Director, Operational Test and Evaluation

FY 2003 Annual Report

DoD Programs
Missile Defense, Chemical and Biological,
Health Systems, Logistics, Support Systems

Army Programs
Aviation, C4I, Armored Vehicles,
Fire Support, Munitions, UAV Systems

Navy and Marine Corps Programs
Amphibious Systems, Surface Ships,
Mine Warfare Systems, EW, Submarine Systems,
Munitions, C4I, Aviation Systems, UAV Systems

Air Force Programs
Aircraft Systems, Space Systems, Munitions,
C4I, Avionics, UAV Systems

DIRECTOR'S INTRODUCTION

In 1983, Congress legislated in Title 10 the creation of the office of Director, Operational Test and Evaluation (DOT&E). Since then, the cold war ended and a global war on terrorism began. These developments have led to far-reaching changes in the way we fight and procure weapons. They have necessitated a rethinking of how we organize and structure our military forces, how we man and train them realistically to face these new threats, and how we equip them in a timely and effective manner with the best systems that rapidly advancing technologies can offer.

In support of these objectives, DoD has undertaken a major transformation of its acquisition process, codifying the latest changes in May 2003. In parallel, significant changes in the regulation governing requirements generation eliminated the term "requirement" in all the documentation, and replaced it with "capability" for new weapons programs.

These innovations have not altered the core mission of DOT&E. This is largely attributable to the original legislation being so clear, focused, and close to the core mission of the acquisition system. Our maxim remains one of determining whether systems will be effective, suitable and survivable in combat, and providing that information to decision makers before commitment to full-rate production or deployment with our combat forces. Congressional establishment of DOT&E was, and remains, the embodiment of the "fly before you buy" philosophy.

Critical to the transformation of how our forces fight with their systems is their growing interdependence. Systems now depend on "jointness," system-of-systems operations, network-centric warfare, and the complexity of precision attack interlinking intelligence, surveillance, reconnaissance, and weaponry. To create realistic operational test opportunities with the required links and relevant environments is expensive. The Services are often reluctant to dedicate the resources required for such testing. Accordingly, some operational tests, especially major command and control tests, tend to become secondary efforts to training exercises, as was the case for the Army's Stryker Brigade Operational Evaluation. The difficulty, simply put, is that test objectives often compete with training objectives. We will need a more integrated planning and execution approach in order to assure test adequacy. The Services must give adequate priority and resources to testing done in conjunction with exercises.

DOT&E will respond to an acquisition system no longer structured around a traditional research, development, test, and evaluation process that leads to a full-rate production Milestone. DoD will likely continue to buy more systems in low-rate initial production than are needed for testing. Given these substantial expenditures, DOT&E's early and continuous involvement prior to IOT&E and full assessment of effectiveness and suitability will be critical.

There are two new acquisition styles: *evolutionary acquisition* (which includes incremental development and spiral development) and *capabilities-based acquisition.* Neither necessarily produces a fixed configuration with which to judge a system's operational effectiveness and suitability or survivability against criteria based on military mission requirements. To address this potential problem, a significant feature of this year's update to regulations was the clear articulation of the acquisition system's purpose: to provide systems "that meet user needs with a measurable improvement to mission capability and operational support…." This is an important criterion for evaluation, no matter what other criteria are used. To meet the challenges of increasing complexity and movement away from articulated requirements, DOT&E is emphasizing two strategies:

- Comprehensive evaluation based on determining a new system's effect on mission capability rather than merely measuring its compliance with specifications.
- Objective evaluation based on direct comparison of the current system against the proposed new ways of conducting a mission. Such comparative evaluation provides the most direct answer to the question "Does the system provide a measurable improvement to mission capability or operational support?"

The F-22 IOT&E, planned for FY04, exemplifies a major system test and evaluation with a mission capability focus. The Air Force will evaluate the F-22's fighter escort mission capability by flying F-22s as escorts for attack aircraft and assessing the level of the attack mission accomplishment, and will also compare that to results of F-15s flying similar missions. This approach will demonstrate whether the F-22 is effective in carrying out required combat missions and whether it provides a measurable improvement over the existing F-15 fighter force.

Comparative evaluations have been useful in other critical ways. In the past, systems sometimes failed to meet specified requirements. By comparing it with the current way of doing a mission, DOT&E was able to evaluate the new system more meaningfully. For example, the Army's M270A1 Multiple Launch Rocket System failed to meet its requirement to be able to move within a certain number of seconds after firing (rapid movement after firing helps survivability by moving before the enemy can respond with counterfire). Even though it failed the specified time requirement, it provided a significant improvement over the current capability, and to survivability.

Comparative evaluation also gives us a means to calibrate the difficulty of a test. A comparison base allows analysis to overcome significant inadequacies in test instrumentation and execution. Cases where comparative evaluations have proved useful include IOT&Es of: F-18 E/F, Longbow Apache, and Stryker.

Nevertheless, the realities of the high operational tempo of our forces in the war on terrorism, combined with the desire to get new capabilities into these forces as quickly as possible, increase the potential for systems to circumvent a rigorous acquisition process. Worse yet, our warfighters may get weapons without knowing their operational capabilities and limitations as demonstrated by adequate operational test and evaluation.

This concern has translated into action by the T&E community to inform warfighters about systems recently used in combat, and their effectiveness, such as the Patriot PAC-3.

- The Patriot PAC-3 completed its IOT&E prior to deployment but failed to demonstrate a ripple fire capability (which is the doctrine for ballistic missile threats). An early failure to salvo two missiles during testing was linked to a software problem that was corrected. During deployment the system successfully engaged two ballistic missile threats with ripple fired PAC-3 missiles.
- The ATFLIR lasers in the first Engineering Demonstration Models (EDMs) were not reliable enough to use in targeting laser-guided weapons. Operational commanders decided to not use those ATFLIR pods, deployed by the Navy to provide an early operational capability, in combat operations over Afghanistan. A second deployment of improved EDM pods in Iraq supported dozens of laser-guided weapons during combat operations with a 100 percent success rate.
- Joint Global Positioning System Combat Effectiveness (JGPSCE) field tests discovered potential weapon systems vulnerabilities to GPS degradation. The quick-look test results concerning these vulnerabilities provided valuable and timely information to warfighters during Operation Iraqi Freedom (OIF).
- To support an impending Stryker deployment to Iraq, the Live Fire Test and Evaluation armor-testing program was intensive. The objective was to verify that the armored vehicle system provides crew protection against munitions up to 14.5mm and reduces system vulnerability to rocket propelled grenades. The Army conducted limited testing of every armor configuration on the brigade vehicles and applied interim mitigation measures to those armor configurations that failed.
- The Joint Technical Coordinating Group for Munitions Effectiveness (JTCG/ME), which is part of DOT&E's Live Fire responsibility, published two interim versions of their Air-to-Surface Weaponeering System joint munitions effectiveness manual in direct support of Operation Enduring freedom (OEF) and OIF. Details are in the live fire section.

Missile defense provides another example of how the operational test and evaluation community is adjusting to the new acquisition environment of capabilities-based acquisition, and spiral development. In close coordination with the Missile Defense Agency (MDA), the Operational Test Agencies (OTAs), and the Joint Staff, a joint assessment team oversees development, review and approval of test plans, and provides input to military utility studies. Details are in the missile defense section.

Last year's annual report stated that T&E needed to serve the development process better by changing how it dealt with *people, processes,* and *facilities*. Developments on each account occurred during this past year. DoD put forward, and Congress enacted, a number of recommendations on *people* that will help maintain a flexible, expert workforce. These include a recommendation in the DOT&E report that would allow increased use of pay banding initiatives. The size of the T&E workforce remains a major concern.

With respect to *process* improvements, last year DOT&E recommended increasing the tempo of testing (related to the workforce size), develop common instrumentation, provide earlier involvement of operational military personnel, test before deployment, make testing more valuable, and address the shortfall in methodologies of Information Assurance and Interoperability.

- To increase the tempo of testing, we need to increase test resources and the means to move, share, analyze data and improve test design. Details are in the resources section.
- The Central T&E Investment Program (CTEIP) stresses the need for common solutions to instrumentation and other test capability problems.
- To make early involvement more effective, DOT&E has begun to apprise the Services at Milestone A of T&E information needs with evaluation plans.
- Early involvement of DOT&E should help the warfighters with respect to deployment before testing. This makes information available before the need to use a system in combat. It requires the early and sustained involvement of the Service OTAs, which continue to be understaffed. For example, the Air Force Operational Test and Evaluation Center will lose 68 military and 11 civilian personnel authorizations in FY04.
- A major finding noted last year was the need to test the way we fight. To do that, DOT&E recommended creating a Joint test and evaluation capability (Joint TEC). In 2003, our efforts to establish this capability evolved to address a Joint Forces Test Capability. Details are in the resources section.
- Congress directed DOT&E to assist Combatant Commanders in testing and evaluating fielded systems with respect to computer attack and other forms of information warfare, an effort known as Information Assurance (IA). This effort will focus on providing evaluations conducted in conjunction with major Combatant Commander training exercises. Details are in the IA section.
- DOT&E assumed management of the Joint Test and Evaluation (JT&E) Program in 2003. We have redirected that program to ensure joint tests provide quick and more relevant information to warfighters. An initial effort, undertaken at the suggestion of the Army, Air Force, and Marine Corps OTA Commanders, will evaluate the causes of battle damage to platforms in Iraq. The JT&E Program also served our forces well in preparation for OIF. Details are in the JT&E Program section.

Last year, legislation established a Defense Test Resource Management Center (DTRMC), responsible to the Under Secretary of Defense for Acquisition, Technology, and Logistics. The DTRMC is tasked with developing a strategic plan for infrastructure investment and with certifying the adequacy of budgets for test infrastructure and test programs. DOT&E will transfer both the CTEIP and the T&E Science and Technology Program to the DTRMC once it is fully established and staffed. In last year's annual report, DOT&E outlined the needs of T&E infrastructure. It included specific recommendations for improvement in *facilities* by warfare area. We believe the DTRMC, when it produces its strategic plan, must address these needs.

In the twenty years since the establishment of DOT&E by Congress, much has changed. This office has relied on its well-defined role as prescribed in the law. This has worked well, producing systems that improve mission capability such as those demonstrated in OIF. However, due to changing acquisition regulations and the growing complexity of combat, DOT&E will bolster its role, while maintaining our focus on evaluation of mission capability, adequate testing, and timely information that comes from early and continuous involvement.

Thomas P. Christie
Director

TABLE OF CONTENTS

TABLE OF CONTENTS

TABLE OF CONTENTS

Air Force Programs

TABLE OF CONTENTS

DOT&E ACTIVITY SUMMARY

DOT&E activity for FY03 involved oversight of 256 programs, including 18 major automated information systems. Oversight activity begins with the early acquisition milestones, continues through approval for full-rate production and, in some instances, during full production until deleted from the DOT&E oversight list.

Our review of test planning activities for FY03 included approval of 53 Test and Evaluation Master Plans (TEMPs), as well as 37 Operational Test Plans. Live Fire Test and Evaluation (LFT&E) activity included the approval of 9 LFT&E Strategies and Test Plans for inclusion in the TEMPs. In FY03 through December 31, 2003, DOT&E prepared seven reports for the Secretary of Defense and Congress.

DOT&E also prepared and submitted numerous reports to the Defense Acquisition Board (DAB) principals for consideration in DAB deliberations.

TEST AND EVALUATION MASTER PLANS APPROVED

Advanced Amphibious Assault Vehicle (AAAV)

Advanced Seal Delivery System (ASDS)

Aerial Common Sensor (ACS)

AN/AAR-47 Missile Warning System Program

AN/APG-79 Active Electronically Scanned Array (AESA) Phase III Radar Upgrade

Auxillary Cargo and Ammunition Ship (T-AKE)

C-130X Phase I Avionics Modernization Program (AMP)

Cobra Judy Replacement Program

Comanche Engineering and Manufacturing Development

Combat Survivor Evader Locator (CSEL)

Defense Integrated Military Human Resources System

Defense Travel System (DTS)

DoD Teleport Version 2.1

Dry Cargo/Ammunition Ship (T-AKE)

E-2 Advanced Hawkeye

EA-6B Improved Capability Three (ICAP III)

Evolved Seasparrow Missile (ESSM) Program

F/A-18E/F

F-35 Joint Strike Fighter (JSF)

Force XXI Battle Command Brigade and Below (FBCB2)/ Blue Force Tracking (BFT)

Fuels Automated System (FAS)

Future Combat System (FCS)

Global Information Grid - Bandwith Expansion (GIG-BE)

Global Transportation Network 21 version 7.2

Guided Multiple Launch Rocket System (GMLRS) Dual Purpose Improved Conventional Munitions (DPICM)

High Mobility Artillery Rocket System (HIMARS)

Integrated Defensive Electronic Countermeasures (IDECM) Capstone

Joint Biological Agent Identification and Diagnostic System (JBAIDS)

Joint Biological Point Detection System (JBPDS)

Joint Biological Standoff Detection System (JBSDS)

Joint Standoff Weapon AGM-154A (JSOW-A)

Joint Tactical Radio System - Joint

Joint Warning and Reporting Network (JWARN)

KC-135 Global Air Traffic Management (GATM)

Line-of-Sight Anti-Tank (LOSAT) Weapon System

Littoral Combat Ship (LCS)

MH-60R Multi-Purpose Helicopter

Multi-Platform - Radar Technology Insertion Program (MP-RTIP)

National Polar-Orbiting Operational Environmental Satellite System (NPOESS)

Navy Marine Corps Intranet (NMCI)

Ohio Class SSGN Conversion Program

Rapid Airborne Mine Clearance System (RAMICS)

TEST AND EVALUATION MASTER PLANS APPROVED (continued)

Rolling Airframe Missile (RAM) Block 1 Upgrade

RQ-4A Global Hawk, Rev A, Change 1

Small Diameter Bomb (SDB)

Strategic Sealift Program (SSP)

Stryker Interim Armored Vehicle (IAV)

Suite of Integrated Infrared Countermeasures (SIIRCM)

Theater Medical Information Program Annex A-Block 1

Tomahawk Cruise Missiles

USMC H-1 Upgrades

Warfighter Information Network Tactical (WIN-T) Program

Wideband Gapfiller Satellite (WGS)

OPERATIONAL TEST PLANS APPROVED

Aberdeen Chemical Agent Disposal Facility

Advanced Tomahawk Weapon Control System (ATWCS 1.7.1.2) (AN/SWG-4(V)) OT-IIIZ

AGM-154A Joint Standoff Weapon System OT-IIIB

AGM-154A Joint Standoff Weapon System OT-IIIB Modification

AGM-154C Joint Standoff Weapon System OT-IIA

Amphibious Assault Ship (Replacement) (LHA(R)) Program Evaluation Strategy

CH-47F Reliability and Maintainability (R&M)

Defense Travel System (DTS)

E-2C Cooperative Engagement Capability (CEC) OT-IIIA

EA-6B Improved Capabilities (ICAP III) OT-IIA

Evolved Seasparrow Missile (ESSM) Program OT-C1

F/A-18E/F with new high order language tactical software (H1E) and Advanced Mission Computers and Displays (AMC&D)

F/A-22 Raptor

Fuels Automated System (Posts, Camps, and Stations)

Global Broadcast Service (GBS) AN/SSR-2 Shipboard Receive Suite (SRS), AN/SSR-2A Dual Antenna SRS, and AN/BSR-1 Sub-Surface Receive Suite (SSRS)

Integrated Defensive Electronic Countermeasures (IDECM) Block 2 (OTII-A)

Joint Air-to-Surface Standoff Missile (JASSM)

Joint Primary Aircraft Training System (JPATS)

Joint Service Family of Decontamination Systems, Decontamination Foam 200 EOA

KC-135 Global Air Traffic Management (GATM)

MH-53E Airborne Mine Neutralization System (AMNS)

MH-60R Multi-Purpose Helicopter

MIDS-LVT 1 (F/A-18 only)

Mobile User Objective System (MUOS) OT-A

Nuclear, Biological and Chemical Reconnaissance Vehicle (NBCRV)

Reserve Component Automation System (RCAS) Increment 8

Rolling Airframe Missile (RAM) Block 1 Upgrade OT-IIIA

Sensor Upgrade (OT-IIIM) AN/AAR-47(V)2 Missile Warning Set / Laser Warning Set, with Change 1

Serial 1200/0237-01

Stryker Family of Vehicles Risk Mitigation on Hull Deformation with ERA RPG Add-on Armor

Stryker Interim Armored Vehicle (IAV)

Tactical Tomahawk Weapon Control System (TTWCS) (AN/SWG-5(V)) OT-IIB

Tactical Tomahawk Weapon Control System (TTWCS) (AN/SWG-5(V)) OT-IIB

Teleport

Teleport System Generation One

Transportation Coordinators' Automated Information for Movements System II (TC-AIMS II)

USMC H-1 Upgrades OT-IIA

LFT&E STRATEGIES AND TEST PLANS APPROVED

Joint Air-to-Surface Standoff Missile (JASSM) OT-4A and OT-4B

Line-of-Sight Anti-Tank (LOSAT) Missile

Stryker Engineer Squad Vehicle (ESV) Change

Stryker Interim Armored Vehicle (IAV)

Stryker Interim Armored Vehicle (IAV) Add-on Armor (AoA)

Stryker Interim Armored Vehicle (IAV) Anti-Tank Guided Missile (ATGM) Vehicle Addendums

Stryker Interim Armored Vehicle (IAV) Medical Evacuation Vehicle (MEV) Addendums

Tactical Tomahawk R/UGM-109E Block IV Missile

Joint Air-to-Surface Standoff Missile (JASSM) OT-4A and OT-4B

REPORTS TO CONGRESS FOR FY03 THROUGH DECEMBER 31, 2003

PROGRAM	REPORT TYPE	DATE
Patriot Advanced Capability-3 (PAC-3) Block 2002 System	Combined OT&E / LFT&E Report	October 2002
Shadow 200 Tactical UAV	OT&E Report	December 2002
B1-B Block E Conventional Mission Upgrade Program	Combined OT&E / LFT&E Report	April 2003
Seawolf Nuclear Attack Submarine and BSY-2 Submarine Combat System	Combined OT&E / LFT&E Report	July 2003
Multifunctional Information Distribution System-Low Volume Terminal 1	OT&E Report	September 2003
Advanced Targeting and Designating Forward-Looking Infrared (ATFLIR) System, Block 1	OT&E Report	October 2003
Integrated Defensive Electronic Countermeasures, Block 2 (IB-2), AN-214 Onboard Jammer	OT&E Report	December 2003

During FY03, DOT&E met with Service operational test agencies, program officials, private-sector organizations, and academia; monitored test activities; and provided information to the DAB committees as well as the DAB principals, the Secretary and Deputy Secretary of Defense, the Under Secretary of Defense (Acquisition, Technology, and Logistics), the Service Secretaries, and Congress. Active on-site participation in, and observation of, tests and test-related activities remain the most effective tools.

