
DEPARTMENT OF DEFENSE

*AGENCY-WIDE
FINANCIAL STATEMENTS*

*REQUIRED SUPPLEMENTARY
STEWARDSHIP INFORMATION*

Required Supplementary Stewardship Information



(This page intentionally left blank)

Required Supplementary Stewardship Information



DEPARTMENT OF DEFENSE CONSOLIDATED NATIONAL DEFENSE PROPERTY, PLANT AND EQUIPMENT For Fiscal Year Ended September 30, 2000 (Stated in Number of Items or Systems)						
(a)	(b)	(c)	(d)	(e)	(f)	
Categories/Major Types	As of 10/01/99	Additions	Deletions	As of 9/30/00	Condition/% Operational	
1. Aircraft						
A. Combat	7,453	121	130	7,444	80%	
B. Airlift	6,033	81	144	5,970	83%	
C. Other	2,281	78	67	2,292	84%	
2. Ships						
A. Submarines	80	-	6	74	100%	
B. Aircraft Carriers	12	-	-	12	100%	
C. Surface Combatants	163	3	37	129	100%	
D. Amphibious Warfare	52	-	5	47	98%	
E. Mine Warfare	27	-	-	27	100%	
F. Support	145	6	12	139	100%	
G. Other	994	13	80	927	100%	
H. Small Boats	2,327	44	107	2,264	87%	
3. Combat Vehicles						
A. Tracked	46,490	183	785	45,888	87%	
B. Wheeled	140,136	3,461	2,794	140,803	97%	
C. Towed	8,584	-	322	8,262	85%	
4. Guided, Self-propelled Ordnance						
A. Missiles	431,941	6,100	27,315	410,726	79%	
B. Torpedoes	18,352	-	95	18,257	100%	
5. Space Systems						
A. Satellites	89	9	6	92	100%	

Narrative Statement

The National Defense Property, Plant and Equipment (ND PP&E) amounts reported above include only items in an “active status.” Inactive ND PP&E items (e.g., items awaiting disposal, mothballed ships, and aircraft stored at Davis-Monthan, AFB) are not included in the amounts reported. The amounts reported in the FY 1999 ND PP&E report included some items in an “inactive” status. As a result, certain beginning balances differ from the balances reported in the

Required Supplementary Stewardship Information



FY 1999 Annual Financial Statements. Additionally, the Military Departments continued to refine the categorization in FY 2000 and have included items not reported in the prior year.

Additions or deletions during the year that were greater than 5% of the beginning balance are explained as follows:

- **Ships** - The Department of the Navy disposed of 140 ships and 107 small boats.
- **Guided, Self-Propelled Ordnance** - The Department deleted about 27,300 missiles. Of this total, 14,600 were used for testing or training; 11,900 were deleted due to demilitarization or disposal; and 300 were sold.
- **Space Systems** - Nine satellites were added. Six satellites became inoperable or were placed in a disposable orbit status.

As of the date these statements were prepared, the Federal Accounting Standards Advisory Board (FASAB) had not determined the final reporting requirements for ND PP&E. Therefore, the Department elected to report ND PP&E for FY 2000 in a manner similar to FY 1998 and FY 1999. Encouraged by the FASAB, the Department implemented in FY 1998 the proposed amendments to the accounting standards that required the reporting of quantities, condition and investment trends for major types of ND PP&E. At subsequent FASAB meetings, the Board chose not to implement the proposed amendments but, rather, to continue studying various alternatives for reporting ND PP&E. These studies were ongoing in FY 2000.

Since the FASAB did not adopt the proposed amendments, the Department is not in full compliance with the existing reporting requirements that require the reporting of the cost of ND PP&E. The Department cannot fully comply with the existing reporting requirement, because many of the Department's ND PP&E accountability and logistics systems do not contain the cost of the ND PP&E assets. These systems were designed for the purpose of maintaining accountability and meeting other logistics requirements and not for capturing and reporting the cost of ND PP&E.

Given the complexity of the existing temporary reporting requirements, the enormous cost of implementing the temporary reporting requirements and their interim nature, the Department is continuing to use the reporting method used in FY 1998. The Department believes that the most reasonable and responsible course of action is to report quantity and investment information for the DoD ND PP&E until such time as the FASAB adopts permanent reporting requirements.

Required Supplementary Stewardship Information



DEPARTMENT OF DEFENSE CONSOLIDATED NATIONAL DEFENSE PROPERTY, PLANT AND EQUIPMENT ANNUAL INVESTMENTS For Fiscal Years 1998 through 2000 (In Millions of Dollars)			
(a) Categories/Major Types	(b) FY 1998	(c) FY 1999	(d) FY 2000
1. Aircraft			
A. Combat	\$ 5,269	\$ 6,901	\$ 7,889
B. Airlift	3,727	4,354	4,951
C. Other	1,512	2,662	2,889
D. Aircraft Support Principal End Items	3,340	1,387	1,320
E. Other Aircraft Support PP&E	6	1,418	1,030
2. Ships			
A. Submarines	1,226	1,409	1,598
B. Aircraft Carriers	1,301	1,340	1,465
C. Surface Combatants	2,921	3,074	2,920
D. Amphibious Warfare	748	581	571
E. Mine Warfare	91	73	16
F. Support	11	371	249
G. Other	575	30	35
H. Ship Support Principal End Items	851	852	2,100
I. Other Ship Support PP&E	6	7	210
3. Combat Vehicles			
A. Tracked	256	354	1,491
B. Wheeled	270	261	735
C. Towed	3	-	28
D. Combat Vehicles Support Principal End Items	842	1,199	61
E. Other Combat Vehicles Support PP&E	49	73	78
4. Guided, Self-propelled Ordnance			
A. Missiles	1,534	1,374	2,583
B. Torpedoes	125	70	47
C. Guided, Self-propelled Ordnance Support Principal End Items	1,339	807	45
D. Guided, Self-propelled Ordnance Support PP&E	-	222	123

Required Supplementary Stewardship Information



5. Space Systems			
A. Satellites	607	1,501	1,120
B. Space Systems Support Principal End Items	537	443	660
6. Other			
A. Other Weapon Systems	\$ 129	\$ 115	\$ 151
B. Other Weapon Systems Support Principal End Items	139	61	87
C. Other Weapon Systems Support PP&E	-	42	4
7. Weapon Systems Support Real Property			
A. Active Ammunition Bunkers	28	19	31
8. Mission Support PP&E	5,096	5,432	3,945

Narrative Statement

Investments included in this report reflect DoD Procurement Appropriation outlays (expenditures). Outlays are used because current DoD systems do not accrue acquisition costs in accordance with accounting standards.

