an OSD official, would be to use existing facilities elsewhere, such as the Strategic Defense Initiative Test Bed, if available.

Electronic Systems Division personnel told us that the contractors' architecture studies were done at the secret level

and that they may be deficient because intelligence at higher classification levels was not used. The Electronic Systems Division included $2.0 million funding in its fiscal year 1989 request to correct this possible deficiency.

The Air Force Foreign Technology Division has developed a validated threat for ADI. However, the threat is based on information at the secret level only. The Electronic Systems Division estimated that including data at a higher classification level would also require $2.0 million of fiscal year 1989 funding.

OSD officials told us that they are aware of these possible deficiencies in the threat definition and are taking steps to ensure that the correct threat is being considered.

According to the Air Force Electronic Systems Division ADI Technical Director, the architecture studies will identify potential systems capable of defending against the strategic threat. He said that the fiscal year 1989 budget request included another $2.0 million for studies to determine if these systems would also be applicable to the tactical threat.

SURVEILLANCE

The Air Force's ADI surveillance activities received $25.4 million in fiscal year 1988, and DOD requested $131.8 million for fiscal year 1989, as shown in table II.1. According to an Electronic Systems Division official, approximately $8.0 million of fiscal year 1989 funding will be needed to complete work begun in prior years; the balance will be available for new activities. Surveillance activities have received a major portion of the ADI funds in fiscal years 1987 and 1988. According to DOD officials, initial program emphasis has been on developing surveillance technologies, since there is little point in developing the other aspects of ADI if cruise missiles cannot be detected and tracked.

The fiscal year 1988 funding is being used primarily to support studies of ground, airborne, and space-based radars and infrared optical sensors. As shown in table II.1, the most significant, in terms of funding, are contracts for studies of (1) ultra high frequency (UHF) and L-band radars ($8.5 million), (2) a space-based radar ($6.2 million), (3) sensor options for the airborne surveillance and tracking technology program ($1.1 million), and (4) a multi-spectral sensor fusion processor ($1.0 million).

UHF and L-band radar technology work was first funded under ADI in fiscal year 1987 for $2.7 million. At that time three

contractors were selected to develop separate designs for airborne radars using UHF and L-band frequencies capable of detecting and tracking all types of air-breathing threats to North America in the 1990s and beyond. A fleet of these airborne radars could be deployed as part of an air defense system for North America. These three contracts also included options that were exercised in May 1988 for each contractor to produce and submit a functional design of an airborne surveillance radar and provide an evaluation of its performance. These contracts are scheduled to be completed in November 1988, according to the Air Force Electronic Systems Division ADI Technical Director.

The Air Force Space Division received $6.2 million in fiscal year 1988 for research on a space-based radar. OSD decided to discontinue using ADI funds for this effort and, as a result, requested no funding for fiscal year 1989. However, OSD has subsequently told us that due to a change of events, some fiscal year 1989 ADI funds may be provided to space-based radar research.

The airborne surveillance and tracking technology program for detecting small targets at long range received ADI funding of $400,000 in fiscal year 1987 and $1.1 million in fiscal year 1988. In fiscal year 1987 the Electronic Systems Division awarded five contracts to identify airborne sensors that would be effective against cruise missiles. Each contractor was to identify the optimum combination of sensors for surveillance, tracking, and identification in two configurations: (1) strategic only and (2) strategic and tactical operations. Each contractor had to evaluate the capability of various sensor suites to detect, track, and identify low-observable targets in all weather over all terrains. Contractors were also asked to define the utility and limitations of each sensor. The contractors were told that a sensor suite should include, but not be limited to, any, some, or all of the following sensors: microwave radar, millimeter wave radar, laser radar, infrared, electronic support measures, acoustics, and ultraviolet. These contracts were completed in fiscal year 1988.

The multi-spectral sensor fusion processor program budget for fiscal year 1988 was $1.0 million. The primary objective of this program is to appraise a sensor data fusion processor that integrates multi-spectral threat data from various sensors. As part of this effort, the various threat signatures or characteristics (i.e., radar cross section, engine noise acoustics, etc.) will be compiled. A data processor and algorithms will then be developed and implemented to demonstrate enhanced detection of the low-observable penetration threat. Performance criteria developed from the multi-spectral fusion

tests and studies will provide guidance in the selection of the best mix of sensors.

The fiscal year 1988 budget for performance evaluation, which involves studying the capabilities of different surveillance technologies, was nearly $1.4 million. One contract involves evaluating the ability of an electro-optical system to detect targets. Another effort involves using a contractor's airplane to collect various types of sensor input. Other studies propose (1) to compare the relative values of high-range resolution profiles and two-dimensional imagery for identifying target aircraft and (2) to begin the development and analysis of a new radar concept specifically oriented toward small targets with a low radar cross section.