DOT&E PROGRAM OVERSIGHT

DOT&E is responsible for approving the adequacy of plans for operational test and evaluation and for reporting the operational test results for all major defense acquisition programs to the Secretary of Defense, Under Secretary of Defense (Acquisition, Technology and Logistics), Service Secretaries, and Congress. For DOT&E oversight purposes, major defense acquisition programs were defined in the law to mean those programs meeting the criteria for reporting under section 2430, Title 10, United States Code (Selected Acquisition Reports (SARs)). The law (sec.139(a)(2)(B)) also stipulates that DOT&E may designate any other programs for the purpose of oversight, review, and reporting. With the addition of such "non-major" programs, DOT&E was responsible for oversight of a total of 256 acquisition programs during FY03.

Non-major programs are selected for DOT&E oversight after careful consideration of the relative importance of the individual program. In determining non-SAR systems for oversight, consideration is given to one or more of the following essential elements:

- Congress or OSD agencies have expressed a high level of interest in the program.
- Congress has directed that DOT&E assess or report on the program as a condition for progress or production.
- The program requires joint or multi-Service testing (the law (sec. 139(b)(4)) requires the DOT&E to coordinate "testing conducted jointly by more than one military department or defense agency").
- The program exceeds or has the potential to exceed the dollar threshold definition of a major program according to DoD 5000.1, but does not appear on the current SAR list (e.g., highly classified systems).
- The program has a close relationship to or is a key component of a major program.
- The program is an existing system undergoing major modification.
- The program was previously a SAR program and operational testing is not yet complete.

This office is also responsible for the oversight of LFT&E programs, in accordance with 10 USC 139. DoD regulation uses the term "covered system" to include all categories of systems or programs identified in 10 USC 2366 as requiring live fire test and evaluation. In addition, systems or programs that do not have acquisition points referenced in 10 USC 2366, but otherwise meet the statutory criteria, are considered "covered systems" for the purpose of DOT&E oversight.

A covered system, for the purpose of oversight for LFT&E, has been determined by DOT&E to meet one or more of the following criteria:

- A major system, within the meaning of that term in Title 10 USC 2302(5), that is:
    - User-occupied and designed to provide some degree of protection to the system or its occupants in combat.
    - A conventional munitions program or missile program.
- A conventional munitions program for which more than 1,000,000 rounds are planned to be acquired.
- A modification to a covered system that is likely to affect significantly the survivability or lethality of such a system.

DOT&E was responsible for the oversight of 94 LFT&E acquisition programs during FY03.

DOT&E ACTIVITY AND OVERSIGHT

PROGRAMS UNDER DOT&E OVERSIGHT FISCAL YEAR 2003

(As taken from the February 2003 Official T&E Oversight List)

ARMY PROGRAMS

ABRAMS Upgrade - Abrams Tank Upgrade

Advanced Field Artillery Tactical Data System (AFATDS)

Advanced Threat Infrared Countermeasures / Common Missile Warning System (ATIRCM/CMWS)

Aerial Common Sensor (ACS)

Air and Missile Defense Planning and Control System (AMDPCS)

All Source Analysis System (ASAS)

AN/TPQ-47 Counterfire Radar

Army Tactical Missile System - Brilliant Anti-Armor Submunition (ATACMS BAT) (includes ATACMS BLKs II/IIA, and BAT P3I)

Battlefield Combat Identification System (BCIS)

Black Hawk Upgrades (UH-60M)

Bradley Upgrade - Bradley Fighting Vehicle System Upgrade

CH-47F – Cargo Helicopter (CH-47D helicopter upgrade program)

Comanche (RAH-66) Reconnaissance Attack Helicopter (Includes 20mm ammunition)

Combat Service Support Control System (CSSCS)

Common Missile

Distributed Common Ground System - Army (DCGS-A)

Excalibur (155mm Round)

Family of Medium Tactical Vehicles (FMTV)

Force XXI Battle Command Brigade & Below (FBCB2) Program

Forward Area Air Defense System (FAADS) Command, Control, and Intelligence (C2I) - includes GBS

Future Combat System (FCS) and all associated systems, including:

- Infantry Carrier Vehicle (ICV)
- Command and Control Vehicle (C2V)
- Recon and Surveillance Vehicle (R&SV)
- Mounted Combat system (MCS)
- Non-Line-of-Sight Mortar (NLOS Mortar)
- Non-Line-of-Sight Cannon (NLOS Cannon)
- FCS Medical Vehicle (MV)

FCS and all associated systems (Continued)

- FCS Recovery Maintenance Vehicle (FRMV)
- Future Tac Trk Systs-Utility (C2)
- Future Tac Trk Systs-Utility (Support)
- Future Tac Trk Systs-Maneuver Sustainment
- Future Tac Trk Systs-Ambulance
- Multi-Mission Radar
- UAV Class I (Organic Air Vehicle – Light) (UAV CL I)
- UAV Class II (Organic Air Vehicle-Medium) (UAV CL II)
- UAV Class III (Small UAV) (UAV CL III)
- UAV Class IV (Shadow) (UAV CL IV GROUND)
- Armed Robotic Vehicle (ARV)
- Multi-Function Utility/Logistics and Equipment Vehicle (MULE)
- Small Unmanned Ground Vehicle (SUGV)
- Unmanned Ground Sensors (UGS)
- Non-Line-of-Sight Launch System (NLOS LS)
- Intelligent Munitions System (IMS)

Global Combat Support System – Army/Tactical (GCSS-A/T)
Global Command and Control System - Army (GCCS-A)

Guided Multiple Launch Rocket System (GMLRS)

Guided Multiple Launch Rocket System (GMLRS) – Unitary

High Mobility Artillery Rocket System (HIMARS)

Integrated System Control (ISYSCON V4)

Javelin- Advance Anti-Tank Weapon System – Medium

Joint Land Attack Cruise Missile Defense Elevated Netted Sensors (JLENS)

Joint Simulation System (JSIMS)

Joint Tactical Radio System (JTRS) Cluster I (JTRS Cluster I)

Kiowa Warrior (OH-58D)

Land Warrior

Line-of-Sight Anti-Tank Missile (LOSAT)

Longbow Apache (AH-64D)

Longbow Hellfire Missile (Upgrades/Modifications)

M829E3 (120mm Round)

ARMY PROGRAMS (continued)

Maneuver Control System (MCS) Army Tactical Command and Control System (MCS (ATCCS))

Objective Crew Served Weapon System (OCSWS) XM307

Objective Individual Combat Weapon System (OICWS)

PATRIOT PAC-3 Patriot Advanced Capability-3

Precision Guided Mortar Munitions (PGMM)

Reserve Component Automation System (RCAS)

Sensor Fuzed Munition

Single Channel Anti-Jam Man-Portable (SCAMP) (MILSTAR, Block II)

Stinger Re-programmable Microprocessor Missile (RMP)

Stryker – Armored Vehicle

Surface-Launched AMRAAM (SLAMRAAM) Missile

Suite of Integrated Radio Frequency Countermeasures (SIRFC) (AN/ALQ-211)

Tow-Fire & Forget Anti-Tank Missile

Transportation Coordinator Automated Information Movement System II (TC-AIMS II)

Warfighter Information Network-Tactical (WIN-T)

NAVY PROGRAMS

Acoustic Rapid COTS Insertion for SONAR

Active Electronically Scanned Array (AESA)

Advanced Amphibious Assault Vehicle (AAAV)

AGM-88E Advanced Anti-Radiation Guided Missile (AARGM) Program

Advanced Seal Delivery System (ASDS)

AIM-9X Air-to-Air Missile Upgrade

Airborne Mine Neutralization System (AMNS)

Air Early Warning (AEW)

AN/AAR-47 V2 Upgrade Missile / Laser Warning Receiver

AN/ALR-67 Advanced Special Receiver (ASR) V2 & V3

AN/APR-39A V2 Radar Warning Receiver

AN/SPY-1 B/D (All Versions)

AV-8B Remanufacture

Broad Area Maritime Surveillance (BAMS)

Cooperative Engagement Capability (CEC)

Cobra Judy Replacement (CJR) - Ship-based radar system

Cruiser Conversion

CVN 68 - Nimitz CLASS Nuclear Powered Aircraft Carriers

CVN (X) - Next Generation Nuclear Attack Carrier

DDG-51 Guided Missile Destroyer

DD(X) Future Surface Combatant Program

Defense Integrated Military Human Resources System (DIMHRS)

Deployable Joint Command and Control (DJC2)

E-2C Advanced Hawkeye (E2C Radar Modernization Program (RMP))

E-2C Reproduction Hawkeye

EA-6B Improved Capabilities (ICAP) III & Multiple Upgrades (Low Band Transmitter, Band 7-8 Transmitter, USQ-113 Communications Jammer)

E/A-18G (electronic variant of F/A-18)

Evolved Seasparrow Missile (ESSM)

Extended Range Active Missile (ERAM)

Extended Range Guided Munition (ERGM)

F-35 -Joint Strike Fighter (JSF) Program

F/A-18 E/F Hornet Naval Strike Fighter (All upgrades)

Fixed Distributed System/Advanced Deployable System (FDS/ADS)

Global Command and Control System – Maritime (GCCS-M)

HyFly

NAVY PROGRAMS (continued)

Integrated Defensive Electronic Countermeasure (IDECM)

Integrated Surface Ship ASW Combat System (AN/SQQ-89)

Joint Maritime Command and Control Capability (JCC (X))

Joint Mission Planning System (JMPS)

Joint Standoff Weapon (JSOW) Baseline/BLU-108/Unitary

Joint Tactical Radio System Cluster 3 (JTRS Cluster 3)

KC-130J Aircraft

LHA(R) - New Amphibious Assault Ship

LHD 1 - Amphibious Assault Ship

Littoral Combatant Ship (LCS)

LPD-17 Amphibious Assault Ship (Includes 30mm ammunition)

MH-60R Multi-Mission Helicopter Upgrade

MH-60S Helicopter (Utility helicopter replacing existing CH-46D, HH-60H, SH-3 & UH-1N helicopters)

Multi-Functional Information Distribution System - Low Volume Terminal (MIDS-LVT)

MK-48 Torpedo Mods

Multi-Mission Maritime Aircraft (MMA)

Maritime Prepositioning Force (Future) (MPF (F))

Naval Integrated Fire Control-Counter Air (NIFC-CA)

Navy Advanced EHF Multi-Band Terminal (NMT)

Navy-Marine Corps Intranet (NMCI)

Navy Standard Integrated Personnel System (NSIPS)

Rapid Airborne Mine Clearance System (RAMICS)

Rolling Airframe Missile (RAM)

Ship Self Defense System (SSDS)

Surface Electronic Warfare Improvement Program (SEWIP)

SSGN Trident Conversion

SSN-21 *Seawolf* AN/BSY-2

SSN-23 *Jimmy Carter*

SSN-774 *Virginia* Class

Standard Missile-2 (SM-2) (Blocks I/II/III/IV)

Standoff Land Attack Missile - Expanded Response (SLAM-ER)

Strategic Sealift Program (SSP) Ship Class

SUB Comms (SubECS/SCSS)

Surveillance Towed Array Sensor System (SURTASS) / Low Frequency Active (LFA)

T-AKE Lewis & Clark Class of Auxiliary Dry Cargo Ships

T-AOE(X) (Triple Product Station Ship)

T-45TS (Undergraduate Jet Pilot Training System)

Tactical Control System (TCS)

Tactical Tomahawk Missile

Tactical Tomahawk Mission Planning System / Tomahawk Command & Control System (MPS/TCCS)

Trident II Missile

Unmanned Combat Aerial Vehicle - Navy

USMC H-1 Upgrades (4BW/4BN)

V-22 Osprey Joint Advanced Vertical Lift Aircraft

Vertical Take-Off Unmanned Aerial Vehicle (VTUAV)

VXX (Presidential Replacement Helicopter) Program

AIR FORCE PROGRAMS

Advanced Wideband System (AWS)

ALR-56M Radar Warning Receiver

ALR-69 Radar Warning Receiver

Advanced Medium Range Air-to-Air Missile (AMRAAM)

Airborne Warning and Control System (AWACS (E-3)) Upgrades (Includes AWACS RSIP (E-3))

Air Force Tanker Replacement Program (Follow-on to KC-10 aircraft)

B-1B CMUP – B-1 LANCER Penetrating Bomber Conventional Munitions Upgrade Program (CMUP)

B-2 Radar Pathfinder Program (B-2 RPP)

B-2A Spirit Stealth Bomber

C-5 Avionics Modernization Program (AMP)

C-5 Reliability and Re-engining Program (RERP)

C-17A - Globemaster III Advance Cargo Aircraft

C-130 AMP - Avionics Modernization Program

C-130J Hercules Cargo Aircraft (All Variants)

Combat Survivor Evader Locator (CSEL)

Combat Search & Rescue Replacement Aircraft Program (CSAR)

Distributed Common Ground System - Air Force (DCGS-AF) Block 20

E-4B Modernization Program

Evolved Expendable Launch Vehicle (EELV)

F-117 Infrared Acquisition and Designation System (IRADS)

F-15 Tactical Electronic Warfare Suite (TEWS) (AN/ALQ-135 Band 1.5 Fiber-Optic Towed Decoy)

F/A-22 – Advanced Tactical Fighter

Global Broadcast Service (GBS)

Global Combat Support System - Air Force (GCSS-AF)

Global Command and Control System - Air Force (GCCS-AF)
- Theater Battle Management Core System (TBMCS)
- Air Operations Center - Weapons System (AOC-WS)

Global Hawk High Altitude Endurance Unmanned Aerial Vehicle

Global Transportation Network-21 (GTN-21)

Integrated Log System-Supply (ILS-S)

Integrated Maintenance Data System (IMDS)

Joint Air-Surface Standoff Missile (JASSM)

Joint Direct Attack Munition (JDAM)

Joint Helmet Mounted Cueing System (JHMCS)

Joint Mission Planning System (JMPS) / Air Force Mission Support System (AFMSS)

Joint Primary Aircraft Training System (JPATS)

Joint Surveillance Target Attack Radar System (JSTARS)

Joint Tactical Radio System Cluster 4 (JTRS Cluster 4)

KC-767A Aerial Tanker Aircraft

KC-135 Global Air Traffic Management (GATM) Upgrade

Large Aircraft Infrared Countermeasures (LAIRCM)

MILSTAR - (Satellite Low/Med Data Rate Communications)

Minuteman III - Guidance Replacement Program (GRP)

Minuteman III - Propulsion Replacement Program (PRP)

Multiple Platform – Common Data Link (MP-CDL)

Multi-Platform Radar Technology Insertion Program (MP-RTIP)

Multi-Sensor Command and Control Aircraft (MC2A) Program

Mobile User Objective System (MUOS)

National Airspace System (NAS)

National Polar-Orbiting Operational Environment Satellite (NPOESS)

NAVSTAR Global Positioning System (GPS)

Navy Extremely High Frequency (NESP) Satellite Communications (SATCOM) Program

Predator Unmanned Aerial Vehicle (UAV) RQ/MQ-1

Predator Unmanned Aerial Vehicle (UAV) MQ-9

AIR FORCE PROGRAMS (continued)

Space-Based Infrared System Program High Component (SBIRS-HIGH)

Space Based Radar (SBR)

Sensor Fuzed Weapon (SFW) P3I (CBU-97/B)