Mission Support PP&E includes ordnance support equipment such as ordnance stands; electronics equipment such as test sets, air compressors and generators; communications equipment such as field communications systems and signal jammers; and other various types of support equipment essential to the conduct of military missions.

Variances between investments reported in FY 2000 and prior years are attributable to revised methodologies used in compiling the report. Additionally, some FY 1998 and FY 1999 amounts have been changed to correct erroneous amounts previously reported.

Required Supplementary Stewardship Information



DEPARTMENT OF DEFENSE CONSOLIDATED HERITAGE ASSETS For Fiscal Year Ended September 30, 2000						
(a) Categories	(b) Unit of Measure	(c) As of 10/01/99	(d) Additions	(e) Deletions	(f) As of 9/30/00	
Museums	Each	220	29	5	244	
Monuments & Memorials	Each	2,041	68	135	1,974	
Cemeteries & Archeological Sites	Sites	30,059	1,053	5,860	25,252	
Buildings & Structures	Each	17,603	2,193	586	19,210	
Major Collections	Each	94	20	12	102	

Narrative Statement

Heritage Assets are property, plant and equipment items that are unique due to their historical or natural significance; cultural, educational or artistic importance; and/or significant architectural characteristics. The reporting of Heritage Assets has been significantly changed from FY 1999. The FY 2000 categories are defined as follows:

- **Museums.** Buildings that house collection-type Heritage Assets including artwork, archeological artifacts, archival materials, and other historical artifacts. The primary use of these buildings is the preservation, maintenance, and display of Heritage Asset collections.
- **Monuments and Memorials.** Sites and structures built to honor and preserve the memory of significant individuals and/or events in history.
- **Cemeteries and Archeological Sites.** Land on which gravesites of prominent historical figures and/or items of significance are located.
- **Buildings and Structures.** Buildings and Structures listed on, or eligible for listing on, the National Register of Historic Places including Multi-Use Heritage Assets. These buildings do not include museums.
- **Major Collections.** Significant collections maintained outside of a museum.

The methods used to establish items as having heritage significance vary between the categories and type of assets. Subject matter experts, and criteria such as listing on the National Register of Historic Places, play a significant role in categorizing these assets. In all cases, a myriad of federal statutes, Military Department regulations, and other guidelines that prescribe heritage significance or provide guidance are used to determine DoD Heritage Assets.

Required Supplementary Stewardship Information



The Department's assessment of the condition of Heritage Assets is based on whether the assets are being cared for and safeguarded in accordance with relevant federal government regulations. The Department's Heritage Assets are in acceptable or good condition and are appropriately safeguarded.

Within the DoD, reporting of Heritage Asset information is evolving and has required the development of new definitions and classifications. As a result, some of the opening balances have been adjusted from the ending balances reported in the prior year. Information pertaining to the Navy and Air Force's Heritage Assets follows.

Department of the Navy

During FY 2000, the Navy inventoried its Heritage Assets to improve the accuracy of the amounts reported and to clear data entry backlogs. In addition, the Navy has selected one system for maintaining accountability and reporting of Heritage Assets and expects to implement this system during FY 2001.

Department of the Air Force

The Air Force Museum, located at Wright-Patterson Air Force Base, Ohio, houses the main collection of historical artifacts that are registered as historical property in the Air Force Museum System. The other 13 Air Force museums are considered Air Force Field Museums, which also contain items of historical interest; some however, are specific to the general locality. As of September 30, 2000, the Air Force Museum System reported approximately 61,000 items that display the culture of the Air Force and its predecessor organizations, including advances in technology and significant persons, places, and events in Air Force history.

There are 151 memorials and monuments located at various Air Force bases throughout the United States. Most of these monuments and memorials honor specific individuals or cadet wings for various accomplishments.

The Air Force has administrative and curatorial responsibilities for 39 cemeteries on Air Force bases and 1,321 archeological sites. The 4,679 sites reported as deletions represent those that have not been evaluated for historical significance, but are included in the Air Force inventory of sites. Each Major Command is responsible for the care and maintenance of the archeological sites under their jurisdiction.

The Air Force currently considers 4,027 buildings and structures Heritage Assets. The deletions reported this year represent those buildings where the Air Force is not the principal property manager. The quantities reported for September 30, 1999, included buildings in which the Air Force was the secondary tenant. Of the 4,027 buildings and structures, 1,831 are currently on the National Register of Historical Places. Most of the buildings and structures are considered to be Multi-Use Heritage Assets, and as such have been capitalized, depreciated, and reported as General PP&E.

The Air Force has eight significant or major collections consisting of: (a) historically significant materials, (b) the Air Force Art Collection, and (c) two collections at the Air Force Academy

Required Supplementary Stewardship Information



containing historical items and memorabilia as well as distinctive works of art. In FY 2000, the permanent collection at the Air Force Historical Research Agency and related repositories contained approximately 51,000 linear feet of historically significant material. In FY 2000, the USAF Art Collection contained approximately 9,000 items. The Air Force Art Collection consists of original oils, drawings, sketches and sculptures. The two major collections at the Air Force Academy consist of historical items and memorabilia as well as distinctive works of art. As of September 30, 2000, the USAF Museum had not completed its inventory of the Academy holdings. It is anticipated that USAF Museum will complete the validation of the inventory by the end of the calendar year.

Required Supplementary Stewardship Information



DEPARTMENT OF DEFENSE CONSOLIDATED STEWARDSHIP LAND For Fiscal Year Ended September 30, 2000 (Acres in Thousands)				
(a) Land Use	(b) As of 10/01/99	(c) Additions	(d) Deletions	(e) As of 9/30/00
1. Mission	16,769	94	45	16,818
2. Parks & Historic Sites	1	-	-	1
Totals	<u>16,770</u>	<u>94</u>	<u>45</u>	<u>16,819</u>

Narrative Statement

Stewardship Land is land that is not acquired for, or in connection with, items of General Property, Plant and Equipment. All land, regardless of its use, provided to the Department from the Public Domain, or at no cost, is classified as Stewardship Land. Stewardship Land is reported in physical units (acres) rather than cost or fair value.