The fiscal year 1988 budget for providing technical, engineering, and management support services to the Air Force in conducting the surveillance programs was $5.6 million. The majority of the funding was provided to the Mitre Corporation; Technical, Engineering, and Management Support contractors; and Systems Engineering and Technical Assistance contractors.

DOD requested $131.8 million for surveillance for fiscal year 1989. Of this amount, about $43.9 million would be used to accelerate by 12 months the work being done on the flight demonstration phase of the airborne surveillance and tracking technology program. According to the Air Force Electronic Systems Division ADI Technical Director, the flight demonstration will test UHF and L-band frequency airborne radars. Air Force Systems Command officials stated that the technology for other sensors may be pursued at the same time as the flight demonstration, but the demonstration is not to be delayed by efforts to develop or fuse these sensors with the airborne radars. According to the ADI Technical Director, whether both UHF and L-band airborne radars will be built will be dependent on the funding. The request for proposals for the development of the radars is expected to be published during fiscal year 1989, if resources are available. An OSD official stated that OSD has not made a final decision on the use of the other $87.9 million.

ENGAGEMENT

Air Force Aeronautical Systems Division received $475,000 in fiscal year 1988 for engagement activities. These funds were used for a conceptual design of a long endurance attack system, for exploratory development of hypersonic vehicles, and for investigating new and innovative air-to-air missile concepts. No fiscal year 1989 funding is needed to complete these contracts.

OSD has requested $12.0 million for engagement activities in fiscal year 1989. According to an Aeronautical Systems Division official, fiscal year 1989 funding will be used to begin development of sensor and weapon technologies. For example, $5.0 million will be used for a multiyear contract to demonstrate the capability of a fire-control system against low-observable threats, and another $3.0 million will be used to further research and refine the engagement technologies identified in the architecture concept studies.

BATTLE MANAGEMENT, COMMAND, CONTROL, AND COMMUNICATIONS

The battle management, command, control, and communications activities received $2.2 million for fiscal year 1988, and DOD requested $14.3 million for fiscal year 1989, as shown in table II.1. Fiscal year 1988 funds were used for three major activities: a contract to develop a command and control simulation facility at Rome Air Development Center, a contract to design an ADI communications system, and salaries and travel for Rome Air Development Center.

According to the Electronic Systems Division official responsible for battle management, command, control, and communications, the Rome Air Development Center's simulation facility will be able to simulate and model all envisioned sensors, threat attacks, and the effects of these attacks. Phase I, which received $1.2 million in fiscal year 1988, involved two contracts awarded in September 1987 and completed in May 1988. In June 1988 a contract was awarded for Phase II ($400,000) to design and demonstrate the simulation architecture developed during Phase I. Electronic Systems Division officials stated that $1.0 million will be needed in fiscal year 1989 to complete the simulation facility, including hardware.

The Electronic Systems Division also provided additional funds ($400,000) for fiscal year 1988 for a communications systems contract awarded in fiscal year 1987. The objective of the contract is to develop a design that will permit the future demonstration of an intelligent, multimedia communications system capable of supporting the surveillance; engagement; and battle management, command, control, and communications components of ADI. According to the Electronic Systems Division official responsible for battle management, command, control, and communications, this contract is expected to be completed in May 1989 and will require a minimum of $241,000 of fiscal year 1989 funds to complete.

OSD has not finalized its plans for spending the $14.3 million it requested for fiscal year 1989.

ADI ACTIVITIES MANAGED BY THE NAVY

The Navy's role in the ADI Program is to develop undersea surveillance and air engagement technology options for inclusion in an overall strategic air defense system in the mid-1990s. A fully capable ADI system would find and attack submarines before they launch cruise missiles, or attack the cruise missiles after launch. The Navy's ADI anti-submarine warfare (ASW) and anti-air warfare efforts will stress operations within the marginal seas--those portions of the Western Atlantic Ocean, the Eastern Pacific Ocean, the Caribbean Sea, the Beaufort Sea, and the Gulf of Mexico that extend hundreds of nautical miles from the coast. These areas have increased in strategic importance due to the introduction of long-range cruise missiles. They also have acoustic environments that differ from those of the high seas and are not well understood. Current Navy ASW and anti-air warfare efforts stress the defense of fleet operations on the high seas, rather than within the marginal seas.

The Navy's current ADI requirement is to track submarines carrying cruise missiles that are in range of North America to permit destruction of the submarines and/or direct the engagement of cruise missiles in flight. Detection and localization of submarines are becoming more difficult because of Soviet quieting and because of the expanded numbers and types of submarines with cruise missiles. Increased numbers of Soviet submarine-launched cruise missiles are expected to be available by the late 1990s.