Small Diameter Bomb (SDB)

Secure Mobile Anti-Jam Reliable Tactical Terminal (SMART-T)

Strategic Warfare Planning System (SWPS)

Ultra High Frequency (UHF) Follow-on Satellite

Unmanned Combat Aerial Vehicle - Air Force

Wideband Gapfiller

OTHER DoD PROGRAMS

Ballistic Missile Defense Program
- Ground Based Midcourse Defense Segment (Includes Ground Based Interceptor [GBI], Ground Based Radar [GBR], and Battle Management C3 [BMC3])
- Medium Extended Air Defense System (MEADS)
- Navy Theater-Wide Ballistic Missile Defense (incorporates AEGIS BMD and SM-3 BLOCK II)
- Space-Based Infrared System-Low (SBIRS-L)
- Theater High-Altitude Area Defense (THAAD)
- YAL-1 Airborne Laser (ABL)

Business System Modernization (BSM)

Chemical Biological Defense Program (CBDP)
- Artemis (Chemical Agent Standoff Detection System)
- Joint Biological Agent Identification and Diagnosis System (JBAIDS)
- Joint Biological Point Detection System (JBPDS)
- Joint Biological Standoff Detection System (JBSDS)
- Joint Chemical Agent Detector (JCAD)
- Joint Service Family of Decontamination Systems (JSFDS)
- Joint Service Light NBC Reconnaissance
- Joint Service Lightweight Standoff Chemical Agent Detector (JSLSCAD)
- Joint Service Sensitive Equipment Decontamination (JSSED)
- Joint Warning and Reporting Network (JWARN)

Chemical Demilitarization

Composite Health Care System II (CHCS II)

Defense Medical Logistics Standard Support (DMLSS)

Defense Message System (DMS)

Defense Procurement Payment System (DPPS)

Defense Travel System (DTS)

DFAS Corporate Database/Warehouse (DCD/DCW)

Fuels Automated System (FAS)

Global Information Grid Bandwidth Expansion (GIG-BE))

Global Command & Control System – Joint (GCCS-J)

High Performance Computing Modernization (HPCM)

Joint Tactical Radio System (JTRS) Cluster II (Multi-Band Intra Team Radio)

Joint Tactical Radio System Waveform (JTRS Waveform)

Net- Centric Enterprise Services (NCES)

Public Key Infrastructure (PKI)

Teleport

Theater Medical Information Program (TMIP)

BALLISTIC MISSILE DEFENSE SYSTEM (BMDS)

This report provides an unclassified assessment of the adequacy and sufficiency of the Ballistic Missile Defense System (BMDS) element test programs during FY03. Classified discussions of these topics will be included in the annual Operational Test & Evaluation Assessment of the BMDS Test Program submitted in February 2004.

The BMDS is intended to provide a layered defense for the entire United States, deployed U.S. forces, friends, and allies from all ranges of threat ballistic missiles during all phases of flight. The BMDS will consist of land-, sea- and space-based sensors (both optical and radar), battle management systems, communications networks, long- and short-range interceptors, and directed-energy weapons.

On December 17, 2002, the President directed the Secretary of Defense, "…to proceed with plans to deploy a set of initial missile defense capabilities beginning in 2004." The Missile Defense Agency (MDA) is working to develop a set of Initial Defensive Capabilities (IDC), which can be deployed to conduct Initial Defensive Operations (IDO), using Ground-based Midcourse Defense (GMD), Aegis Ballistic Missile Defense (Aegis BMD), and other BMDS elements. Each of these elements' support of the IDO is discussed in its respective section.

It is prudent to identify and exploit defensive capabilities inherent in the BMDS infrastructure during the development phase. However, it is important to understand that assessments of these capabilities are based primarily on modeling and simulation, developmental testing of components and subsystems, and analyses – not end-to-end operational testing of a mature integrated system. Due to the immature nature of the systems they emulate, models and simulations of the BMDS cannot be adequately validated at this time. Confidence in assessed capabilities will improve as more system performance data is gathered to anchor the simulations or directly demonstrate these capabilities.

Planned operational assessments of IDO capability will focus on system performance against nation specific threats, as documented in a series of Defense Intelligence Agency (DIA) threat assessments. MDA is designing BMDS based on the capabilities of broad threat classes. MDA and the operational test agencies (OTAs) are working to connect the MDA threat capability document to the DIA threat assessment. IDO capability will be assessed for four engagement sequence groups consistent with North Korean Intercontinental Ballistic Missile (ICBM) attack scenarios. The Command and Control, Battle Management and Communications (C2BMC) element will integrate the other BMDS elements into a system capable of providing integrated, layered defenses against all types of ballistic missile threats. For Block 2004 and IDO, C2BMC is planned to provide enhanced situational awareness for the warfighter. Specifically, this will consist of a common operating picture that provides early launch warning and impact point predictions to the warfighter and voice authorization for weapons release provided through an appropriate concept of operations. Plans call for enhancing C2BMC capabilities in Block 2006.

Due to immature BMDS elements, very little system level testing was performed by the close of FY03. Therefore, BMDS capabilities assessed for IDO will be based on test events planned for FY04. The OTAs are involved in the planning of these events and DOT&E is reviewing and approving operational test objectives for combined developmental test/operational test events. These tests will be executed using simulated or theoretical performance characteristics for some elements. Scenarios are still being developed for the system level integrated ground-test (IGT-2), planned to support the initial deployment of BMDS. Flight tests planned to support validation of the ground-testing and modeling efforts have slipped to the point that data will not be available prior to IGT-2. Data from flight testing and ground testing is needed to support extensive validation, verification, and accreditation efforts currently underway. Without the results of the flight testing, the ground-testing efforts are at risk. If models accurately reflect flight test performance, IGT-2 results will be validated after the fact. At this point in time, it is not clear what mission capability will be demonstrated prior to IDO.

GROUND-BASED MIDCOURSE DEFENSE (GMD)

The Ground-based Midcourse Defense (GMD) element is an integrated collection of components that perform dedicated functions during an ICBM engagement. As planned, the GMD element includes the following components:

- GMD Fire Control and Communications. The communications network links the entire element architecture via fiber optic links and satellite communications. For IDO, all fire control will be conducted within the GMD element.
- Long-range sensors, including the Upgraded Early Warning Radar, the COBRA DANE radar, and the Ground-Based Radar Prototype. In December 2005, a sea-based X-band (SBX) radar is to be incorporated.
- Ground Based Interceptors and emplacements, consisting of a silo-based ICBM-class booster motor stack and the Exoatmospheric Kill Vehicle (EKV). The plan for the 2004 Test Bed plan places six Ground Based Interceptors at Fort Greely, Alaska, and four at Vandenberg Air Force Base, California. In 2005, plans are to place ten more at Fort Greely.

GMD soon plans to interface with other BMDS elements and existing operational systems through external system interfaces. Through FY06, these plans include GMD interfacing with the Aegis SPY-1B radars and satellite-based sensors and communications.

To date, the GMD program has demonstrated the technical feasibility of hit-to-kill negation of simple target complexes in a limited set of engagement conditions. The GMD test program in FY03 was hindered by a lack of production representative test articles and from test infrastructure limitations. Delays in production and testing of the two objective booster designs have put tremendous pressure on the test schedule immediately prior to fielding. The most significant test and infrastructure limitations and mitigation plans are described in the table below.

Major GMD Test Limitations and MDA Mitigation Plans

Limitation	Comments	MDA Mitigation Plan
Lack of a deployable boost vehicle	The Orbital booster has been tested in developmental flight tests without attempted intercepts. The Lockheed booster testing has slipped such that it may not be available for IDO.	MDA is proceeding with deployment plans emphasizing the Orbital booster. Testing will continue with both designs as Lockheed booster production resumes.
Lack of a realistically placed midcourse sensor	The GMD test radar is collocated at the interceptor launch site. The FPQ-14 radar, a non-deployable asset that tracks a transmitter attached to the test target, currently accomplishes the midcourse tracking and discrimination functions.	GMD is developing a mobile, sea-based radar. The scheduled employment of this radar in the GMD Test Bed occurs in the post-2005 time frame.
Fixed intercept point	All of the flight tests to date have had similar flyout and engagement parameters. This limitation includes range constraints and a requirement not to create space debris.	The 2004 Test Bed expands the flyout range and engagement conditions. Space debris creation remains a problem.[a] Transitioning between testing and operations is a concern.

[a] These factors constrain test engagements to relatively low target intercept altitudes and downward directed velocities for both the target and interceptor.

Intercept Flight Test - 9 (IFT-9) took place on October 14, 2002, resulting in a successful intercept. The target suite consisted of a mock warhead and a number of decoys launched from the Vandenberg Air Force Base, California, towards the Reagan Test Site. IFT-9 (largely a replay of IFT-8) was designed to increase confidence in the GMD capability to execute hit-to-kill intercepts. Overall, the test execution was nominal although the EKV experienced the track gate anomaly previously observed in IFT-7 and IFT-8. The software changes incorporated in IFT-9 to mitigate this problem were not successful. Further changes were made prior to IFT-10.

In December 2002, GMD attempted a night intercept in IFT-10. In this test, the EKV failed to separate from the surrogate boost vehicle and therefore the ability to intercept the target could not be tested. The failure to separate was attributed to a quality control failure combined with shock and vibration loads on the EKV. As a result, corrective measures taken to fix the track gate anomaly found in previous tests could not be tested.

GMD suspended intercept flight testing after the EKV failed to separate from the surrogate booster in IFT-10. IFT-11 and IFT-12 that employed the problematic surrogate booster were eliminated from the schedule. This decision was reasonable given the increased risk of surrogate boost vehicle failure, the resources that would have to be diverted from tactical booster development to fix the problems, and the limited amount of additional information to be gained in IFT-11 and IFT-12 over that available from previous flight tests. It does, however, leave very limited time for demonstration of boost vehicle performance, integration of the boost vehicle to the new, upgraded EKV, and demonstration of integrated boost vehicle/interceptor performance. IFT-13A and IFT-13B remain in the schedule as non-intercept flight tests to confirm booster integration and performance. IFT-13C was added to the schedule and represents a significant exercise of the Test Bed infrastructure. It will be the first system-level flight test to use the Kodiak, Alaska, facility to launch a target missile. While it is not a planned intercept attempt, it will fully exercise the system and may result in an intercept. IFT-13C also addresses a long-standing concern over target presentation that has not yet been tested. IFT-14 and IFT 15 are the next official intercept attempts and are scheduled for May 2004 and July 2004, respectively.

The Orbital Sciences Corporation booster was successfully tested with a mock EKV on August 16, 2003. Shock and vibration environments were measured and compared to previous test levels. Preliminary analyses suggest that the new booster produces lower than expected vibrations at the EKV. Performance of the real EKV mated with the Orbital booster will be demonstrated in IFT-14 prior to IDO. Similar demonstration flights for the Lockheed Martin booster design are slipping due to technical difficulties and several explosions at the missile propellant mixing facility.
Silos and related construction projects at Fort Greely, Alaska; Kodiak, Alaska; and Vandenberg Air Force Base, California, are proceeding on schedule. Due to safety considerations, no tests are currently planned to launch interceptors from the operational missile fields.

To date, EKV discrimination and homing have been demonstrated against simple target complexes in a limited set of engagement conditions. Demonstrations of EKV performance are needed at higher closing velocities and against targets with signatures, countermeasures, and flight dynamics more closely matching the projected threat. In addition, system discrimination performance against target suites for which there is imperfect a priori knowledge remains uncertain.
GMD is developing a SBX radar mounted on a semi-submersible platform. The SBX radar, scheduled for incorporation into the GMD element in December 2005, is designed to be a more capable and flexible midcourse sensor for supporting GMD engagements. This radar will improve the operational realism of the flight test program by providing a moveable mid-course sensor.

A flight demonstration of the BMDS capability using Aegis SPY-1B data (particularly for defense of Hawaii) is planned for IFT-15 in FY04. A flight demonstration of COBRA DANE is currently not planned, and its capability will need to be demonstrated by other means until an air-launched target is developed. IFT-14 and IFT-15, scheduled for FY04, are intended to provide demonstrations of integrated boost vehicle/EKV performance. Even with successful intercepts in both of these attempts, the small number of tests would limit confidence in the integrated interceptor performance.

AEGIS BALLISTIC MISSILE DEFENSE (AEGIS BMD)

The Aegis Ballistic Missile Defense (BMD) element is intended to provide U.S. Navy surface combatants with the ability to defeat short-range (less than 1,000 kilometers), medium-range (1,000 to 3,000 kilometers), and long-range (greater than 3,000 kilometers) ballistic missiles during exoatmospheric flight. The Aegis BMD element consists of two major components: the shipboard Aegis Weapon System (AWS) and the Standard Missile-3 (SM-3) missile. The AWS detects and tracks the threat and provides midcourse uplink information to the SM-3 missile. The SM-3 missile is a four-stage hit-to-kill missile launched from an Aegis ship.

The Aegis BMD flight test program has achieved four successful intercepts in five attempts. These flight tests have demonstrated the capability to intercept short-range, simple unitary targets in both descent and ascent phases of flight, and in the case of FM-6, have shown the capability to destroy the target warhead. In FY03, two intercept attempts of a unitary target in its ascent phase were conducted. In the first test, the Aegis BMD element successfully intercepted the target. Using a newly designed divert system onboard the SM-3 missile, the Aegis BMD failed to intercept the target in the second test. The cause of the failed intercept has been attributed to a malfunction in a divert valve in the attitude control system onboard the kinetic warhead. Testing is continuing based on the consistent performance of the sustained pulse mode, while mitigation options are evaluated.

In FY03, the operational robustness of the Aegis BMD Block 2004 test program was enhanced by increased operational realism in the test strategy. Efforts to add operational realism as part of the developmental test strategy provide significant risk reduction in advance of operational testing and potential deployment of the element. The planned growth in flight test realism is consistent with the maturity of the system. Although the Block 2004 flight test plan includes many operationally realistic aspects, some important operational scenarios will remain untested by the end of the Block 2004 test program. These include multiple simultaneous engagements and separating targets. Development and integration of critical technologies pertaining to threat discrimination (e.g., AWS discrimination logic, radar and infrared seeker upgrades) and missile propulsion (e.g., kinetic warhead divert system, SM-3 booster propulsion) could improve operational capability as they are introduced in Block 2004 and subsequent upgrades.

Initial assessments of the Aegis BMD Surveillance and Track (S&T) capability to support integrated BMDS missions were also conducted as part of the FY03 flight test program. The goal of the Aegis BMD S&T effort is to allow GMD to use Aegis tracking data to generate search cue commands for the Ground Based Radar Prototype in order to acquire and track ICBM class targets. As part of this effort, Aegis BMD is participating in the GMD IFT program. Depending on the accuracy of Aegis track data, the Block 2004 Aegis BMD S&T capability could contribute to GMD detection and tracking. Aegis BMD participated in both IFT-9 and -10 to evaluate its capability to support more integrated missions in future flight tests.

THEATER HIGH ALTITUDE AREA DEFENSE (THAAD)

The Theater High Altitude Area Defense (THAAD) is an element of the terminal defense segment of the BMDS and is a mobile ground-based missile defense element designed to protect forward-deployed military forces, allies, and population centers from short- and intermediate-range ballistic missile attacks. THAAD uses kinetic energy "hit-to-kill" technology to intercept incoming ballistic missiles in the late mid-course or terminal phases of their trajectories, at either high endoatmospheric or exoatmospheric altitudes.

The THAAD radar has progressed in maturity and is now in manufacturing and integration testing. Assembly of the first radar is nearly complete, with end to end testing of subarrays completed. Radar component hardware has successfully completed reliability testing and accelerated life testing of critical transmit/receive assemblies. The first radar component is on schedule for a spring 2004 delivery to White Sands Missile Range, New Mexico, for final integration, calibration, and ground testing.

The production facility in Troy, Alabama, has been activated and is preparing to produce the first THAAD missiles this fiscal year. Recent safety incidents at propellant mixing facilities of the Pratt & Whitney, Chemical Systems Division booster manufacturer are causing a revision to the missile development schedules. The Missile Critical Design Review (CDR) was completed in FY03 and developmental testing supports the mission controls flight test in late-CY04.

No integrated system-level testing occurred in FY03. However, during FY03 the THAAD contractor test program completed several successful assembly/subassembly level tests and simulated interoperability exercises. Although some failures and anomalies associated with the missile design were encountered during this testing, mitigation strategies are sufficient to address the problems with little or no impact on the flight test schedule.

Flight safety analyses for testing at the Pacific Missile Range Facility are taking longer than expected. It is unclear if all range safety constraints can be met with current targets. Debris from intercept events or flight termination is a serious safety concern. If unresolved, this could limit the use of a long-range target, forcing testing to the Reagan Test Site (RTS). This would likely conflict with GMD testing at RTS.

Budget adjustments caused the ground and flight test programs to be repeatedly restructured over the past year. The flight test schedule emerged from these changes with minimal deferments, with the first intercept against a threat-like target planned for 2005. The government's ground-test program, which includes system safety and performance qualification, has been delayed. This could impact plans for deploying interim hardware buys. Mobility, logistics, climatic and dynamic environments, reliability, and maintainability will all be tested between 2007 and 2009. If this acquisition concept is implemented, Block 2004 and Block 2006 THAAD systems will be procured and fielded with little or no government performance qualification or operational testing.