Stewardship Land transactions during the year consisted of minor acquisitions and disposals. The beginning balances this year differ slightly from the ending balances reported in FY 1999 due to an adjustment for Stewardship Land which was not previously reported.

Required Supplementary Stewardship Information



DEPARTMENT OF DEFENSE CONSOLIDATED NONFEDERAL PHYSICAL PROPERTY Annual Investments in State and Local Governments For Fiscal Years 1996 through 2000 (In Millions of Dollars)					
(a) Categories	(b) FY 1996	(c) FY 1997	(d) FY 1998	(e) FY 1999	(f) FY 2000
Transferred Assets:					
National Defense Mission Related	\$ 62	\$ 38	\$ 34	\$ 20	\$ 5
Total	\$ 62	\$ 38	\$ 34	\$ 20	\$ 5
Funded Assets:					
National Defense Mission Related	-	-	-	\$ 17	\$ 7
Total	-	-	-	\$ 17	\$ 7
Grand Total	\$ 62	\$ 38	\$ 34	\$ 37	\$ 12

Narrative Statement

Investments in Nonfederal Physical Property are incurred by the Department for the purchase, construction, or major renovation of physical property owned by state and local governments, including major additions, alterations, and replacements; the purchase of major equipment; and the purchase or improvement of other physical assets. In addition, Nonfederal Physical Property Investments include federally owned physical property transferred to state and local governments.

Investment values included in this report are based on outlays (expenditures). Outlays are used because current DoD systems do not accrue costs in accordance with accounting standards.

The FY 1999 investment has been restated from the prior year's investment amount by \$17 million for an Air Force investment not previously reported.

Department of the Army

The total amount of reported transferred asset values are for non-cash items that were transferred to state and local governments by the Department of the Army. These properties are essential in accomplishing the mission of the Army National Guard. The Army National Guard funds maintenance costs for these nonfederal assets.

Department of the Navy

The Navy did not fund or transfer assets to any state or local governments.

Required Supplementary Stewardship Information



Department of the Air Force

The total amount of reported funded asset values are Air National Guard investments in Military Construction Cooperative Agreements. These agreements involve the transfer of funds and allow joint participation with states, counties, and airport authorities for construction or repair of airfield pavements and facilities required to support the flying mission assigned to civilian airfields.

Required Supplementary Stewardship Information



DEPARTMENT OF DEFENSE CONSOLIDATED INVESTMENTS IN RESEARCH AND DEVELOPMENT Annual Investments in Research and Development For Fiscal Years 1996 through 2000 (In Millions of Dollars)					
(a) Categories	(b) FY 1996	(c) FY 1997	(d) FY 1998	(e) FY 1999	(f) FY 2000
1. Basic Research	\$ 3,755	\$ 1,479	\$ 1,258	\$ 1,115	\$ 812
2. Applied Research	1,768	2,617	2,756	2,985	3,095
3. Development					
A. Advanced Technology Development	2,729	4,227	3,861	4,444	3,753
B. Demonstration and Validation	5,822	5,698	6,762	6,564	6,557
C. Engineering and Manufacturing Development	9,178	8,435	8,336	7,934	8,353
D. Research, Development, Test & Evaluation Management Support	3,515	3,409	3,331	3,146	2,954
E. Operational Systems Development	7,428	9,724	9,850	9,801	10,124
4. Other	1,900	1,732	1,585	1,636	1,906
Total	<u>\$ 36,095</u>	<u>\$ 37,321</u>	<u>\$ 37,739</u>	<u>\$ 37,625</u>	<u>\$ 37,554</u>

Narrative Statement

Investment values included in the report are Research, Development, Test and Evaluation (RDT&E) outlays (expenditures). Outlays are reported because current DoD systems are unable to accrue costs in accordance with accounting standards. DoD RDT&E programs are classified in the following categories:

- **Basic Research** is the systematic study to gain knowledge or understanding of the fundamental aspects of phenomena and of observable facts without specific applications, processes, or products in mind.

Required Supplementary Stewardship Information



- **Applied Research** is the systematic study to gain knowledge or understanding necessary for determining the means by which a recognized and specific need may be met. This includes the systematic application of knowledge toward the production of useful materials, devices, and systems or methods, including design, development, and improvement of prototypes and new processes to meet specific requirements.
- **Development** takes what has been discovered or learned from basic and applied research and uses it to establish technological feasibility, assessment of operability, and production capability. The first stage, Advanced Technology Development, demonstrates the general military utility or cost reduction potential of a new technology when applied to different types of existing military equipment or techniques. Demonstration and Validation, which is system specific, evaluates integrated technologies in a realistic operating environment to assess the performance or cost reduction potential of a new technology. Engineering Manufacturing and Development concludes the program or project and prepares it for production. It consists primarily of pre-production efforts, such as logistics and repair studies. Two other phases include management and support of RDT&E efforts and testing and upgrades.
- **Other** includes research and development efforts that are not related to a specific program and do not meet the criteria for the above categories.

Information pertaining to Military Department and Defense Agency RDT&E programs and projects is provided below.

Department of the Army

Basic Research

Basic research sustains Army scientific and technological superiority in land warfighting capabilities, provides new concepts and technologies for the Army's Objective Force, and provides the means to exploit scientific breakthroughs and avoid technological surprises. The basic research program is coordinated with the other Military Services through the Joint Directors of Laboratories panels, Project Reliance, and other interservice working groups. The majority of the research is classified as Defense Research Sciences which includes research in sensors; battlefield environment; human interface, performance and training; propulsion; vehicle and air mobility; materials; ballistics; information; environmental; and medical. Examples include developing ultrasensitive gravity gradiometers to detect underground bunkers and tunnels and identifying how specific odor molecules interact with odorant receptors.