NAVY'S PROGRAM PLAN

The Navy developed a program plan in 1987 to meet its ADI requirement. The plan covers fiscal years 1988 through 1992 and consists of undersea surveillance activities and an integration and architecture activity. The plan provides for work in four surveillance technology areas. Table III.1 shows proposed funding by fiscal year. However, according to Navy officials, as a result of budget decisions and program consolidations, this plan no longer accurately reflects the current Navy financial plan. For example, the plan did not include an engagement program, which is included in the current program. However, the plan still provides general guidance to Navy officials implementing the ADI Program.

Table III.1: The Navy's Original ADI Program Funding Plan

Program	Fiscal year 1988	1989	1990	1991	1992	Total
	(millions)					
Integration and architecture	$ 5.0	$ 6.0	$ 6.5	$ 5.0	$ 5.0	$ 27.5
Undersea surveillance						
Passive acoustics	12.3	20.5	43.3	37.0	24.8	137.9
Active acoustics	15.9	27.7	32.3	29.7	19.4	125.0
Non-acoustic detection	5.7	6.2	6.7	6.6	4.1	29.2
Environmental assessment	8.3	7.0	12.2	11.1	5.2	43.8
Engagement	0.0	0.0	0.0	0.0	0.0	0.0
Total	$47.2	$67.4	$100.9	$89.5	$58.5	$363.5

Note: Totals may not add because of rounding.

CURRENT PROGRAM

The Navy received $12.0 million of its $47.2 million request for fiscal year 1988 and requested $40.2 million for fiscal year 1989. Table III.2 shows how the Navy plans to spend these funds. Detailed information about the Navy's planned fiscal year 1989 program has not yet been finalized; therefore it is not available. However, a Navy official did say that most of the fiscal year 1988 work, which was concentrated on planning, will be completed by October 1988. Fiscal year 1989 funds will be used to award new contracts for technology development.

The Navy program's initial goal is to conduct an at-sea demonstration of an advanced integrated undersea surveillance system that would provide options for full-scale development decisions in the mid-1990s.

Integration and architecture

The integration and architecture activity of the Navy program consists of three components: architecture; modeling; and management, coordination, and planning. Fiscal year 1988 funding for these components totals $5.0 million, as shown in table III.2. Navy officials estimate that this amount was 83 percent obligated as of June 30, 1988.

Table III.2: Funding Status of the Navy's ADI Program

Program activities	FY 1988 Funded	FY 1988 Obligated	FY 1989 request
	---------(thousands)--------		
Integration and architecture			
Architecture			
Architecture evaluation tools	$ 603	$ -	$ -
Methodology applications	270	-	-
Architecture development and analysis	675	-	-
Top level warfare requirement	265	-	-
Other architecture tasks	296	-	-
Subtotal	2,109	-	-
Modeling			
Modeling study	505	-	-
Input database	889	-	-
Model development and validation	815	-	-
Management	81	-	-
Subtotal	2,290	-	-
Management, coordination, and planning	601	-	-
Total	5,000	4,135	5,200
Undersea surveillance			
Acoustic testing	4,500	4,500	-
Acoustic measurements	500	200	-
Total	5,000	4,700	30,000
Engagement	2,000	185	5,000
Grand total	$12,000	$9,020	$40,200

The Navy integration and architecture activity is being implemented by over 20 Navy laboratories and private contractors. The Navy "contracts" with its laboratories (such as the Naval Ocean Systems Center and the Naval Underwater Systems Center) by having both parties agree to a tasking statement and a funding document. This process was completed in August 1988. All of the private contractors have existing ASW contracts with the Navy, and the ADI tasks have been added as amendments. This process was completed in July 1988, except for one amendment still under negotiation. In all cases, laboratories and contractors were selected based on submitted proposals.

Architecture

The architecture component is being conducted as an overlay to existing organizations involved in ASW technologies, architecture, and engineering. DOD has directed that the fiscal year 1988 Navy program define the baseline undersea surveillance architecture and conduct system tradeoffs to identify the most promising technologies for further development. According to Navy officials, this work is closely coordinated with the Air Force's architecture and engineering studies.

Total fiscal year 1988 funding for architecture is over $2.1 million. As shown in table III.2, architecture has five major tasks, which are expected to be completed between September and November 1988.

The first task, architecture evaluation tools, is intended to develop and enhance architecture models permitting the characterization and assessment of candidate ASW architectures involving command, control, communications, and intelligence aspects.