At this time, the THAAD element has no deployable hardware, except for the prototype radar. The THAAD radar technology is being developed by the Sensor Directorate at MDA for a forward-deployed, mobile, X-band radar to enhance early launch detection and tracking capability.

PATRIOT ADVANCED CAPABILITY-3 (PAC-3)

The PATRIOT air defense system is designed to detect, track, engage, and destroy air-breathing threats (ABTs) and tactical ballistic missiles (TBMs). PATRIOT Advanced Capability-3 (PAC-3) Configuration-3, the latest version, completed an eight-month IOT&E in September 2002. The Army manages the PAC-3 program and interfaces with the BMDS through data and communications exchange. The PATRIOT system is designed to defend against multiple hostile TBMs and ABTs in electronic countermeasures and clutter environments. The ABTs include fixed-wing and rotary-wing aircraft, cruise missiles, tactical air-to-surface missiles, anti-radiation missiles, and unmanned aerial vehicles.

In December 2002, DoD approved the limited production of 100 PAC-3 missiles during FY03 and 109 missiles during FY04 to equip PAC-3 battalions and support ongoing military actions. PATRIOT battalions with PAC-3 fire units were employed in Operation Iraqi Freedom (OIF) against TBMs. In OIF, PAC-3 interceptors were ripple-fired against ballistic missile threats, a user requirement that was not demonstrated during operational testing. This eliminated the need for a follow-on test to demonstrate this capability. All PATRIOT engagements were conducted in a complex operational environment. Three instances of erroneous engagements between PATRIOT batteries and friendly aircraft are under investigation and are not discussed here. System performance against TBMs appears to have been highly effective and consistent with expectations documented in DOT&E's beyond low-rate initial production report submitted to Congress in October 2002. PATRIOT performance during OIF is detailed in the classified FY03 BMDS annual report.

System shortcomings identified in the IOT&E require a Follow-On Test Program, which is not yet fully defined. There are three flight tests scheduled in FY04, twelve in FY05, five in FY06, and seven for FY07. The adequacy of this testing cannot be fully assessed because the detailed objectives for most of the flight tests in FY05 and beyond are not yet defined. The Mobile Flight Mission Simulator Hardware-in-the-Loop facility provided much of the data to assess PAC-3 system performance during IOT&E, but it has significant limitations and needs improvement. In order to conduct an integrated battalion-level test, two additional Mobile Flight Mission Simulator systems should be procured. It is essential that the Army provide the funding resources needed to properly execute this program.

PATRIOT PAC-3 provides the only BMDS operational capability that can be assessed with high confidence at this time. PAC-3 demonstrated effectiveness, suitability, survivability, and lethality against a limited set of threats during the IOT&E in 2002. PAC-3 successfully engaged missiles that threatened defended assets during OIF. As with all defensive systems, significant improvements are needed in our capability to positively identify "friend or foe."

MEDIUM EXTENDED AIR DEFENSE SYSTEM (MEADS)

The Army manages the Medium Extended Air Defense System (MEADS) program, which is intended to be a highly mobile air defense system for the protection of maneuver forces and fixed assets. PATRIOT will either evolve to the MEADS capability or be replaced by the MEADS system, depending on the acquisition strategy adopted for the program. The system should provide area and point defense capabilities against multiple, simultaneous, 360-degree attacks by ballistic missiles, large caliber rockets, fixed-wing and rotary-wing aircraft, unmanned aerial vehicles, cruise missiles, tactical air-to-surface missiles, and anti-radiation missiles. It should be strategically deployable by C-130 roll-on/roll-off, and tactically mobile to keep up with maneuver forces. MEADS has not yet entered the System Design and Development phase and currently has no operational capability. Testing has been limited to demonstrations using prototype software in digital simulations.

MEADS is an international program that DoD is reevaluating to determine if it can be integrated with the PATRIOT product improvement program. The evaluation is ongoing with the international community.

AIRBORNE LASER (ABL)

The Airborne Laser (ABL) program is employing a spiral development concept. The Block 2004 effort develops, integrates, and tests the initial weapon system on a Boeing 747 aircraft. ABL is intended to engage and destroy enemy ballistic missiles during their boost phase. The ABL engagement concept places laser energy on the threat missile booster motor casing. This energy damages the casing, causing the missile to rupture or lose thrust and flight control, falling short of its target. Engagement in the boost phase negates the missile before decoys, warheads, or submunitions are deployed.

Three different Block configurations are planned. Blocks 2004 and 2008 are on Boeing 747 transport aircraft modified to accommodate ABL subsystems. Block 2006 continues testing the Block 2004 aircraft, with minimal hardware and software update, against a wider variety of ballistic missile targets. Also, during this spiral, deployable ground support equipment will be developed to support early operational capability and MDA test activities.

To date, the program has been concentrating on activities associated with getting “first light” through six fully integrated laser modules, and integrating the beam control system. All Block 2004 efforts are focused on achieving a successful, live shoot-down of a ballistic missile during FY05.

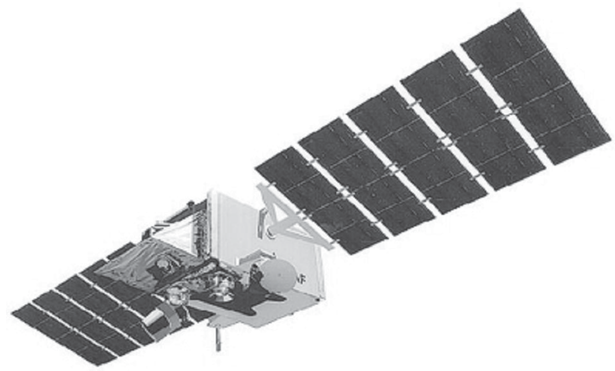
In order to demonstrate system performance as soon as possible, the Block 2004 program will delay some integration and testing until after the ballistic missile shoot-down. For example, integration and testing of the Active Ranger System is now scheduled to occur after the shoot-down.

The program has also reorganized the High Energy Laser (HEL) Lethal Edge Irradiance characterization, reducing the number of tests and engagement geometries occurring prior to the ballistic missile shoot-down. This limits the amount of data available through FY05, for extrapolating ABL’s negation capabilities against other missile threat classes. HEL beam characterization flight tests will be re-planned to the degree possible after the shoot-down event. Characterization of the HEL beam should continue in the Block 2006 test program to increase understanding of ABL lethality.

A thorough lethality test program is planned in the Block 2006 program but is not completely funded. The plan addresses primary negation parameters and includes the procurement of about a dozen targets, their engagement flight tests, and the necessary preliminary lab and flight testing. The execution of this plan, combined with good HEL beam characterization, should result in a thorough understanding of ABL's negation capabilities under a range of conditions and threats.

SPACE TRACKING AND SURVEILLANCE SYSTEM (STSS)

The Space Tracking and Surveillance System (STSS) is planned as a low Earth orbit satellite constellation with cross-link capabilities, and is a sensor element of the BMDS. The STSS is intended to acquire, track, discriminate, assess, and report ballistic missile events from lift-off through intercept using multi-spectral sensors and stereo tracking. The STSS may eventually consist of a large constellation (up to 27 spacecraft) to provide continuous coverage of most of the globe.



Block 2004 STSS test activities will consist of ground-based tests, simulations, and rehearsals using the STSS Surrogate Test Bed (SSTB). Communications protocols and procedures will be evaluated, including the ability for STSS data to be disseminated through C2BMC to other BMDS elements. Other pre-launch tests include system and software integration tests, which are scheduled to begin in FY04.

The STSS is currently at the Block 06 CDR stage. STSS currently has no operational capability. The earliest feasible capability will occur during FY07 if the first two satellites are launched as planned. Early STSS capability will have significant onboard power constraints and coverage limitations. A STSS Development Master Test Plan and a GMD/STSS Integration Test Plan have been drafted. STSS participation in BMDS tests during Block 2004 involves the SSTB to resolve C2BMC interface issues. The full capabilities of the STSS cannot be tested until Blocks 2006 and 2008.

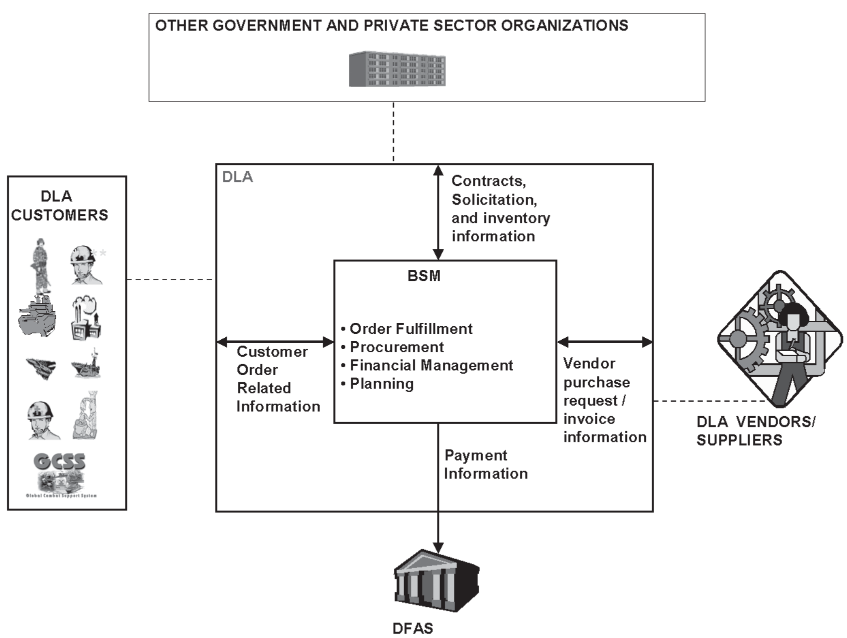
Business System Modernization (BSM)

The primary objective of Business Systems Modernization (BSM) is to align Defense Logistics Agency (DLA) business practices with the best practices by re-engineering logistics processes at all echelons and to provide robust information technology to support this re-engineering. Specifically, the BSM program, first conceived in 1998, is to establish a framework for continuous business practice improvements by:

- Shifting to the best business practices and capitalizing on industry-based integrated supply chain management solutions.
- Moving from organic to commercial sector support when business and readiness factors dictate.
- Exploiting DLA's leveraged buying capabilities and harnessing that power through value-added electronic shopping opportunities to enable customers to get the best prices and fastest delivery of products and services.

The Joint Requirements Oversight Council-approved Operational Requirements Document identified the need for DLA to manage to specific outcomes, allow optimization within given levels of resources, and focus support on product and operating-cost reduction. These objectives represent DLA's approach to meeting the requirements of the DoD Future Logistics Enterprise and the DLA Strategic Plan. The BSM strategy's first focus is to replace DLA's primary legacy supply chain management/materiel management systems — The Standard Automated Materiel Management System and the Defense Integrated Subsistence Management System — with an expanded enterprise computing environment and commercial off-the-shelf software packages that include Enterprise Resource Planning and Advanced Planning Systems. The BSM strategy, over the course of several years, will result in a new agency-wide information technology architecture that will enable the DLA to reengineer its logistics processes to reflect the best business practices.

In July 2002, DLA initiated the concept demonstration of BSM Release 1.0, which represented approximately 80 percent of the planned functionality, with a limited number of commodities (5 percent) and a small number of end-users at the Defense Supply Centers. Release 1.0 essentially replaces the functionality of the legacy Standard Automated Materiel Management System. Based on the experience obtained in the development and implementation of this first release, DLA revised the BSM implementation strategy and schedule for the remaining functionality. The next phase is to demonstrate Release 1.1, which incorporates the functionality related to the management of battle dress uniform (BDU) and subsistence. The development and implementation of Release 1.1 is based on a conversion and rollout approach to minimize technical and mission risks. BDU management functionality and subsistence management functionality will be introduced as part of a phased rollout beginning in December 2003 thru May 2004. After successful demonstration of Release 1.1, Release 2.0 (July implementation) will integrate additional functionality prior to the IOT&E of BSM. A full deployment decision review is scheduled for November 2004.



The primary objective of Business Systems Modernization is to align Defense Logistics Agency business practices with the best practices by re-engineering logistics processes at all echelons and to provide robust information technology to support this re-engineering.

TEST & EVALUATION ACTIVITY

- DOT&E approved the revised BSM Test and Evaluation Master Plan in May 2002.
- The Joint Interoperability Test Command conducted an operational assessment (OA) on selected functionality of Release 1.0 in the Fall of 2002, to assess system maturity. The OA was conducted in production environments at the following locations: DLA Headquarters, Ft. Belvoir, Virginia; Defense Supply Center in Richmond, Virginia; Defense Supply Centers in Richmond, Virginia; Philadelphia, Pennsylvania; and Columbus, Ohio; and the BSM Production Center in Denver, Colorado; and with the Defense Finance and Accounting Service in Columbus, Ohio.
- The IOT&E of BSM, which will support full deployment, is planned for October 2004.

TEST & EVALUATION ASSESSMENT

The OA results revealed that BSM was able to successfully perform 90 percent of its functional requirements. Of the four primary BSM functional areas, Order Fulfillment achieved the most favorable results. Users in this area experienced little or no operational difficulties. The Planning and Financial Management functionality performed well in general. However, some Demand Planning users experienced difficulties completing demand analysis and forecasting actions. The Procurement functionality was the least favorable overall. Users could not consistently complete contract evaluations and process awards ¾ mostly due to excessive manual workarounds required by the Procurement Desktop 2 subsystem. The 21 external system interfaces assessed all performed well with no interoperability failures observed. The OA results also revealed that shortcomings in the areas of information assurance and usability exist. The Program Manager is currently working to correct these identified deficiencies prior to an OA for Release 1.1, which is scheduled for March 2004.

Composite Health Care System II (CHCS II)

The Composite Health Care System II (CHCS II) is a Tri-Service medical management automated information system sponsored by the Assistant Secretary of Defense (Health Affairs). CHCS II provides a uniform, comprehensive, legible, secure, electronically transferable health record for every beneficiary in the Military Health System, as mandated by the President and Congress (Presidential Review Directive 5 and Public Law 105-85). It will be used in every military medical treatment facility (MTF) worldwide – fixed, deployed, and aboard ships. CHCS II also addresses the need for readily accessible health care information about deployed Service members. Building on the existing CHCS, CHCS II integrates medical and dental information and is a key enabler for force health protection and population health improvement – two cornerstones of military medicine.

CHCS II achieved Milestone I in 1998. During 1999 and 2000, the Army Test and Evaluation Command (ATEC) conducted operational assessments on CHCS II prototype systems installed in selected clinics at MTFs in Hawaii. Although the results indicated that these systems were not yet operationally effective or suitable, the assessments proved valuable in designing the next iterations of the software, which incorporated substantial operational and technical architectural changes. The program manager (PM) started implementing CHCS II in multiple blocks with increasing functionality.

During 2000 and 2001, the PM installed CHCS II Block 1, which targets ambulatory care, in selected clinics at four pilot sites. The PM continued to improve the software, based on user input, and ATEC conducted IOT&E at the sites in the summer of 2002. In August 2002, the Joint Requirements Oversight Council approved an updated CHCS II Operational Requirements Document. In January 2003, the Milestone Decision Authority granted Milestone C limited deployment authority for CHCS II Block 1, awarded Milestone B for Block 2, and awarded Milestone A for Block 3. The PM fielded CHCS II Block 1 to six MTFs among the three Services. In September 2003, the Overarching Integrated Product Team recommended approval for CHCS II Block 1 worldwide deployment beginning January 2004.

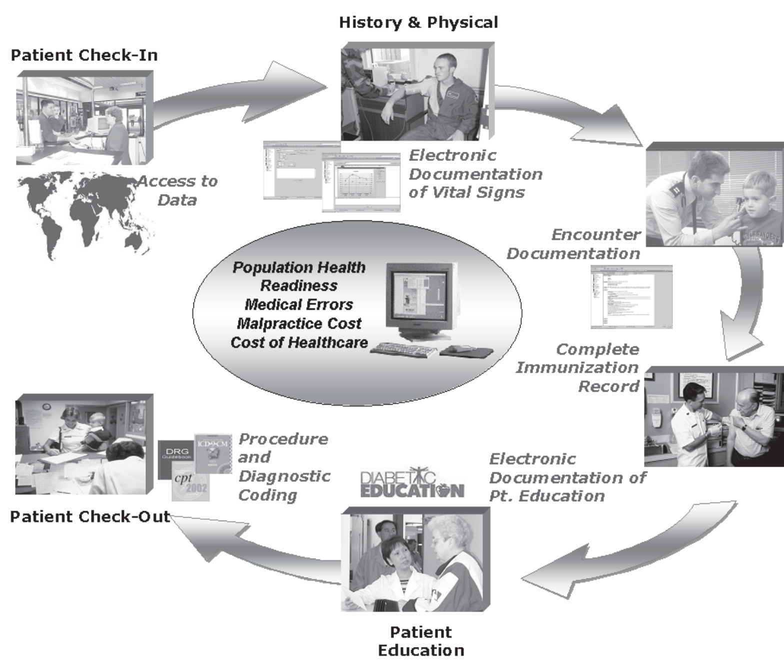
TEST & EVALUATION ACTIVITY

DOT&E approved an updated CHCS II Test and Evaluation Master Plan for Block 1 in May 2002.