Applied Research

The Army's applied research activities include:

- **Environmental Technology** - This program researches and applies technologies that will improve the Army's ability to comply with regulations mandated by all federal, state and local environmental/health laws and to reduce the cost of this compliance. This program provides the Army with a capability to decontaminate or neutralize Army-unique hazardous and toxic wastes at sites containing waste ammunition, explosives, heavy metals, propellants, smokes, chemical munitions, and other organic contaminants. It also provides technology to avoid the potential for future hazardous waste problems, by reducing hazardous waste generation through process modification and control, materials recycling, and substitution.
- **Medical Technology** - The primary goal of medical research is to sustain medical technology superiority and to improve the protection and survivability of U.S. Forces on conventional battlefields as well as in potential areas of low intensity conflict and humanitarian military operations. Research includes methods and materials for infectious disease prevention and treatment (e.g., vaccines, prophylactic, and therapeutic drugs); insect repellents; methods of diagnosis and identification of naturally occurring infectious diseases; prevention and treatment of combat maxillofacial (face and neck) injuries; essential dental treatment on the battlefield; combat casualty care of trauma and burns due to weapons; organ system survival; shock treatments resulting from blood loss and infection; blood preservation; potential blood substitutes for battlefield care; assessment of the health hazards of military materiel; and the sustainment or enhancement of soldier performance.
- **Combat Vehicle Technology** - This program provides an extensive evaluation of competing technologies and concepts of operation to improve the performance of combat missions across the full spectrum of operations. These include strategic transportability, peacekeeping operations, urban warfare, countermobility, amphibious operations, and offensive and defensive tactical operations.
- **Ballistic Technology** - This program researches armaments and armor to support future combat systems and the Objective Force and to support dominance in future conflicts across a full spectrum of threats in a global context. It focuses on pulsed power technologies for electric armaments which offer the potential to field leap-ahead capability in providing hypervelocity and hyperenergy launch well above the ability of the conventional cannon. It also focuses on research in ballistics technology to enhance the lethality and survivability of future weapons such as advanced solid propellants, launch and flight dynamics, weapons concepts for light forces, warheads and projectiles, armor, and munition-target interactions.



Development

The Army's Advanced Technology Development programs include the following:

- **Aviation Advanced Technology** - This program develops and demonstrates advanced technology engines and integrated components to achieve improved performance levels for current and future rotary wing vehicles. Technology areas for development include aeromechanics, aerodynamics, structures, propulsion, reliability and maintainability, safety and survivability, mission support equipment integration, aircraft subsystems, advanced helicopter rotors and flight control, flight simulation, aircrew-aircraft system integration, aircraft weapons integration for air-to-air and air-to-ground, aircraft avionics for command and control, communications, controls and displays, digital avionics and architectures, navigation, mission planning, and air traffic management.
- **Combat Vehicle and Automotive Advanced Technology** - This program develops and demonstrates new and improved combat vehicle and automotive technologies. Future combat systems are the primary emphasis. Other component technology areas include: survivability, mobility, and intra-vehicular digital electronics.

The Army's Demonstration and Validation activities include:

- **Artillery Systems** - This program supports the Crusader Advanced Development Program. The Crusader system is comprised of the next generation self-propelled howitzer and artillery resupply vehicles designed to support Army XXI, Joint Vision 2010 and the Future Army. The Crusader will significantly increase lethality, mobility, survivability, resupply, command and control, and sustainability capabilities, capitalizing on emerging, advanced technologies. The focus of the revised Crusader program is to increase all modes of deployability while retaining all key performance parameters.
- **Army Missile Defense Systems Integration** - This program funds missile defense systems integration efforts for both the Army Space and Missile Defense Command and the Program Executive Office for Air and Missile Defense. Additionally, this program funds the Space and Missile Defense Battle Lab, which is chartered to develop warfighting concepts, focus military science and technology research, and conduct warfighting experiments. It also resources the Force Development and Integration Center.

Required Supplementary Stewardship Information



The Army's Engineering and Manufacturing Development activities include:

- **Comanche** - This program provides for the development and operational testing and evaluation of the RAH-66 Comanche and the T801 growth. The Comanche is a multi-mission aircraft optimized for the critical battlefield mission of tactical armed reconnaissance. It provides a globally self-deployable attack platform for light/contingency forces.
- **BAT** - The BAT is the submunition in the Block II missile system supporting the Army's deep fire doctrine. The BAT is being designed with a target range in excess of 100 kilometers. In the past, the only options were to engage such targets with attack helicopters or fixed wing aircraft. While effective, these options placed critical resources, particularly aircrews at risk. The BAT system significantly reduces this risk through its autonomous acquisition and terminal guidance capabilities, attacking well-defended armored forces behind enemy lines.

The Army's Research, Development, Test and Evaluation Management Support efforts include:

- **Army Test Ranges and Facilities** - This program provides the institutional funding required to assure a developmental test capability is available for DoD Program Executive Officers, Program and Product Managers, and Research, Development, and Engineering Centers.
- **Support of Operational Testing** - This program finances the operational testing of developmental materiel systems, including Multi-Service, First Digitized Division, and Automated Information Systems. Additionally, the program funds the development and acquisition of non-major systems, the sustainment of instrumentation necessary to conduct credible and robust operational tests demanded by DoD and Congress, and the replacement and improvement of existing obsolete inventory and development of new technologies to keep abreast of new weapons advancements.

The Army's Operational Systems Development activities include the following:

- **Industrial Preparedness** - This program works with industry to find new ways to improve readiness and reduce total ownership cost for the Army through new manufacturing technologies and enhancements/improvements to legacy systems. The technologies introduced through this program support the Army transition to the Objective Force.
- **Combat Vehicle Improvement Programs** - This program responds to vehicle deficiencies identified during Desert Storm, continuing technical system upgrades and addresses needed evolutionary enhancements to tracked combat (Abrams and Bradley) and tactical (Bradley Fire Support) vehicles.



Other

Research is conducted to support special requirements for battlefield visualization, tactical decision aids, weather intelligence products, and capabilities to exploit space assets. Research in weapons and munitions will increase system lethality and survivability, lower weight, and reduce size. Also, aviation research will expand scientific knowledge in the area of rotary wing vehicle technologies.