The second task, methodology applications, is expected to review, using the methodology developed for other ASW defenses, the ADI methodology for characterizing selected system architectures in terms of their interactions with other ADI components (national command authority, air defense forces, ground defense forces, other services, etc.). Also, evaluations and enhancements of selected candidate architectures are expected to be conducted.

The third task, architecture development and analysis, entails providing platform/system descriptions of the ASW-related architecture, and ASW-related system performance capabilities, identifying performance shortfalls in the ASW architecture for ADI, and developing and assessing candidate architectural options.

The fourth task, top level warfare requirement, is intended to develop a working requirement for the Navy effort. A proposed requirement is undergoing Navy review to establish an official requirement document.

The fifth task, other architecture tasks, includes management, review, and coordination activities.

Modeling

The Navy will test proposed architectures using computer modeling techniques. According to Navy officials, ADI brings unique challenges to ASW modeling, related to environmental conditions in the marginal seas, and timing and accuracy constraints, that differ from a typical fleet defense ASW system.

Total fiscal year 1988 funding for the modeling component was $2.3 million. As shown in table III.2, modeling has four major tasks. These tasks are expected to be completed between September and December 1988.

The first task, a modeling study, entails developing ADI scenarios; identifying, evaluating, and selecting models; defining model strengths; recommending model enhancements; and evaluating the baseline ADI architecture.

The second task, input database, is intended to gather and develop all input data parameters (i.e., performance predictions and costs of technology candidates) required for the ADI modeling and assessment studies and identify, describe, and evaluate the relevant models, formulas, and algorithms concerning their strengths, weaknesses, accuracy, and suitability. Recommendations for enhancements will be made, and quality assurance reviews will be performed on engineering models.

The third task, model development and validation, is expected to identify a procedure to enhance appraisal models to increase sensitivity to command, control, communications, and intelligence issues and outline engineering model requirements for follow-on model development.

The fourth task, management, is intended to provide management and review support in all efforts to develop the ASW system architectures.

Management, coordination, and planning

Total fiscal year 1988 funding for this component was $601,000. These funds are to be used for providing management and technical support for the program, coordinating ADI technology with that of other related programs, conducting or participating in integration planning and review of related ASW platforms and technologies, and reviewing systems analysis performance input databases.

Undersea surveillance

Fiscal year 1988 funding for undersea surveillance, as shown in table III.2, is $5.0 million. These funds provide about 21 percent of the Navy's total fiscal year 1988 funding to develop better acoustic information on target submarines. This activity has two components. One component received fiscal year 1988 ADI funding of $4.5 million and is expected to procure hardware to build acoustic measuring devices and electronic processing equipment to be used to conduct special acoustic testing. The other received fiscal year 1988 ADI funding of $0.5 million and is intended to conduct unique measurements on a representative target.

Acoustic testing will be performed by a private contractor and by three Navy laboratories--the David Taylor Research Center, the Navy Civil Engineering Laboratory, and the Naval Air Development Center. The contractor is receiving $0.5 million to provide systems engineering and technical assistance and $2.0 million to furnish acoustic data collection and measurement hardware and experiment support. The David Taylor Research Center is receiving $1.2 million to provide acoustic receivers and is responsible for overall coordination and planning. The Navy Civil Engineering Laboratory is receiving $0.2 million to determine and provide power requirements and to provide a handling system for the acoustic sources. The Naval Air Development Center is receiving $0.6 million to provide support equipment needed for the testing. These funds are 100 percent obligated.

Acoustic measurements will be performed by a private contractor and the David Taylor Research Center, each receiving $250,000 in fiscal year 1988 funds. The contractor will receive a sole source contract to meet the scientific needs of the exercise. The David Taylor Research Center will be responsible for meeting the logistical requirements. These funds were estimated to be 40 percent obligated as of June 30, 1988.

Engagement

The Navy is pursuing air engagement technology options that would be used against the cruise missile threat. The scope of the engagement activity consists of defining and developing an airborne avionics system that can function as an integral component of a total cooperative engagement combat system. This system will (1) be composed of surveillance and detection sensors capable of detecting and tracking specified targets, (2) include an on-board information and data processing and control display capability, and (3) include reporting links to ensure interoperability with fleet and air defense facilities.

Fiscal year 1988 funding for engagement, as shown in table III.2, was $2.0 million. The objective is to generate a performance specification that defines and describes an advance airborne combat system that can operate as the airborne component of an overall engagement system and function as an integral component of an air defense system. The performance specification will establish and set limits for the technical portion of an overall procurement package, which can be utilized for subsequent development of an advance airborne combat system. The performance specification is expected to be completed on December 30, 1988.

This activity is being conducted by the Naval Air Systems Command and the Naval Air Development Center. Fiscal year 1988 funds were estimated to be 9 percent obligated as of June 30, 1988.

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