During 2003, ATEC worked with Bearing Point, Inc. to conduct a continuing evaluation of CHCS II in order to study whether its long-term benefits outweigh a perceived lower productivity level that came to light during the 2002 IOT&E.

In September 2003, ATEC completed a reassessment of Block 1 interoperability and productivity issues.

An updated Test and Evaluation Master Plan for Block 2 (which provides dental and optometry capabilities) is in the final approval stage. ATEC is scheduled to conduct Block 2 OT&E in early 2004 at Army and Navy test sites in the Virginia Tidewater area and at Sheppard Air Force Base, Texas.



Building on the existing Composite Health Care System, Composite Health Care System II integrates medical and dental information and is a key enabler for force health protection and population health improvement – two cornerstones of military medicine.

TEST & EVALUATION ASSESSMENT

CHCS II uses the latest proven technology and links multiple commercial off-the-shelf products. The system uses templates to record patient encounters to build the Electronic Health Record. Since it will be the Department of Defenses' premier computer-based health care system, CHCS II will have a tremendous operational impact on the fighting force. The Electronic Health Record will be the first (military or civilian) cradle-to-grave automated health care record – one that can revolutionize the effectiveness of the Military Health System by providing instantaneous patient information to health care providers (HCPs) worldwide.

ATEC found Block 1 to be operationally effective, suitable, and survivable. The DOT&E determined that the IOT&E was adequate and agreed with the ATEC findings, based on the approved operational requirements. However, during the course of the IOT&E, it became apparent that an additional mission performance parameter –one not found in the approved Operational Requirements Document – also applied. HCPs at every test site reported that the number of patient encounters that can be completed is a major measure of mission performance. Many HCPs stated that they had been told by their superiors that they should see as many as 25 patients per day. These users indicated that a patient encounter usually takes longer using CHCS II than it would if documented solely on paper, particularly in general clinics such as family practice and primary care. User surveys conducted during the IOT&E indicated that a majority of HCPs who perform full patient encounters (i.e., complete office visits with their patients) were dissatisfied with the ability of CHCS II to help achieve the goal of 25 patients per day.

During the limited deployment of Block 1, the operational test community continued to assess CHCS II. In conjunction with the Joint Interoperability Test Command, ATEC retested the interoperability aspects that had been problematic during the 2002 Block 1 IOT&E. In September 2003, ATEC and the Joint Interoperability Test Command determined that the PM had corrected the interoperability problem, which involved the transfer of clinical and demographic data to a third party financial accounting system. DOT&E concurred that interoperability issues were resolved.

In spring and summer 2003, ATEC assessed the productivity of CHCS II using data gathered by Bearing Point, Inc. The results showed that after CHCS II was installed, the number of patient encounters performed by HCPs initially dropped off by approximately 20 percent across the Services. However, due to the short data collection period, DOT&E and the user community do not yet completely understand all of the ramifications of these findings. More data will be collected to determine whether the former level of patient encounters is possible and, if so, how long it will take to achieve that level. DOT&E will continue working with the PM, the users, and the testers to accomplish this while planning for Block 2 OT&E continues.

Defense Medical Logistics Standard Support Automated Information System (DMLSS AIS)

The Defense Medical Logistics Standard Support (DMLSS) program defines and implements a more efficient medical logistics capability for military medical treatment facilities (MTFs) and deployed field units by radically changing the medical logistics business processes and developing and deploying an integrated medical logistics automated information system (AIS). The DMLSS Automated Information System (DMLSS AIS), co-sponsored by the Assistant Secretary of Defense (Health Affairs) and the Deputy Under Secretary of Defense (Logistics and Materiel Readiness), automates and integrates the medical logistics systems of the Services and reduces MTF inventories of medical and pharmaceutical items. It supports four major functional areas: materiel management, facility management, equipment and technology, and wholesale operations. DMLSS AIS Release 3 is currently replacing all remaining legacy systems operated by the individual Services except for one Army system, the Theater Army Medical Management Information System, which will continue to be used in deployable Army medical units.

The Joint Requirements Oversight Council revalidated the DMLSS Operational Requirements Document in August 2001, and DOT&E approved an updated Test and Evaluation Master Plan in December 2001. Since the system was first deployed to test sites in 1995, the Operational Test and Evaluation Force (OPTEVFOR) performed OT&E on three major releases and some incremental system enhancements. The DMLSS program office fielded DMLSS AIS Release 2 worldwide to approximately 110 MTFs and is in the process of deploying Release 3 as a Release 2 replacement.

TEST & EVALUATION ACTIVITY

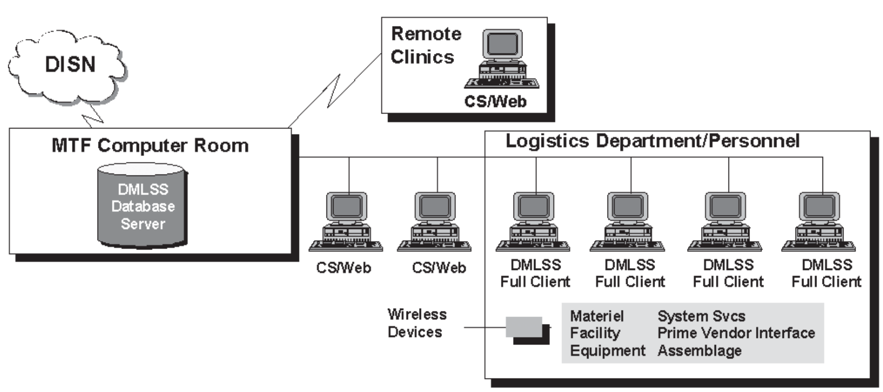
The DMLSS program office installed DMLSS AIS Release 3 and conducted developmental testing at three beta test sites during 2001: Naval Medical Center, Portsmouth, Virginia; David Grant Medical Center, Travis Air Force Base, California; and Brooke Army Medical Center, Fort Sam Houston, Texas. These sites comprise large MTFs that collectively exploit all of the Release 3 capabilities.

OPTEVFOR conducted operational testing at the three sites in January 2002. OPTEVFOR observed users performing typical actions in an operational environment, distributed user questionnaires, conducted user interviews, and reviewed relevant reports, logs, and other documentation.

In June 2002, OPTEVFOR conducted a limited Verification of Correction of Deficiencies (VCD) at the Navy and Air Force sites; meanwhile, the DMLSS program office continued to work on the anomalies found at the Army site, including problems with financial interfaces. In January 2003, OPTEVFOR completed a limited VCD at Brooke Army Medical Center.

TEST & EVALUATION ASSESSMENT

Following the January 2002 OT&E, DOT&E assessed DMLSS AIS Release 3 as operationally effective for all Services except the Army. The release was not operationally suitable. For the Army, critical interfaces with financial systems did not work, significantly hampering fiscal accountability. The Navy and the Air Force, with different financial interfaces, legacy systems, and procedures than the Army, did not exhibit these



Defense Medical Logistics Standard Support Automated Information System Release 3 is operationally effective and suitable for the Navy and Air Force, and operationally effective for the Army. Operational suitability for the Army is contingent upon software changes being made by the Standard Procurement System.

effectiveness deficiencies. DOT&E assessed the releases as not operationally suitable based on deficiencies in logistic supportability, training, and documentation. In May 2002, the Program Manager corrected these deficiencies and invited immediate verification of his corrective actions.

In June 2002, OPTEVFOR performed a VCD at the Navy and Air Force sites and found all deficiencies were corrected with one remaining anomaly – an automated materiel management quality control feature requiring workaround. From October 28, 2002, through January 24, 2003, OPTEVFOR performed a VCD for the Army and determined that all known deficiencies had been corrected, with the exception of interoperability with the Standard Procurement System (SPS), the correction of which will require software changes by the SPS program in order to interface with DMLSS AIS Release 3. This interface is intended to automate the Army's ability to order certain items not readily available through the normal supply process. The users can order these supplies manually, but with greater effort.

As of May 2003, the DMLSS AIS Release 3 is operationally effective and suitable for the Navy and Air Force, and operationally effective for the Army. Operational suitability for the Army is contingent upon software changes being made by SPS. Additionally, the DMLSS Operational Requirements Document requires interfaces to systems still in development. As these systems become operational, DMLSS will interface with these systems and conduct additional OT&E to verify successful performance and interoperability.

Defense Message System (DMS)

The Defense Message System (DMS) enables anyone in DoD to exchange both classified and unclassified messages with anyone else in DoD using a secure, accountable, and reliable writer-to-reader messaging system. DMS supports organizational and individual messaging. DMS is intended to reduce the cost and manpower demands of the legacy Automatic Digital Network (AUTODIN) organizational messaging system. To replace AUTODIN, DMS must be implemented in more than 40,000 organizations at more than 700 sites worldwide and must support message exchanges with tactical forces, allies, other Federal Government users, and defense contractors. The DMS employs the latest commercial technology, supports Allied Communications Publication 120 (common security protocol required for all DoD message systems), and operates on the DoD Internet Protocol classified and unclassified networks. While today's security needs require using the international X.400 messaging standard and X.500 directory services standard, the DMS program expects to evolve toward more commercial Internet e-mail standards as they adopt security and support features capable of meeting military requirements.

The Defense Information Systems Agency started the DMS program in 1988, and first tested the commercial-based messaging system in 1997. Since then DMS continued to improve performance and capability, and DMS 3.0 was approved for fielding in July 2002. Meanwhile, the AUTODIN backbone was downsized to three message-switching centers called DMS Transition Hubs (DTHs). On October 1, 2003, the DTHs were closed to general service (GENSER) messages. One of the DTHs, the continental U.S. hub, will operate as a National Gateway Center (together with the Pentagon Telecommunications System Center) and will continue to provide a gateway service between the Intelligence Community (IC) and GENSER communities. After DTH closure, the IC and several other user communities (e.g., small deck Navy ships, non-DoD Federal Departments, Allies, and defense contractors) will continue to operate their legacy messaging systems with the National Gateway Center to interface with the DMS world until they can transition to DMS.

TEST & EVALUATION ACTIVITY

DOT&E approved an updated DMS Capstone Test and Evaluation Master Plan in April 2002.

The OT&E of the Nuclear Command, Control, and Communication (NC^3) Emergency Action Message (EAM) Hybrid Solution was in April 2003.

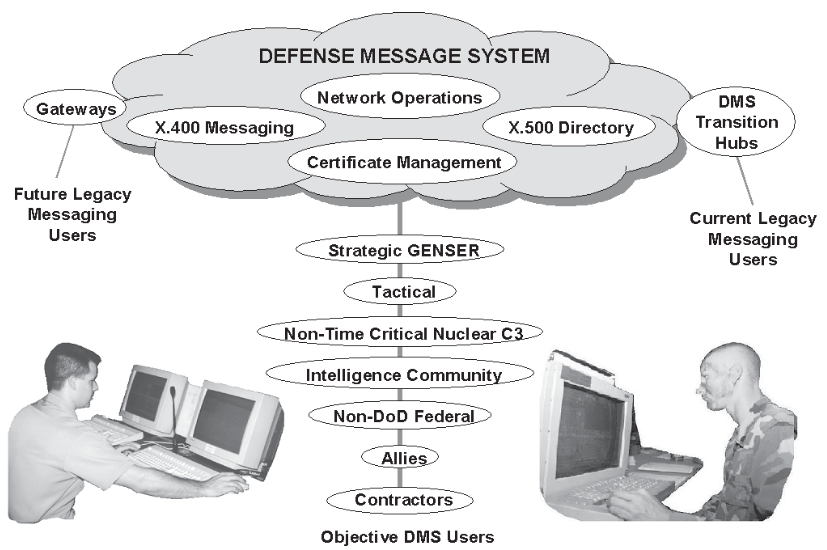
The operational assessment (OA) of the Automated Message Handling System (AMHS) DMS outbound capability, a capability required by several Combatant Commands, was in June 2003.

The Joint Interoperability Certification (JIC) test for DMS-deployed (DMS-D) (i.e., tactical DMS) during the Joint User Interoperability Communications Exercise was in August 2003.

OA for directory security enhancement (DSE) Phase I took place in August 2003.

TEST & EVALUATION ASSESSMENT

During the OT&E of the NC^3 EAM Hybrid Solution, test message injectors were able to send messages, but not all fixed and mobile platforms received or acknowledged receipt of the messages. For time-critical users, the messages were delivered in a timely manner, but that was not the case for the other users. Interfaces of the NC^3 EAM Hybrid



The Defense Message System enables anyone in DoD to exchange both classified and unclassified messages with anyone else in DoD using a secure, accountable, and reliable writer-to-reader messaging system.

Solution experienced difficulties operating with some of the legacy systems. Even though the NC^3 EAM Hybrid Solution does not employ Internet standards and is less vulnerable to attack, the security practices were weak and required improvement. The NC^3 community corrected the deficiencies in August 2003 and Joint Staff J3 authorized a six-month period of concurrent operations with the DTH legacy distribution alternative as the backup system. The DTHs will remain open for NC^3 traffic-only after September 30, 2003, until the successful completion of the six-month parallel operations.

The AMHS DMS outbound capability worked well during the OA. DOT&E did not identify any major deficiencies. The AMHS approach reflects the general trend for DMS organizational messaging to be from automated message center-to-automated message center rather than from writer-to-reader.

The Joint Interoperability Test Command (JITC) conducted the JIC test in August 2003 to obtain an interoperability certification for DMS-D to support an authority to operate as required by Chairman, Joint Chiefs of Staff Instruction 6212.01B (Interoperability and Supportability of National Security Systems and Information Technology Systems). This test was not a full OA or OT&E, but DOT&E followed it closely in order to clarify suspected operational suitability issues of DMS in the tactical environment. The test did not yield sufficient, repeatable results for the JITC to grant an interoperability certification.

The operators complained that DMS was difficult to set up and maintain. The set-up process is significant to the tactical community because this process is necessary every time a force deploys and redeploys in contrast to the strategic community, which incurs this process essentially only once for its largely fixed-site infrastructure. As a result of the failure of DMS-D in the JIC test, a second JIC test has been proposed to coincide with the DoD Interoperability Communications Exercise in the February-March 2004 timeframe. DOT&E's conclusion from the first JIC test is that the Services must train their operators more thoroughly and DMS procedures must be simplified in order to facilitate effective operations.

Following the successful OA for the DSE Phase I, the Defense Information Systems Agency recommended the DSE Phase I for fielding in September 2003. The IC requires DSE Phase II before fielding DMS, but Phase II will not be ready until CY04. The Test and Evaluation Master Plan requires future testing of DMS for DSE Phase II and for various maintenance releases and version upgrades for both the IC and DoD tactical community.

Defense Travel System (DTS)

The Defense Travel System (DTS) is a seamless, paperless, automated information system that is to reduce costs, support travel requirements, and provide superior customer service. DTS integrates commercial travel reservation systems and DoD accounting and disbursing systems via a virtual private government network to provide the traveler with an end-to-end travel process. The Program Director (PD) is developing DTS as an evolutionary acquisition using a spiral development process that will field the system in increments of increasing functionality. There are two phases, or blocks, of development. The initial focus (Block 1) is on Temporary Duty Travel. After fielding the Block 1 releases (named after U.S. Presidents), the focus will shift to developing the Permanent Change of Station travel releases (Block 2).

The travel process begins with the users accessing the DTS via a web portal to create and digitally sign travel requests based on real-time transportation, lodging, and rental car availability using interfaces to various commercial reservation systems. The user-generated travel authorization contains an estimate of the trip. DTS enforces compliance with DoD travel policies based on simplified entitlements using audit alerts. Once completed, the authorizations are routed to authorizing officials for approval via designated routing lists. When travel is concluded, the traveler prepares an on-line voucher that is validated through appropriate financial systems that generates the reimbursement.

The program manager installed early DTS prototype systems at various pilot sites a few years ago. In May 2002, the Assistant Secretary of Defense (Command, Control, Communications, and Intelligence) put DTS on OSD acquisition oversight and the Army Test and Evaluation Command (ATEC) was the lead Operational Test Agency. At that time, the Adams release, which had a client-server architecture, was already in use or soon to be installed at approximately 20 pilot sites. During 2002 and 2003, the PD developed a new release, called Jefferson, which is web-based. Based on feedback from the Adams users, the PD decided to make further enhancements to the Jefferson software before releasing it. The PD declared the improved release, called Enhanced Jefferson, ready for IOT&E in June 2003. Milestone C and a declaration of initial operational capability were reached in 1QFY04.

TEST & EVALUATION ACTIVITY

DOT&E approved the Test and Evaluation Master Plan and a detailed test plan in June 2003.