Department of the Navy

Basic Research

The Navy's basic research includes the following:

- **High Frequency Acoustics** - Consists of research of acoustic interaction with sediments in shallow water. High frequency sonar is used to locate submerged and buried mines in these areas, reducing the risk of loss in wartime.
- **Ocean Biological Dynamics** - Research includes understanding marine biology, particularly as it relates to optical and acoustical systems. A recent effort determined that ocean phyto- and zoo-plankton may, at times and under certain conditions, be concentrated in extremely thin layers in the ocean. These layers may cover several kilometers and persist for a period of several days leaving important optical and acoustical signatures.

Applied Research

The Navy's applied research includes the following:

- **Precision Target Handoff** - Funded under the Navy's Air and Surface Weapons Technology program, the Precision Target Handoff project developed an automated process to derive accurate target coordinates for use by precision guided munitions. The process matches imagery obtained from radar, infrared imaging, or visible sources with a coordinate reference system to determine target aim-point coordinates. This enables warfighters to quickly extract precision target coordinates at the tactical unit level.
- **Ocean and Atmospheric Technology (Bioluminescence)** - A recently initiated research effort is examining short-term predictability of bioluminescence in the coastal ocean, which affects visibility of moving objects during the night.

Required Supplementary Stewardship Information



- **Ocean and Atmospheric Technology (Atmospheric Science)** - Atmospheric conditions and the ability to predict those conditions is of crucial importance to the day-to-day operations of the Navy. As such, the Navy continues to invest in atmospheric science research. A recent effort involved the use of the Navy's tactical SPY-1 radar to determine detailed atmospheric characteristics. The system affords the Navy the ability to filter clutter arising from the atmospheric structure, enhancing the tactical performance of the radar.
- **Dragonfly Unmanned Aerial Vehicle** - The Office of Naval Research, the Naval Research Laboratory and the Marine Corps Warfighting Laboratory developed a low cost portable, user-friendly unmanned aerial vehicle (UAV) for the Marine Corps. Weighing under five pounds, the UAV, known as Dragonfly, can be carried in a backpack, assembled in under a minute and flown for up to an hour, reaching speeds up to 35 knots, with a range of 15 kilometers. The UAV carries an electro-optical infrared seeker that provides color video images or full motion infrared video back to a ground control station strapped to the operator's wrist. The system is currently undergoing flight-testing, and when fully implemented will provide the Marine Corps with enhanced surveillance capabilities.

Development

The Navy's Advanced Technology Development includes the following:

- **Direct Attack Munition Affordable Seeker (DAMASK)** - The DAMASK advanced technology demonstration integrates low cost commercial infrared imaging seekers with the Joint Direct Attack Munition weapon. The resulting integration allows image-guided bombs to function as accurately as more expensive laser guided bombs. Additionally DAMASK provides a fully autonomous method of deployment eliminating the need for pilots to maintain their view of a target using image-based guidance and improves accuracy to 3 meters, while performing in a jammed environment.
- **Hemostatic Dressing** - In FY 2000, the Navy engaged with a commercial partner to develop products allowing rapid treatment of battlefield hemorrhaging. Selected prototypes have been tested in appropriate animal models and initial data indicate these prototypes are effective in instances of severe hemorrhage. Testing of the dressing was completed in the fourth quarter of FY 2000 and transition to industry is expected following FDA approval.

Required Supplementary Stewardship Information



- **Undersea Advanced Warfare** - The Navy's continued investment in fiber optic towed array technology reduced acquisition costs by 80 percent due to simplified construction, as well as life cycle cost reductions of 30 percent due to elimination of complex, outboard telemetry components. Elimination of the electric field of conventional sonar systems eliminates the danger of shark attacks. Simpler fiber optic construction of the sensor core also allows a thicker hose-wall and reduced internal connections by a factor of more than 200. These improvements lead to enhanced reliability while simultaneously meeting high performance noise specifications. This technology is on an accelerated track for transition to fleet acquisition and will result in a more economical sonar system with greater availability for tactical use in the fleet.
- **Undersea Warfare Advanced Technology** - The Navy developed a prototype Lead Zirconate Titanate slotted cylinder element, along with a lightweight power amplifier as an enabling technology for acoustic sources. The Navy developed the Littoral Warfare Advanced Development (LWAD) management program to support the Future Naval Capability (FNC) concept; developed a LWAD/FNC long range testing program using fleet assets and finally developed an extensive marine mammal mitigation program. The Navy conducted sea testing of non-acoustic systems against shallow targets in littoral waters. The Navy determined and provided the venue for testing developmental active systems in littoral environments. The Navy also continued evaluation, development and improvement of surveillance programs initiated in FY 1998 and FY 1999 and performance enhancements through data fusion of available undersea warfare sensing technologies.

The Navy's Demonstration and Validation activities include:

- **Joint Strike Fighter** - For FY 2000, the Navy continued technology demonstration efforts including ground and flight demonstrations, technology maturation, and concept refinement for a family of aircraft, as well as the continuation of the alternate engine program and the completion of technology demonstrations and assessments in the areas in airframe, manufacturing and production feasibility, propulsion, and mission and flight systems.
- **Air/Ocean Tactical Applications** - The Navy continued modeling and conducting simulations of ocean environmental effects on its systems and development of techniques for data assimilation. In addition, the Navy initiated development of next-generation forecast models for air and ocean effects and completed development of the tropical cyclone forecasting Arabian Gulf/Arabian ocean models. The Navy also continued work on coastal and enclosed basin tactical scale oceanographic models for selected geographical locations in response to emergent requirements. Continued development of techniques for bathymetry and surf zone and high-resolution micro-topography algorithms and automated objective processing in the littoral environment.



- **Carrier Systems Development - Aircraft Launch, Recovery & Support - Electromagnetic Aircraft Launch System** - For FY 2000, the Navy awarded two competitive contracts to develop fully-integrated, reduced-length prototype launcher systems. In addition to implementation, the Navy completed the Systems Requirements Review, trade studies, and initial Preliminary Design Review for both contracts as well as establishing a baseline for ship system designs and initiating sub-scale test bed development and critical component testing. The Navy also developed initial ship integration plans for the launchers and identified preliminary hull, mechanical and electrical support requirements, and provided management, system engineering, and ship integration support.
- **Combat and Intelligence Systems** - In FY 2000, the Navy completed the Phase II competitive solicitation for Combat Systems Integration concepts and design process. The Navy continued monitoring improvements targeted at reducing the operational and support costs of warfighting systems, and remained focused on reducing the number of systems through the use of “multi-function” radars and flat planar antenna arrays, data exchange across operational areas, data fusion, and integrated display for operators. The Navy also commenced Phase III Design Refinement and Refined Combat Systems Integration design.
- **DD-21 Advanced Gun System (AGS)** - The Navy initiated the AGS sub-system design phase for DD-21, completing AGS munitions concepts, developed performance and interface specifications, and developed proof of concept test fixture and validation and verification tools for AGS.