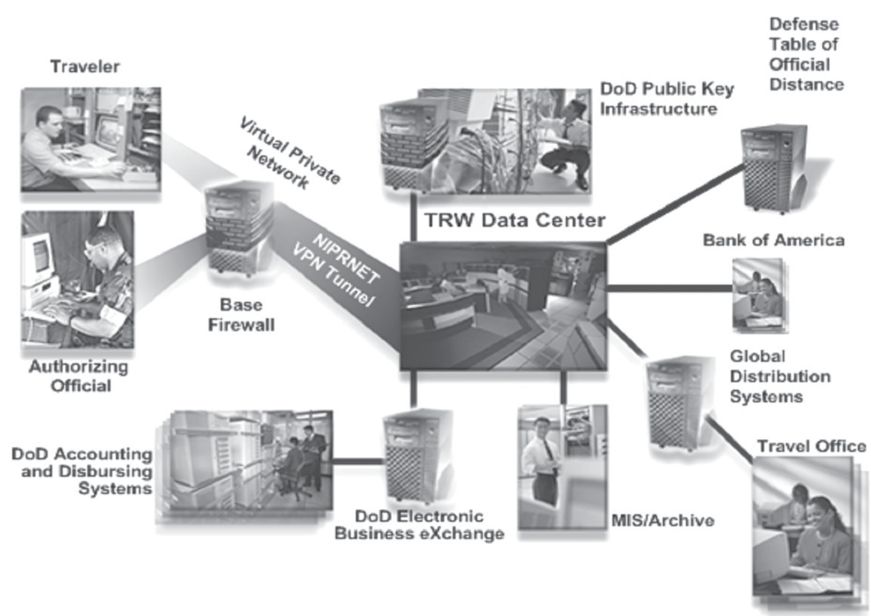
The PD completed developmental test and evaluation on Enhanced Jefferson in June 2003.

ATEC completed the first phases of initial operational testing on Enhanced Jefferson in July 2003.

ATEC conducted an in-field operational assessment on Enhanced Jefferson in July and August 2003.

TEST & EVALUATION ASSESSMENT

OT&E of a web-based system like DTS presents major challenges. The PD develops initial capabilities and subsequent enhancements in a contractor's development environment. However, once a new software release is made available to selected users for alpha testing, it must replace the previously fielded release completely. This is because



The Enhanced Jefferson release of Defense Travel System is operationally effective, operationally suitable, and survivable. However, some features (such as group travel) still require workarounds.

all users worldwide log on to a single web site in order to use the system. The web server exchanges information with multiple Defense Accounting and Disbursing Systems. Thus, while functionality can be tested in the development environment, the system must be fielded in order to be tested in the users' actual web-based environment. It cannot be fielded to a partial set of web-based users while other web-based users continue to use an older release.

To meet this challenge, ATEC developed a plan to conduct operational testing of the Enhanced Jefferson release in several phases. First, the operational testers visited several of the Adams release pilot sites to develop a baseline and learn more about DTS procedures. Next, they monitored the establishment of new pilot sites to evaluate installation and training. Once the PD completed developmental testing of the Enhanced Jefferson software, the operational testers brought in users from the field and conducted the initial phase of operational testing in a development environment using scripted scenarios. This allowed the operational testers to simulate all the required capabilities of the system without forcing the users to actually travel solely for the purpose of conducting the tests. Meanwhile, the PD pulled the Adams release from the web site, replacing it with Enhanced Jefferson. After the new release had been in use for one month, ATEC followed up with in-field surveys and interviews of users at selected locations to determine whether the system was performing the same in the field as it had in the development environment.

The Enhanced Jefferson release of DTS is operationally effective, operationally suitable, and survivable. However, some features (such as group travel) still require workarounds; the system needs to be made more intuitive to the user, and training needs improvement. DOT&E also notes that since DTS changes several business processes, it is more successful when vigorously implemented and supported by the using commands. Information received after the IOT&E indicated a possible deficiency in system security, but the PD appears to have corrected this problem almost as soon as it was found. The security fix has been validated by ATEC and DOT&E supports full fielding of Enhanced Jefferson while fixes and improvements are made to Madison, the next release.

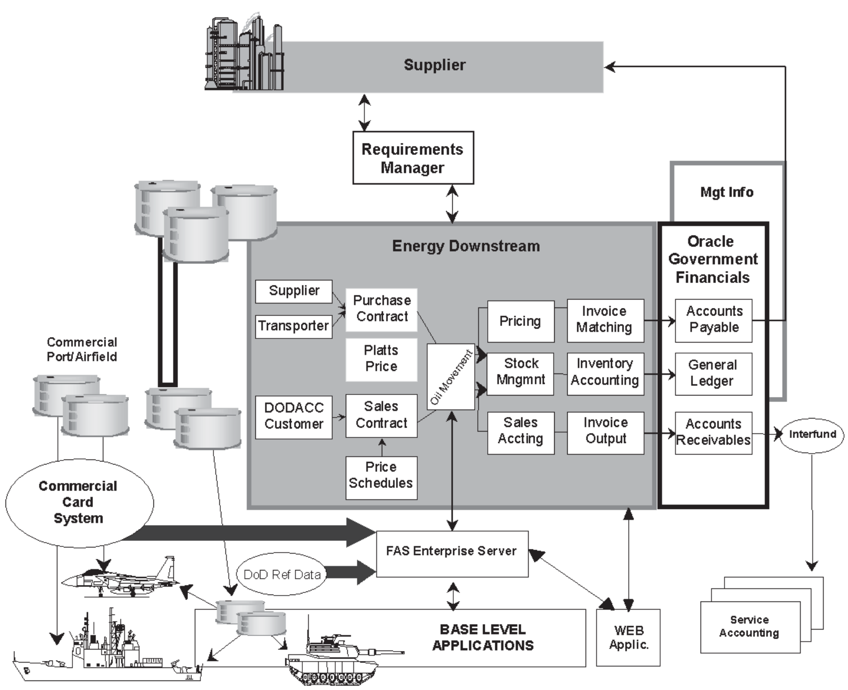
Fuels Automated System (FAS)

The Defense Logistics Agency initiated the Fuels Automated System (FAS) program in FY96 to provide an automated, integrated, and responsive system for managing DoD fuels. FAS is designed to improve fuel inventory and consumption management at the Defense Fuel Supply Points, integrate automatic tank gauging and automated leak detection capabilities, provide a mechanism for specialized customer support through tailored terminal interfaces, and promote real-time data processing.

FAS consists of base and enterprise levels. The base level system provides transaction data at the fuel distribution terminal, whereas the enterprise level system handles procurement, supply, and financial functions. The base level system consists of 400 commercial off-the-shelf (COTS) microcomputer servers and 1,300 COTS microcomputer workstations deployed to 600 Service and Defense Logistics Agency locations. The enterprise level system comprises two major components: Oracle Government Financials provides accounts payable, general ledger, and accounts receivable functions; and Oracle Energy Downstream (a COTS package that Oracle acquired from British Petroleum) manages fuels contracts; movements; inventories; and invoice matching.

Since the completion of the base level system in FY97, the FAS Program Management Office has turned its attention to the enterprise level system. Throughout FY98 and FY99, implementation of the enterprise level system was delayed because the vendor failed to incorporate all requirements for prompt payment and price escalation into the government layer of the financial applications. During FY00 and FY01, the FAS Program Management Office implemented changes in the FAS software, established information transfer capability between all FAS users, conducted FAS developmental test, and provided training to FAS users.

The Joint Interoperability Test Command (JITC) conducted the IOT&E for the first enterprise level release (bulk fuels) in August and September 2001. The IOT&E results indicated that FAS was operationally suitable, but not operationally effective. The mission performance and interoperability critical operational issues did not meet the requirements. DOT&E directed that JITC conduct a follow-on operational assessment (OA) to re-evaluate the deficient areas after they are rectified. JITC conducted the follow-on OA in December 2001. The OA results showed that most of the deficiencies have been improved or fixed, except the problems associated with system access and audit log capabilities. However, workarounds implemented during the OA met the users' needs and most users interviewed indicated they were satisfied with the progress made. In May 2002, FAS received full fielding approval for its bulk fuels release.



The Fuels Automated System provided adequate automated support to the materiel management of DoD fuel assets at the posts, camps, and stations.

TEST & EVALUATION ACTIVITY

DOT&E approved an updated FAS Test and Evaluation Master Plan (TEMP) in August 2003.

JITC conducted follow-on test and evaluation (FOT&E) for the second enterprise level release (Posts, Camps, and Stations) in August through October 2003, in accordance with a DOT&E-approved TEMP, primarily in Customer Organization Group 8, the

Northwestern United States. During the FOT&E, FAS operated in parallel with the legacy system, Defense Fuels Automated Management System, the system of record during the test period.

TEST & EVALUATION ASSESSMENT

The test results for the second enterprise level release revealed that FAS provided adequate automated support to the materiel management of DoD fuel assets at the posts, camps, and stations. JITC was able to resolve four critical operational issues, including mission performance; interoperability; usability; and reliability, availability, and maintainability. However, the information assurance critical operational issue was not satisfactorily resolved. During the FOT&E, JITC noted many deficiencies in accordance with the recently released DoD Instruction 8500.2 on information assurance. DOT&E immediately mandated the program manager develop an action plan to correct the deficiencies. The Defense Logistics Agency plans to merge FAS with the Business Systems Modernization program. The FAS program funding will remain independent of the Business Systems Modernization program until the end of FY04.

Global Command & Control System - Joint (GCCS-J)

The Global Command and Control System - Joint (GCCS-J) is the DoD joint command and control (C2) system of record for achieving the full spectrum dominance articulated in Joint Vision 2020 and is the foundation of the command, control, communications, computers, and intelligence (C4I) for the Warrior initiative. GCCS-J is a suite of mission applications that supports the Command authorities and subordinate elements in conducting synchronized operations from dispersed locations by providing joint C4I throughout all phases of conflict. GCCS-J provides many diverse capabilities, including operations planning and situation awareness. It fuses select C2 capabilities into a comprehensive, interoperable system by exchanging imagery, intelligence, status of forces, planning, and execution information.

To ensure GCCS-J effectively interoperates with the C2 systems of record, interoperability testing focuses on external interfaces. Testing is designed to measure completeness, accuracy, timeliness and usability of the actual exchange. Services variants interfaces with GCCS –J programs of record are characterized as follows:

Service Variant	GCCS-J Mission Area
GCCS-Army	Situational Awareness Force Planning
GCCS-Martime	Situational Awareness
GCCS-Air Force TBMCS DCAPES	Situational Awareness Intelligence Force Planning

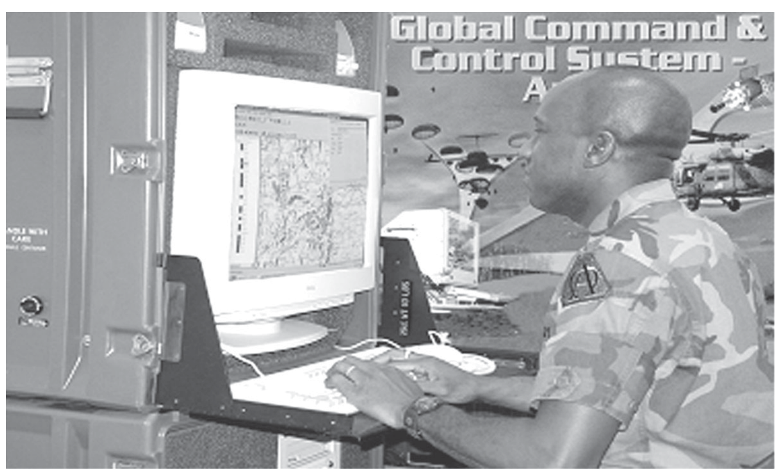
GCCS-J consists of a series of capability improvements fielded as spiral and incremental releases within evolutionary blocks. Each release supports evolving user requirements for new or enhanced functional capabilities. Current releases feature an adaptable and constantly improving client/server architecture using commercial software and hardware, open systems standards, government developed military planning software, web technology, and office automation.

TEST & EVALUATION ACTIVITY

GCCS-J software releases are tested in accordance with the DOT&E *Guidelines for Conducting Operational Test and Evaluation for Software-Intensive System Increments,* dated June 16, 2003.

The GCCS-J 3.6 combined developmental test/operational test in December 2002 was conducted primarily to test intelligence upgrades to support U.S. Central Command requirements. Four intelligence applications were added to the GCCS baseline. Minor upgrades were made to several other functional applications.

Five minor spiral releases only required developmental testing. GCCS-J 3.6.1 consisted of two security patches. GCCS-J 3.6.2 consisted primarily of security patches, bug fixes, and minor improvements particularly to the intelligence, JOPES, and COP portions of GCCS-J. GCCS-J 3.6.3 consisted primarily of security patches, minor improvements to the operating systems and DII Common Operating



Global Command & Control Sytems-Joint is a suite of mission applications that supports the Command authorities and subordinate elements in conducting synchronized operations from dispersed locations by providing joint C4I throughout all phases of conflict.

Environment, and improvements in Force planning. GCCS-J 3.6.4 contained more security patches, improvements to situational awareness, combat support services, an upgrade of the Global Status of Resources and Training System to maintain interoperability with the Navy readiness reporting system, and early initial fielding of the Readiness Assessment System Output Tool (RAS OT) that was originally planned for release in GCCS-J 4.0. GCCS-J 3.6.5 contained several new and/or upgraded Force projection capabilities including Adaptive Course of Action, Joint Operational Planning and Execution System (JOPES) Editing Tool, Transitional Interface to External Systems, and prepositions two segments (Netscape 7 and Go-Global) that will enable user access to the JOPES strategic servers when they become available. These upgrades were key to reducing risk for major release 4.0. GCCS-J 3.6.5 also contained upgrades to intelligence applications, added more security enhancements, and introduced the Defense Messaging System client to the user community. Risk is low for all five minor releases, and developmental testing with user participation was deemed adequate for fielding. The Operational Test Agency (OTA) had sufficient insight into the developmental testing.

GCCS 4.0 introduces a new version of an operating system, database management system, and the new version of the JOPES. To reduce risk and expedite the release of the critical new warfighter capability of JOPES, the GCCS-J Program Manager decided to split the GCCS-J 4.0 release, thereby allowing earlier fielding of JOPES. Both halves will require a major OT&E effort, and each will also undergo a major risk reduction test (RRT) prior to entering OT&E. The RRT for JOPES was conducted in late September and early October 2003 with all combatant commands and most Service components actively participating. Operational test for JOPES could occur in January 2004. The second RRT for infrastructure upgrades, COP, and intelligence applications will be conducted in February 2004, with subsequent operational testing planned for May/June 2004.

TEST & EVALUATION ASSESSMENT

Continued execution of the recommendations reported in 2002 remains important to ensuring smooth operational assessment of GCCS-J. DOT&E has worked closely with both the GCCS-J Program Management Office (PMO) and Joint Interoperability Test Command to ensure test readiness and adequacy. The PMO is successfully working to reduce risk on the program.

The effectiveness of GCCS-J 3.6 was satisfactorily demonstrated with no critical impact statements. Some suitability aspects of GCCS-J 3.6 could not be fully assessed due to the lack of subject matter experts and lack of user training prior to testing. The five minor releases were all adequately and successfully tested prior to fielding. Functionality originally scheduled for GCCS 4.0 has been tested and delivered early to meet warfighter needs for Operation Iraqi Freedom, thereby reducing the risk for the GCCS 4.0 release. GCCS-J 3.6.5 upgrades are also proving critical in reducing risk during the significant 4.0 testing effort by pre-positioning client software that will make the operational implementation of the new JOPES capability much less complex, and enabling the 4.0 testing to focus on the new JOPES and Status of Resources Training System server software. The RRT for JOPES was the largest test since Y2K upgrades. It involved all combatant commands and most components and has proven crucial to Defense Information Systems Agency and the OTA in preparing for the JOPES operational test effort. The combatant commands were instrumental in developing test scenarios, and most scenarios will require very little modification for the JOPES operational test. Because operational testing for GCCS-J cannot impact the operational system, the RRT for GCCS-J 4.0 has been instrumental in identifying test peculiarities associated with testing separately from the live system but yet in an operationally representative environment. RRT results for the JOPES test have been very positive and have served very well to reduce the risk for the upcoming JOPES operational testing.

Future success will require continued managing of the GCCS-J 4.0 increment and Block V releases to an acceptable level of risk, which means appropriate developmental testing, OTA insight and observation of developmental testing, and bringing capability to operational test only when ready.

Global Information Grid - Bandwidth Expansion (GIG-BE)

The Global Information Grid - Bandwidth Expansion (GIG-BE) Program is a foundational DoD net-centric transformational initiative. GIG-BE will create a ubiquitous "bandwidth-available" environment to improve national security intelligence, surveillance and reconnaissance, and command and control information sharing. The program will provide increased bandwidth and diverse physical access to approximately 100 critical sites in the continental United States, Pacific, and European Theaters.

GIG-BE will provide a secure, robust, optical terrestrial network that delivers very high-speed classified and unclassified Internet Protocol (IP) services to key operating locations worldwide. The high-capacity, 800 Gigabits per second backbone employs commercial fiber optical transmission and optical switching technology. The GIG-BE is as secure and survivable as the sites it serves. As encryption technology under development matures, GIG-BE will route traffic in 10-Gigabit per second bands, and as new IP devices mature, the GIG-BE will become a high-speed IP network. By essentially eliminating bandwidth communication limitations, GIG-BE is one of the transformational communications technologies for DoD. Implementation is scheduled to begin in mid-FY04 and extend through FY05.

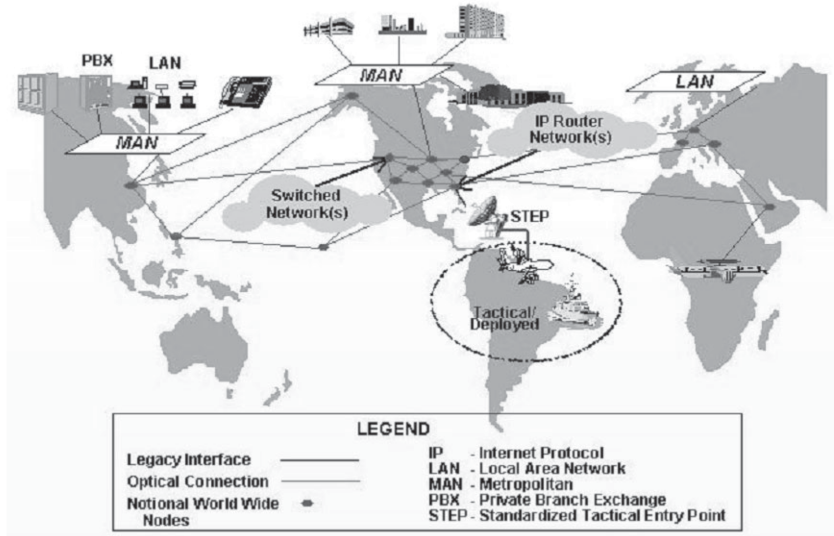
TEST & EVALUATION ACTIVITY

DOT&E approved a fully coordinated GIG-BE Test and Evaluation Master Plan in July 2003 that co-evolved with the Acquisition Strategy and the refinement of requirements and associated criteria led by the Joint Staff/J-6 User Representative. The GIG-BE Test and Evaluation Master Plan outlines a five-phase test strategy. Phase 1 covers a preliminary evaluation of hardware stability and an Equipment Integration Evaluation prior to equipment contract award in December 2003. Phase 2 focuses on Interoperability Certification for the specified interfaces, as well as Component Security Tests and Element Management Tests. Phase 3 supports Installation and Acceptance Testing, operational assessments, and final interoperability certification. Phase 4 encompasses the IOT&E that supports GIG-BE Initial Operational Capability (IOC). Phase 5 contains all follow-on testing to include Security Test and Evaluation for final accreditation in support of the final operational capability (FOC) declaration.

The Operational Test Agency, Joint Interoperability Test Command, is preparing to observe industrial laboratory Equipment Integration and Evaluation testing (Phase 1), to conduct operational assessments at each of the first six field sites (Phase 3), and to execute an IOT&E on a network among those six sites in September 2004 (Phase 4).

TEST & EVALUATION ASSESSMENT

Since the GIG-BE employs mature commercial telecommunications technology, commercial contractors will integrate the architecture and test its functionality in a commercial industrial laboratory. The principal challenges are to implement security up to the highest levels within the constraints of the underlying commercial technology, to integrate existing Defense Information System Network management with the GIG-BE, to anticipate and test all critical user needs, and to establish a baseline network that can evolve as new encryption and IP technology matures. An IOT&E in FY04 of the GIG-BE IOC requires sufficient integration of the architecture and installation at test sites



The Global Information Grid - Bandwidth Expansion will create a ubiquitous "bandwidth-available" environment to improve national security information sharing.

with user traffic to evaluate those operational requirements applicable to the IOC network. An OT&E in FY05 of the FOC will evaluate all operational requirements on the GIG-BE's complete network configuration (within and outside the United States). The GIG-BE critical functional capabilities required to support users must be anticipated, exercised, and tested in the developmental laboratory environment or later as stand-alone tests at the various field sites. An existing challenge for the operational tester is identification of user traffic needs for GIG-BE at each site in time to support the scheduled IOT&E in September 2004.

Additional concerns being addressed through developer-tester-user forums include: the ability to evaluate critical survivability and network management capabilities prior to site installation as these may not be implemented until the FOC network is in place; identification of security features and testing of them in representative operational environments; and the ability to assess effectiveness and suitability with representative user traffic and functions during the IOT&E.

Joint Biological Agent Identification and Diagnosis System (JBAIDS)

The Joint Biological Agent Identification and Diagnostic System (JBAIDS) is intended to be a reusable, portable, modifiable, biological agent identification and diagnostic system capable of identifying multiple biological agents of operational concern and other pathogens of clinical significance in clinical specimens and environmental samples. JBAIDS is intended to be used by military clinicians and other trained personnel to screen for biological agents given such factors as known or suspected threat agents and geographical endemic diseases. The system will consist of an identification instrument based on polymerase chain reaction technology, a laptop computer with software, a storage/shipping case, assay test kits, support equipment, and other laboratory consumables. JBAIDS will be used at forward deployable medical treatment facilities, area and theater medical laboratories, laboratories and clinics on ships, and at high threat fixed sites.

The JBAIDS program is divided into three developmental blocks in order to expedite procurement and fielding while reducing technical risk. Block I will use commercial-off-the-shelf technology capable of identifying 10-20 biological warfare agents within 40 minutes after completion of the test sample extraction process from either a clinical or environmental sample. Initial fielding of the Block I and II systems is not contingent upon approval from the Food and Drug Administration (FDA). Therefore, prior to FDA approval, clinical results must be confirmed using established diagnostic methods. The FDA approval process will be initiated during Block I and will continue throughout the development process for all blocks. There are already several versions of polymerase chain reaction technology in use by the Services. A Block I goal is to standardize on a single system for all Services. Block II will add toxins to its target list of warfare agents. Block III will involve a newly developed hand-held unit with a capability to identify 50-70 agents with automated sample preparation and be able to be used by non-medical personnel. Block III is intended to be an FDA approved diagnostics device. Block III will interface with the Joint Warning and Reporting Network and medical patients' records/medical surveillance systems.

JBAIDS is an Acquisition Category III program. The Operational Requirements Document (ORD) was approved on May 3, 2003. A Milestone B decision occurred on September 25, 2003, and a contract award for production of the Block I system on September 29, 2003.

TEST & EVALUATION ACTIVITY

During August 2002, the West Desert Test Center (WDTC) at U.S. Army Dugway Proving Grounds, Utah, conducted a competitive test of candidates for the JBAIDS system. Seven systems were challenged to exhibit their ability to identify inactivated agents of biological origin. Two inactivated agents of biological origin, diluted in defibrinated sheep blood, were used: *Bacillus anthracis* (Ames Strain) and vaccinia virus. The program manager evaluated three areas: system performance, physical characteristics (e.g., size, weight) and other subjective factors such as reliability, ease of operation, and expandability.

The Test and Evaluation Master Plan was approved by DOT&E on September 26, 2003. The IOT&E is currently planned for FY04.

The Joint Biological Agent Identification and Diagnostic System is intended for use by military clinicians and other trained personnel to screen for biological agents given such factors as known or suspected threat agents and geographical endemic diseases.

TEST & EVALUATION ASSESSMENT

The results of the competitive test indicate that technology exists to meet the sensitivity and specificity goals of detecting biological agents of interest. Two of the systems passed the defined criteria and were taken into source selection.

IOT&E must address all target biological agents in appropriate matrices using inactivated threat representative agents. Assay performance will be assessed using assumptions that performance levels are independent of sample matrices. The applicability and timeliness of JBAIDS reporting information must be sufficient to support decision-makers and mission performance

Joint Biological Point Detection System (JBPDS)

The Joint Biological Point Detection System (JBPDS) is to provide early warning and identification of biological warfare agents to supported forces. It will provide biological agent point-detection, identification, and sampling capability for both fixed-site and mobile operations. The system is to automatically detect and identify up to ten agents simultaneously in less than 15 minutes.

The JBPDS is intended to be man-portable or installed onboard ships, in shelters mounted on high-mobility multipurpose wheeled vehicle -heavy variants, or on trailers. The capabilities of each configuration are common and will eventually be used by each of the Services. JBPDS will be integrated into the Joint Services Light Nuclear, Biological, and Chemical Reconnaissance System. The Army will incorporate JBPDS into the Stryker Reconnaissance Vehicle. The Army fielded the JBPDS to the 375th Biological Detection Company during FY03, and the Air Force plans to field it in FY04.

In December 1996, the Joint Program Manager for Biological Defense approved the Milestone II decision for JBPDS, and the system transitioned into the engineering and manufacturing development phase. DOT&E placed the JBPDS on oversight in January 2000.

In February 2002, the Army requested an urgent fielding of the JBPDS shelter variant to upgrade the 310th Chemical Company and in April 2002, requested urgent fielding of the JBPDS for the 375th Chemical Company due to the heightened threat to deployed forces. In April 2002, the Air Force also requested an urgent fielding, identifying the deployment of a trailer variant for high-threat air bases in Europe.

TEST & EVALUATION ACTIVITY

Because of these urgent needs, and similar operational commitments from other Services, the Program Manager accelerated the schedule for low-rate initial production and adopted a six-phase IOT&E. DOT&E approved the test plan and the Army conducted Phase I at Dugway Proving Grounds, Utah, for the shelter variant from September-November 2002. DOT&E approved the Test and Evaluation Master Plan on January 13, 2003. Data from Phase II of the IOT&E, scheduled at Eglin Air Force Base, Florida, for November-December 2003, will be used to support the Air Force urgent need. Phase III, run concurrently with Phase II, is a cold weather operational test at McKinley Laboratory, Eglin Air Force Base. Phase IV, scheduled for January-April 2004, will be the Navy's test onboard a ship. Phase V will be a follow-on test for the Army to confirm that changes made as a result of Phase I have not degraded the performance of the JBPDS. For testing efficiency, one portion of Phase V will occur concurrently with the Air Force Phase II and Phase III testing at Eglin while a second portion of the Phase V testing will take place at McClellan, Alabama, in conjunction with a training exercise. Phase VI is planned to repeat the first three phases with production articles if necessary.

TEST & EVALUATION ASSESSMENT

The Army shelter variant testing Phase I results showed system improvement in detection and identification, but an increase in false positives. Weather conditions limited the release of some of the simulants. The system did not meet the requirement for mean time between operational failure (54 hrs vs. 144 hrs). Lack of headquarters and Corps nuclear, biological, and chemical analysis cells precluded command, control, and reporting procedures to be adequately tested and evaluated. Because of these issues, Phase V will address system suitability, effectiveness, and command and control interoperability.

An adequate end-to-end evaluation of the Joint Biological Point Detection System will be based on the performance of the whole system tested in a chamber against live biological warfare agents.

Additional developmental component-level testing of biological warfare agents is underway with aerosol challenges against the biological aerosol warning sensor and liquid-injection challenges against the assay identifier. These tests will be used to establish a tentative correlation between live biological warfare agents and their simulants used for IOT&E field releases. The biological aerosol warning sensor and assay identifier– as components– do not represent the whole system. An adequate end-to-end evaluation of the JBPDS will be based on the performance of the whole system tested in a chamber against live biological warfare agents. The whole system test will consist of a sample collection and include its transportation and delivery to a theater medical laboratory for analysis. It was requested that the West Desert Test Center conduct a feasibility study to accomplish whole-system live-agent testing and the risks associated with the development, construction, operation, and maintenance of this facility. The National Research Council of the National Academy of Sciences were requested to validate the solution proposed by the West Desert Test Center.

Adequate whole-system testing will be the basis for characterizing JBPDS biological warfare and simulant detection performance before a full-rate production decision.

Joint Biological Standoff Detection System (JBSDS) Block I

The Joint Biological Standoff Detection System (JBSDS) Block I is an interim joint biological standoff detection program intended to provide early warning of a biological agent attack. The Army and Air Force will deploy the system at fixed sites or mount the system on vehicle platforms such as the high-mobility multipurpose wheeled vehicle. Block I is to be capable of detecting biological aerosol clouds at distances up to five kilometers; be capable of ranging and tracking aerosol clouds; and be able to discriminate clouds of biological origin from all other clouds. The system is not intended to identify the specific biological content of a cloud; this must be done by an air sampling point detection system.

The Block I development and production phase consists of the development, integration, testing, manufacture, and fielding of the JBSDS for two Services, the Army and the Air Force. The program has developed two different prototypes and will select one design during system design and development. The Army and Air Force are to be able to employ the Block I system at a limited number of sites. An operator will relay the system's output to a command location. A Block II system is intended to be employed by all Services, to be fully interoperable, and to have increased detector sensitivity and range. Block II's communications, cloud tracking, and analysis will be fully automated. Additionally, Block II will have improved mobility capabilities, and will be mounted on reconnaissance vehicles.

In December 2000, the Project Manager awarded a contract to build a rugged infrared, ultra-violet, portable digital-fluorescence and aerosol laser imaging detection and ranging sensor for standoff detection and identification of biological-agent aerosols. The JBSDS program then added another contractor to the concept development effort. By March of 2003, both firms had matured the technology and system to Technology Readiness Level 6 and had built engineering prototypes ready for a competitive evaluation. The acquisition objective is 24 systems. Milestone B occurred on September 9, 2003.

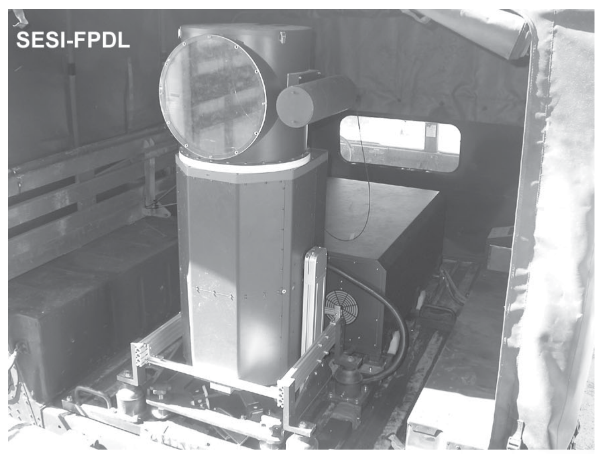
TEST AND EVALUATION ACTIVITY

In June 2003, JBSDS Block I Production Qualification Test was conducted in the form of a competitive shoot-off. The shoot-off provided technical data that will be used in the selection of one contractor for low-rate initial production of six systems. The full-rate production will include the refurbishment of the six low-rate initial production systems and an additional 18 systems.

The Production Qualification Tests included multiple releases of both simulants and killed biological agents at Dugway Proving Ground, Utah. The releases were made in the standoff Ambient Breeze Tunnel and on the open test grid. Following the Dugway activity, there was a series of false alarm tests conducted at the Philadelphia Navy Yard.

TEST AND EVALUATION ASSESSMENT

The IOT&E budget for Block I is fully funded. The JBSDS program needs an additional $4.8M in production funds to execute the FY04 program. This funding requirement was addressed by an unfunded requirement submission. If that fails, the requirement will be supplemented by a diversion of JBSDS Block II RDT&E money. This diversion would assure Block I development, but delay Block II development.



The shoot-off provided technical data that will be used in the selection of one contractor for low-rate initial production of six systems.

Test planning appears adequate; however some questions remain regarding the correlation of simulants to live agents. This correlation is under study at Sandia National Laboratory. One of the concerns with the JBSDS program is whether live biological agents can be adequately represented by gamma-radiated biological agents or by other non-lethal simulants.

Joint Chemical Agent Detector (JCAD)

The Joint Chemical Agent Detector (JCAD) is a hand-held device intended to automatically detect, identify, quantify, and warn users of the presence of nerve, blister, and blood chemical agents. JCAD will be fastened to the operator's load-bearing equipment or mounted on a ground vehicle, aircraft, or ship. JCAD is used as a mobile and fixed-site monitor, as well as a quick-responding survey instrument. JCAD's ability to detect extremely low levels of agent concentration will be used in shelter and aircraft operations. The system operates as a stand-alone detector, as part of a small local network of other JCAD units, or can interface with the Joint Warning and Reporting Network as part of a larger network of biological and chemical detectors.

JCAD's hardware consists of the main detector unit (DU); an accessory for extending the limit of the DU (named the Preconcentrator); and an interface cradle that connects the DU with external power, external alarms, and other DUs to form a local network. All Services will use one basic DU configuration. JCAD will replace or augment existing Service-unique chemical agent detectors.

The Air Force is JCAD's lead Service material developer, while the Army is the lead Service developmental and operational tester and evaluator. A combined Milestone I/II decision in December 1997 allowed JCAD to enter into Engineering and Manufacturing Development (EMD). Phase I of the EMD contract was awarded to BAE Systems in February 1998 and the Phase II contract option was exercised in April 1999. DOT&E placed JCAD on oversight in January 2000.

DOT&E approved the updated Operational Requirements Document in March 2002. Due to problems in the development of the Preconcentrator accessory, there will be a separate Milestone C review and IOT&E for the UD and accessory unit. The current schedule calls for the DU Milestone C in June 2004 and IOT&E beginning in 2QFY05. The Preconcentrator accessory scheduling is still in formulation. The Test and Evaluation Master Plan is currently being staffed through the Services.