The Navy’s Engineering and Manufacturing Development activities include:

- **H-1 Upgrade** - The Navy completed assembly of first AH-1Z I UH-1Y aircraft and beta testing of the device. The Navy continued transmission bench test, tooling validation, and flight test planning and commenced aircraft instrumentation system level functional testing and aircraft ground testing. The Navy completed CV-22 remanufacture and modification efforts during the fiscal year, and began Terrain Following/Terrain Avoidance radar development testing for the CV-22. The Navy also continued ongoing CV-22 contract activities, including software, Naval Aviation Maintenance Trainer Suite, Operational Flight Trainer/Full Fidelity Simulator, and Weapons Replacement Assembly/Test Program Sets developments, as well as Fatigue Test Article efforts, logistics efforts, and Power-by-the-Hour support of engines. The Navy also conducted MV-22 operation evaluation and support.
- **Tactical Command Systems** - An interface for emerging aircraft data transport devices was developed to receive and process information from new sensors such as Synthetic Aperture Radar, high resolution Inverse Synthetic Aperture Radar, and advanced Electro-Optical devices. The Navy investigated processing inverse and quadrature data from APS 137 B(V)5 radar, developed expanded interfaces for new

Required Supplementary Stewardship Information



weapons and sensors and drafted an integration plan for modernized radio frequency communications systems, including UHF, SHF, and EHF Satellite Communications units into tactical mobile units.

- **Ship Contract Design/Live Fire - Warfare Systems Integration (WSI)** – Completed a competitive solicitation for an Electronic Systems Integrator (ESI) team to partner with Newport News Shipbuilding in an effort to develop an Integrated Warfare System for the CVN 77. The Navy commenced assessment of the winning ESI concept and its integration into the ship contract data package. The Navy continued monitoring improvements targeted at reducing the life cycle costs of the ship’s warfighting systems. Initiatives focused on reducing the number of systems through the use of “multi-function” radars and flat planar antenna arrays, data exchange across operational areas, data fusion, and integrated displays for operators. Finally, the Navy commenced concept design refinement.
- **DD-21 Multi-Function Radar (MFR)** - The Navy furthered its engineering and manufacturing development (E&MD) phase of the DD-21 MFR, developed and provided technical design data to support critical design review (CDR), and procured engineering development model hardware. In addition, the Navy provided government engineering services support for E&MD, and conducted CDR while simultaneously providing program management in support of the above program milestones.

The Navy’s Research, Development, Test and Evaluation Management Support efforts include:

- **Test and Evaluation Support (Weapons Division)** - The Navy operated core major range test facility base capabilities required to meet acquisition program and fleet test workload, including costs required to manage, operate, and maintain Pacific Ranges’ sea, air, ground, electronic combat, ordnance test facilities, operational target vehicle launch functions and test wing aircraft maintenance.
- **Management, Technical and International Support** - The Navy developed, updated, and maintained detailed Navy standard scenarios based on Defense Planning Guidance and developed the integrated warfare architectures. Using the standard simulation and database architecture developed by Navy Modeling and Simulation, the Navy vastly improved the utility of these tools to the assessment process. In addition, the Navy developed new tools to utilize models in the standard simulation and database architecture and coordinated/supported the Joint Analytical Model Improvement Program.

Required Supplementary Stewardship Information



The Navy's Operational Systems Development activities include the following areas:

- **F/A-18 Improvement** - In FY 2000, the Navy developed and integrated enhancements to the F/A-18 weapon system and subsystems to include tactical aircraft moving map capability, and continued development and conversion of the system configuration set to a high order language.
- **Tomahawk** - The Navy completed the critical design review leading to development testing of the entire system in FY 2001. The Navy continued development of common launch and track control systems for surface ship and submarine platforms for the new tactical Tomahawk baseline.
- **Navy Meteorological and Ocean Sensors - Space (METOC)** - In FY 2000, the Navy also developed improved ground station satellite data processing techniques. Additionally, the Navy assessed on-orbit system performance, conducted payload calibration/validation and resolved performance anomalies.

Department of the Air Force

Basic Research

The Air Force's Defense Research Sciences basic research program funded basic scientific disciplines that are core to developing future warfighting capabilities. Funding was provided to twelve scientific projects, one education program for scientists and engineers, and a number of international programs. The scientific projects were focused on atmospheric, biological sciences, chemistry, electronics, fluid mechanics, human performance, materials, mathematical and computer sciences, physics, propulsion, space sciences, and structures.

Applied Research

The Air Force's applied research program is developing technologies to support both an air and space force of the future. Technology developments are focused in those areas that are essential to future warfighting capabilities. This investment strategy recognizes the enabling technologies that are being developed by commercial industry and allows the Air Force to focus on those military-relevant technologies that are not being developed by industry. Technology developments are in a laboratory environment. Two examples are hardware in-the-loop simulation of laser algorithms for terminal guidance of small conventional weapons and the development of a trans-atmospheric vehicle simulation capability.

Development

The Air Force's Advanced Technology Development program demonstrates, in a realistic operational environment, integrated sets of technology to prove military worth and utility. Technology achievements included fabrication of an Unmanned Aerial Combat Vehicle

Required Supplementary Stewardship Information



(UCAV). The UCAV is a joint Defense Advanced Projects Agency program, which will demonstrate the utility of using an unmanned vehicle to drop small munitions. Additionally, an advanced jet fuel additive transitioned into operational use in the Air Force. The new additive significantly reduces maintenance costs on high performance turbine engines. The Federal Aviation Agency has approved the use of the additive in commercial aviation.

The Air Force's Demonstration and Validation programs include:

- **Airborne Laser** - The Air Force plans to design, build, and test a high-energy laser weapon. The primary task is to acquire, track, and kill theater ballistic missiles in boost phase of flight. The system utilizes a modified commercial 747 freighter aircraft.
- **Advanced EHF-Engineering Model** - The Air Force will develop digital processors to produce a more capable and cheaper Advanced EHF satellite. During this year, the digital processor development was finished and testing began at testing facilities in October. Early development of the digital processors will reduce both economic risk and technical risk for the future engineering and manufacturing development phase.
- **Combat Identification - Enhanced Recognition and Sensing Laser Radar (ERASER)** - The Air Force is developing a new tool for non-cooperative target identification. ERASER allows attack aircraft to stand off at longer ranges when employing weapons, increasing effectiveness/survivability, and reducing death by friendly fire. ERASER consists of a modified laser designator and an extremely sensitive infrared camera. During this year, the Air Force demonstrated ERASER to have an exceptionally long range and higher resolution imaging capability when compared with current technology.

The Air Force's Engineering and Manufacturing Development efforts include:

- **Joint Direct Attack Munitions (JDAM)** - A low cost, autonomously controlled, adverse weather, global position system aided inertial navigation guidance kit for the Air Force/Navy 1,000 pound (MK-83), 2,000 pound (MK-84 and BLU-109), and 500 pound (MK-82) general purpose bombs.
- **Specialized Undergraduate Pilot Training (SUPT)** - A joint Air Force and Navy project to obtain a Joint Primary Aircraft Training System (JPATS) and Ground Based Training Systems (GBTS). JPATS, known as the T-6A Texan II, will replace the current primary trainer aircraft and associated GBTS in both Departments. In February 2000, the Air Force accepted delivery to the T-6A manufacturing development aircraft and completed development and test of the development aircraft.

Required Supplementary Stewardship Information



- **Expendable Evolved Launch Vehicle (EELV)** – The EELV replaces the current fleet of Titan, Atlas and Delta launch vehicles. The EELV program is halfway through a four-year partnership with industry to develop two new families of space launch vehicles. Once operational, EELV will launch both commercial and Government satellite payloads.
- **Integrated Command and Control Applications** - Provided the Air Force capability for a virtual meeting space for geographically dispersed units to work together.

The Air Force's Research, Development, Test and Evaluation Management Support projects include:

- **The Major Test and Evaluation Investment program** - Funds the planning, improvements and modernization for three national asset test centers with unique test facilities/capabilities operated and maintained by the Air Force for DoD test and evaluation missions and available to others having a requirement for their unique capabilities. Many efforts are contained within this program, but two examples are the Guided Weapon Evaluation Facility and the Common Airborne Instrumentation System project.
- **The Threat Simulator Development program** - Supports many of the Air Force Electronic Warfare Test Processes. Current projects focus on improved Low Radar Cross Section measurements, advanced sensor testing and fused sensor testing, high-fidelity threat modeling and simulation, and enhanced IR and RF countermeasures testing.

The Air Force's Operational System efforts include:

- **C-17 Required Navigation Performance RNP-4** - Provides the C-17 with continuous navigation performance without time limitations and allows required air traffic control data to be transmitted via a high frequency data link.
- **C-5 Reliability Enhancement and Reengineering Program (RERP)** - RERP improves C-5 reliability, maintainability and availability and reduces total ownership cost. By replacing the powerplant and fixing unreliable system components, C-5 RERP increases capability, throughput and access to GATM airspace.
- **Airborne Warning and Control System (AWACS)** - Projects included an onboard capability that was developed and demonstrated on the AWACS fleet. This effort will lead to a less than \$2 million, rapid fleet wide solution to meet a warfighter requirement.

Required Supplementary Stewardship Information



- **AIM-9X Sidewinder** - This project improves seeker performance, infrared counter-countermeasures, and kinematics of the AIM-9M short-range air-to-air missile. Aim-9X regains short-range first-shot, first-kill capability for the U.S. warfighter.
- **GPS Modernization** - Initiated in response to the jamming threat and the national policy to encourage civil use of GPS without degrading military utility. All recommended GPS enhancements support economic infrastructure and national security. Modernization efforts include adding a new military signal and civil signals to future GPS satellites.

Ballistic Missile Defense Organization (BMDO)

Basic Research

The BMDO did not conduct any basic research.

Applied Research

Innovative Science and Technology efforts included the High Frequency Short Wave Radar demonstration program, initiation of the real-time radar operating system; completion of preparations to install the completed radar for shore-based air and missile target tracking exercises and demonstrations.

Development

The BMDO's Advanced Technology Development activities include:

Surveillance Technologies included continued intermediate level analysis of Midcourse Space Experiment data in support of Space Based Infrared System and National Missile Defense Ground-Based Interceptor. Interceptor Technologies included Jet Interaction testing and initial model validation, Special Compartmented Information Isolation Segment prototype design, and Secondary Divert and Altitude Control System prototype design. Finally, this development included Directed Energy Programs.

Required Supplementary Stewardship Information



The BMDO's Demonstration and Validation efforts include the following:

- **Navy Theater Wide (NTW) Theater Ballistic Missile Defense (TBMD) system** - Required to provide protection to U.S. and allied forces against medium to long-range theater ballistic missiles, which may be equipped with Weapons of Mass Destruction.
- **National Missile Defense (NMD)** - This program is designed to protect the nation against long-range ballistic missile threats. The NMD Program contributed to each of the three components of the nation's broad strategy to deal with proliferation: preventing and reducing the threat, deterring the threat, and defending against the threat.
- **Theater Missile Defense (TMD)** - This program's goal is to develop, maintain and deploy a cost-effective, Anti-Ballistic Missile Treaty compliant system designed to protect deployed forces and areas of operation against the immediate and growing threat from shorter range theater ballistic missiles.
- **Family Of Systems, Engineering And Interoperability (FoS E&I)** - Worked to develop, maintain, and deploy a cost-effective, Anti-Ballistic Missile Treaty compliant interoperable system designed to protect deployed forces and areas of operations against the immediate and growing threat from shorter range theater ballistic missiles.
- **Ballistic Missile Defense (BMD) Technical Operations Programs** - Comprised of the centrally managed functional capabilities required to assure the execution of TMD, FoS E&I, NMD, and Technology programs
- **The Theater High Altitude Area Defense (THAAD)** - System is being designed to negate theater ballistic missiles (TBMs) at long ranges and high altitudes.

Engineering and Manufacturing initiatives of the BMDO include the following:

- **Navy Area Theater Ballistic Missile Defense (TBMD)** - This program builds on the national investment in AEGIS ships, AEGIS Weapon Systems (AWS), and Navy Standard Missile II (SM-2) Block IV missiles.
- **The Theater High Altitude Area Defense (THAAD) System** - The (EMD) phase will refine and mature the Demonstration/ Validation (Dem/Val) system design to ensure component and system performance, production capability, and supportability.
- **PATRIOT** - Is a long-range, mobile, field Army and Corps air defense system, using guided missiles to simultaneously engage and destroy multiple targets types at varying ranges.

Required Supplementary Stewardship Information



Defense Advanced Research Projects Agency (DARPA)

The DARPA investments in research and development are in the areas of basic research, applied research, and advanced technology development. The significant accomplishments of DARPA projects in each of these areas follows.

Basic Research

New research included biology, information technology, and micro/physical systems, which focused on BioComputational Systems, Simulation of Bio-Molecular Microsystems, Bio Futures, Biological Adaptation, and Biomechanics. Components of all these programs were the identification, development, and demonstration of new mathematical algorithms that enabled the representation of biological systems and the identification of the emergence of biologically inspired algorithms for these complex, non-linear problems. Ongoing research includes the following:

- **Information Sciences** - Supported basic scientific study and experimentation in areas such as computational models, new mechanisms for performing computation and communication, innovative approaches to the composition of software, and novel human computer interfaces and computing architectures.
- **Electronic Sciences** - Electronic Sciences explore and demonstrate electronic and optoelectronic devices, circuits and processing concepts.
- **Materials Sciences** - Material Sciences work on developing high power density/high energy density mobile and portable power sources; design approaches for nanoscale and/or biomolecular materials and interfaces; materials and measurements for molecular-scale electronics; spin-dependent materials and devices; new materials discovery; and novel propulsion concepts.

Applied Research

The DARPA applied research includes the following:

- **Computing Systems and Communications Technology** - Consists of Intelligent Systems and Software, which focused on the development of new information processing technology concepts that will lead to fundamentally new software and intelligent system capabilities. Also, it includes High Performance and Global Scale Systems, which develop the computing, networking, and associated software technology base underlying the solutions to computational and information-intensive applications for future defense and federal needs.
- **Extensible Information Systems** - Is part of a multi-agency initiative to greatly extend the reach and effectiveness of networked computation. It includes Deeply Networked Systems which extend the DoD's ability to monitor and control the

Required Supplementary Stewardship Information



physical environment and will require a much “deeper” approach to information systems – one that manages the vast quantities of “physical” information that can be accessed by sensors and actuators in direct contact with real world processes.

- **Biological Warfare Defense** - This program focuses on the underlying technologies associated with pathogen detection and remediation. Tactical Technology included Naval Warfare Technology that focuses on enabling technologies for a broad range of Naval requirements and Advanced Land Systems Technology that develops technologies for operations ranging from force-on-force conflict to Military Operations-Other-Than-War. Also included is Advanced Tactical Technology that explores the application of compact lasers, algorithms for electronic warfare and target recognition and tracking systems, precision optics components, air vehicle survivability, advanced airbreathing weapons, enabling technologies for advanced space systems, payload delivery concepts, miniature air-launched decoy systems, and affordable rapid response missile demonstrations.
- **Aeronautics Technology** - Aeronautics Technology explores technologies to reduce costs associated with advanced aeronautical systems and works to provide revolutionary new capabilities for current and projected military mission requirements. Advanced Logistics role is to investigate and demonstrate technologies that will make a fundamental difference in transportation and logistics. Joint Logistics will develop and migrate interoperable web-based joint logistics decision support tools to the Military Departments’ logistics communities.
- **Materials and Electronics Technology** - These programs work to develop technology related to materials, electronics, and biological systems. Several smaller programs fall into this category. Materials Processing Technology worked on developing materials processing techniques, mathematical models and fabrication strategies for lower the cost, increase performance, and increase human performance. Microelectronics Device Technologies worked on advanced electronic and optoelectronic devices, semiconductor process tools and methodologies, and materials for optoelectronics and infrared devices. Finally, Cryogenic Electronics conducted research on specific applications of thin-film electromagnetic materials in electronic devices and circuitry for military applications.

Development

The DARPA Advanced Technology Development activities include:

- **Advanced Electronics Technology** - Designs and demonstrates state-of-the-art manufacturing and process technologies for the production of various electronics and microelectronic devices, sensor systems, actuators and gear drives that have military applications and potential commercial utility.

Required Supplementary Stewardship Information



- **Command and Control Information Systems** - Works on technologies to facilitate joint campaign planning and control throughout the battlespace. It includes the Joint Force Air Component Commander; the Man and Machine Command and Control program; the Information Assurance Science and Engineering Tools; the Advanced Intelligence, Surveillance and Reconnaissance Management program; the Control of Agent-Based Systems program; Project Genoa; and the Active Templates program. Information integration systems will develop technologies to ensure that the enhanced information required by battlefield combatants is available on a near real-time basis. Programs include the Dynamic Database program; the Airborne Communications Node program; the Command Post of the Future program; Symbiotic Communications; and Bandwidth Solutions.
- **Sensors and Guidance Technology** - This program develops system-oriented technologies necessary to enhance sensor and weapon system accuracy and capability to meet current and emerging threats. Projects included in this area are Guidance Technology, Aerospace Surveillance Technology, the Air Defense Initiative, and Sensors and Exploitation Systems.
- **Marine Technology** - Identifies, develops, and rapidly matures critical advanced technologies and system concepts for maritime applications. Activities included Advanced Ship-Sensor Systems comprising Undersea Littoral Warfare, Water Hammer, Buoyant Cable Array Antenna, Robust Passive Sonar, Future Submarine Payloads program, Rapid Deployment and Logistics Ship program, and the Advanced Maritime Propulsion program.