TEST & EVALUATION ACTIVITY

During FY03, several portions of the JCAD's Production Qualification Test (PQT) program were completed and the program office prepared for the live agent portion of PQT. The Army completed both cold region and tropical region operation and storage testing, and the contractor modified the JCAD's design based on the lessons learned. In addition, the program office and contractor executed several field tests to better characterize the JCAD's false alarm rate. Portions of this testing may have to be repeated due to extensive software revisions to JCAD's DU.

Operation Iraqi Freedom, limited the number of Service personnel available to conduct the scheduled Limited User Test. This test was intended to provide the developers with more operational effectiveness and mission impact insights for reliability, availability, and maintainability data in advance of the IOT&E. To gather additional data in these areas, the program office enhanced and lengthened the cold region and tropical region developmental testing. In addition, the program office approved a Field Simulant Test program to be conducted during FY04 in parallel with the PQT live agent chamber testing.

Joint Chemical Agent Detector is a hand-held device intended to automatically detect, identify, quantify, and warn users of the presence of chemical agents that will detect extremely low levels of agent concentration.

TEST & EVALUATION ASSESSMENT

DOT&E, the Air Force Operational Test and Evaluation Center, and the Navy Operational Test and Evaluation Force have all expressed to the program office the concern that the planned developmental testing will be insufficient to adequately evaluate the JCAD's effectiveness and suitability for aircraft operations. These issues include aircraft integration, operations under reduced atmospheric pressure conditions, agent detection, power requirements, aircraft employment concepts, training, and system logistics. The PQT plan provides for a robust set of agent and interferent (ie fog, smoke, blowing dust, etc.) challenges to the JCAD, including weapons-grade agent testing. Preliminary PQT data indicate that the JCAD is experiencing problems in detecting chemical agents at extremely low concentration levels. This must be corrected for JCAD to be operationally effective in aircraft, shelter, and other operations that require undiminished visual acuity.

Developmental test results indicate the JCAD has an unacceptably high false alarm rate, particularly when exposed to insect repellent and Aqueous Film Forming Foam (AFFF). AFFF is commonly used as a fire extinguishing agent on Navy ships, as well as in Air Force aircraft fire bottles, hangars, runways, and ramps. Recent developmental testing appears to establish a correlation between aircraft in-flight pressure changes and false alarms. The contractor is attempting to resolve the false alarm issue by refining the JCAD's DU detection algorithm. Additional field testing is scheduled for FY04 to determine the success in addressing this issue.

The JCAD's Preconcentrator accessory unit experienced software and hardware problems. The unit performs erratically in high and low temperatures and causes the DU to go into failure mode when the unit is removed from, and then reinserted into, the interface cradle. Glass shards from the interior of the Preconcentrator can enter the DU and interfere with its detection of chemical agents. DU live agent PQT continues while the contractor develops and implements a solution for the Preconcentrator problems. Once the Preconcentrator is fixed, the program office will have to conduct live agent regression testing and additional operational testing on the Preconcentrator-equipped DU.

The contractor examination of JCAD units previously used in developmental testing indicates that the surface acoustic wave (SAW) array service life will be approximately 1,100 hours of operation, which is considerably less than previous estimates. The program office will add a PQT service life subtest to better estimate service life. The contractor assessment also indicates that the SAW array might have to be replaced once the unit has been exposed to chemical agents more than eighty times. This would have a negative impact on several projected Service uses for the JCAD, including screening of vehicles and personnel during decontamination operations. It would also place a burden on Service logistics and maintenance systems. The contractor is exploring ways of allowing the JCAD's operator or unit maintenance personnel to more easily replace the detector array without requiring depot-level maintenance.

From the aspect of JCAD response, agent-simulant correlation testing has identified Triethyl Phosphate (TEP) as the most desirable simulant. The Navy determined that TEP is not currently safe for use on ships and a different simulant is required.

Joint Service Light Nuclear, Biological, and Chemical Reconnaissance System (JSLNBCRS)

The Joint Services Light Nuclear, Biological, and Chemical Reconnaissance System (JSLNBCRS) is a mobile system intended to detect and report nuclear, biological, and chemical (NBC) hazards on the battlefield. The JSLNBCRS consists of a base vehicle equipped with hand-held and vehicle-mounted NBC detection and identification equipment. The JSLNBCRS detectors are intended to detect, sample, and identify known NBC agents, as well as toxic industrial materials. The communications suite will format and transmit analog and digital NBC reports in accordance with the NBC Warning and Reporting System to provide NBC contamination predictions and warnings to battlefield commanders. The system is capable of marking contaminated areas, using standardized NATO hazard markers. Local meteorological and navigation information is provided by onboard meteorological and global positioning systems. Two base vehicles are planned: the High-Mobility Multipurpose Wheeled Vehicle (HMMWV) for the Army, Air Force, and Marine Corps and the Light Armored Vehicle for the Marine Corps.

The JSLNBCRS provides new sensors and information dissemination systems to detect chemical or biological attack at extended standoff ranges and provide warning to affected units. JSLNBCRS will be employed in forward combat areas and integrated into NBC reconnaissance, surveillance, monitoring, and survey plans to support combat operations. It will also be employed in rear areas to monitor main supply routes, logistics bases, airfields, ports, and key command and control centers for NBC hazards.

The JSLNBCRS is a Sentinel program under the Chemical Biological Defense (CBD) Program, with the Under Secretary of Defense for Acquisition, Technology, and Logistics as the Milestone Decision Authority and the Joint Program Executive Officer for CBD responsible for program management. The Milestone Decision Authority approved a two-phased low-rate initial production. The first phase consists of six systems, which will undergo first-article testing prior to production of the second phase of eight systems. These 14 JSLNCBRS systems will support multi-Service operational test and evaluation (MOT&E) in FY05.

TEST & EVALUATION ACTIVITY

The Army Test and Evaluation Command (ATEC) conducted an operational assessment (OA)/ limited user test (LUT) of the JSLNBCRS at Dugway Proving Ground, Utah, from September 23 to October 11, 2002. Three JSLNBCRS systems were tested performing route and area reconnaissance and surveillance missions representative of Air Force and Marine Corps airbase and field environments. The JSLNBCRS teams were challenged with chemical and biological warfare agent field simulants released from crop duster aircraft, ground agricultural sprayers, and helicopters to portray a threat environment.

TEST AND EVALUATION ASSESSMENT

The LUT/System Evaluation Plan (SEP) did not require a full-up operational representation of the command and control centers expected in the Air Force and Marine Corps scenarios. This limited the evaluation of how the NBC reports received from the reconnaissance vehicles benefited operational commanders. Threat release events were tailored to challenge whichever sensor was operational, which somewhat overstated sensor performance. Overall, the program did not provide adequate training to the Marines and Airmen for this test. ATEC will correct these test inadequacies prior to the MOT&E in FY05.

Both versions of the Joint Services Light Nuclear, Biological, and Chemical Reconnaissance System will be employed in forward combat areas and integrated into NBC reconnaissance, surveillance, monitoring, and survey plans to detect chemical or biological attack.

Because the OA/LUT began without planned key system integration and interoperability tests, the JSLNBCRS systems experienced numerous integration problems with the software, sensors, and connecting cables during the test. The new development sensors integrated with the JSLNBCRS – Chemical Biological Mass Spectrometer, Joint Biological Point Detection System, and Joint Service Lightweight Standoff Chemical Agent Detector (JSLSCAD) – performed poorly mainly due to immature sensors and software. As designs mature the performance of these sensors are expected to improve. However, because the JSLSCAD has not met its operational requirements, the Joint Program Executive Officer developed an alternative strategy to fulfill the standoff chemical agent detection requirement. The Milestone Decision Authority will decide whether the JSLNBCRS will integrate the current version of the JSLSCAD or an alternative within the next fiscal year.

Additional engineering and testing is required before commitment to the full number of low-rate initial production systems to support the MOT&E. Operational reliability, immature sensor integration, overpressure failures, insufficient power, excessive vehicle weight, safety, and human factors integration are key design issues that limit the system's effectiveness and suitability in an operational environment. An OA is scheduled for late FY04, using the test results of a first-article test to provide evidence that the critical deficiencies have been corrected before the MOT&E.

The Test and Evaluation Master Plan is currently being updated to reflect engineering and test plans to address these performance problems and to support an incremental approval for low-rate initial production systems for the MOT&E. The updated Test and Evaluation Master Plan must also address strategies to fulfill the standoff chemical agent detection requirement should the JSLSCAD not be available.

Joint Service Lightweight Standoff Chemical Agent Detector (JSLSCAD)

JSLSCAD is intended to be a passive detector of chemical agent vapors at ranges up to 5 kilometers and ultimately to 10 kilometers. It is intended to provide real-time detection of specific types of chemical warfare threats to U.S. forces at fixed sites and while on-the-move. This system will be installed in fixed locations for protection of facilities and installations such as air bases. The mobile configurations of JSLSCAD will be used on platforms such as ground vehicles and ships.

The JSLSCAD will have visual and audible indicators to display the chemical agent class (nerve, blister, and blood), and to indicate the azimuth and elevation (but not distance) of the detection. Detection and warning information may be entered automatically into Service command, control, communications, computers, and intelligence (C4I) systems, or the information may be reviewed and distributed manually. JSLSCAD is to be interoperable with the Joint Warning and Reporting Network when it becomes available.

JSLSCAD consists of four major components: scanner module, sensor electronics module, operator display unit, and power adapter. There are two configurations of the scanner module. The aerial applications scanner covers a 60-degree forward-looking cone and ground mobile, fixed-site, and shipboard configurations scan 360-degrees in azimuth and +50 to -10-degrees in elevation. The mobile configurations of JSLSCAD Block I will be used on platforms such as ground vehicles and ships. Aircraft configurations will be included in JSLSCAD Block II. The JSLSCAD Block I is intended to be integrated into the Joint Service Light Nuclear, Biological, and Chemical (NBC) Reconnaissance System (JSLNBCRS) and the Stryker-NBC Reconnaissance Vehicle, and will be employed at fixed sites such as air bases and aboard Navy landing ship docks (or equivalent aviation capable amphibious ships). JSLSCAD Block II is intended to be carried on Army and Navy helicopters, and outboard on selected Air Force C-130 aircraft. Present plans call for the JSLSCAD to be carried as an unmanned aerial vehicle payload, but the unmanned aerial vehicle to be used has not been selected.

The Joint Program Office for Chemical, Biological, Radiological, and Nuclear Defense approved the current operational requirements document in July 2003. JSLSCAD achieved Milestone II on September 17, 1996. The Test and Evaluation Master Plan (TEMP) for JSLSCAD was approved in 1997, before the system came under DOT&E oversight in January 2000. In August 2003, the Joint Program Executive Office for Chemical and Biological Defense decided to restructure the program, which required a revised TEMP.

This system will be installed in fixed locations to protect facilities and installations. The mobile configurations of the Joint Service Lightweight Standoff Chemical Agent Detector will be used on platforms such as ground vehicles and ships.

TEST & EVALUATION ACTIVITY

To investigate false alarm performance, the JSLSCAD was operated at Eglin Air Force Base, Florida; Philadelphia, Pennsylvania; and Wallops Island, Virginia; as well as in the agent chamber at Dugway Proving Ground, Utah. Developmental field testing with simulant releases in the open air were conducted at Dugway and over water at Dahlgren, Virginia. Other developmental tests included a laser glint vulnerability assessment at White Sands, New Mexico. The Program Manager terminated the desert storage test at Yuma, Arizona, because of the program restructuring.

TEST & EVALUATION ASSESSMENT

Developmental testing can be characterized as a test-fix-test process, and has resulted in the JSLSCAD Program Office's decision to restructure the program. The proposed strategy is to purchase a limited number of the current system for integration into the Stryker Reconnaissance Vehicle, the JSLNBCRS, and naval ships (fixed sites are also under consideration), and to purchase systems to meet the remainder of the requirement by a commercial buy. A test and evaluation strategy supporting this plan will be documented in the TEMP. The test strategy must include a protocol (such as that recommended by the National Research Council for passive infrared standoff detectors) that can provide confidence that JSLSCAD can detect and identify actual chemical warfare agents in a realistic environment at standoff distances. To implement the National Research Council recommendations, the developmental and operational evaluators require a signal-processing model, validated algorithm stimulator, background spectra, and an increased understanding of algorithm operations.

Test limitations in the multi-Service operational test and evaluation will include the use of simulants instead of actual agents. Although the chosen simulants approximate spectral or physical characteristics of agents, they do not match them. Current testing is intended to support the ability to correlate concentration levels of real chemical vapors to concentration levels of simulant vapors. Even if a good correlation could be determined, the details of the algorithm in the JSLSCAD must be changed to allow it to detect a simulant vapor, and hence there could be some question about the system's operational effectiveness on the battlefield. The implementation of the NRC recommendations in the test and evaluation strategy will increase the robustness of test and evaluation and mitigate this limitation.

Other test limitations include the simulation of agent delivery by explosive, line, and stack-release devices instead of actual weapons and a restricted network warning capability instead of a full-theater or joint task force C4I system. Achieving ideal delivery conditions during tests is difficult due to the uncertainties of weather and the desired effects of the atmospheric mixing layer dictate that releases are best made during pre-dawn hours, but this is the same challenge any threat force would face. The test site at Dugway, an isolated, desert location that does not represent military bases, cities, or many types of battlefields where JSLSCAD likely will be deployed, is a limitation. The Navy plans to conduct a test at sea and the Air Force plans to test the system at Eglin Air Force Base.

Joint Warning and Reporting Network (JWARN)

The Joint Warning and Reporting Network (JWARN) is a standardized software application intended to provide nuclear, biological, and chemical (NBC) warning and reporting, downwind hazard prediction, operations planning, and NBC management capabilities for Joint Forces, from battalion to theater-level command. JWARN will be located in the NBC Command and Control Centers and employed by NBC specialists and other designated personnel. Its primary functions are to report and warn Commanders and personnel of NBC attacks; perform analysis of NBC information and provide hazard predictions; support planning and assessments of NBC defense, including vulnerability assessments; and support sensor management including maintenance planning, configuration control, performance monitoring, and testing.

JWARN will be hosted on Joint and Service Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance (C4ISR) systems using the Defense Information Infrastructure Common Operating Environment common resources applications. JWARN C4ISR host systems include Global Command and Control System (GCCS), GCCS-Army, GCCS-Maritime, Intelligence Operations Server (IOS), the Theater Battle Management Core System (TBMCS), Maneuver Control System (MCS), Force XXI Battle Command, Brigade and Below (FBCB2), Advanced Field Artillery Tactical Data System (AFATDS), and Command and Control Personal Computer (C2PC). The JWARN will share information with command and control host databases and other DoD databases providing information on friendly and enemy forces, terrain, weather, and other combat information.

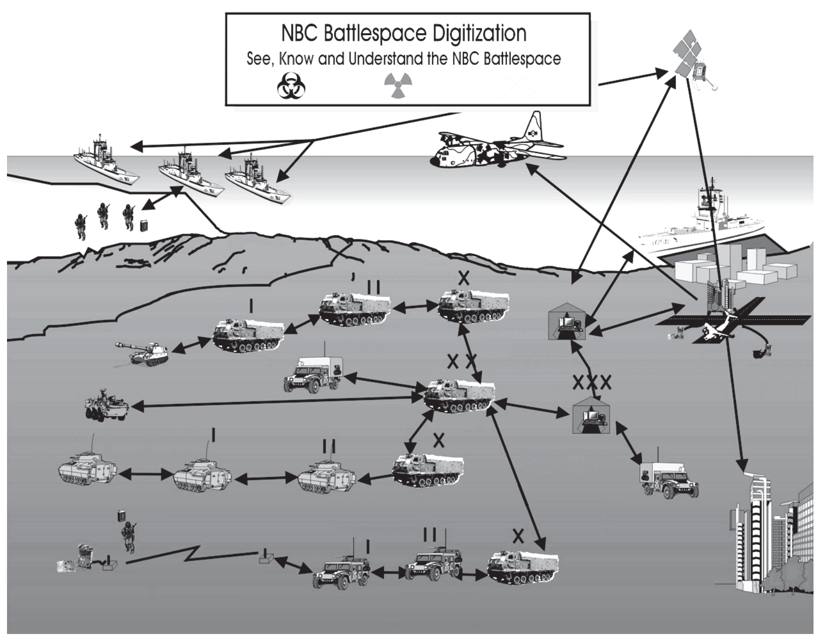
This system is intended to exchange information with legacy and new development NBC sensors. The JWARN Component Interface Device (JCID) allows the exchange of information between the NBC sensors and the JWARN application hosted on the C4ISR systems via Service-specific C4ISR communications architecture (e.g., radio, wire).

JWARN is being developed in three blocks. Block I is standalone NBC analysis software already fielded. Block II is mission software that will be hosted on the higher echelon command and control systems: GCCS, GCCS-M, GCCS-A, TBMCS, and IOS. Block III will be hosted on the same C4ISR platforms as Block II, plus C2PC, MCS, FBCB2, and AFATDS. The JCID interface links Block III to the NBC sensors for remote monitoring and control. Block III will be linked to the Joint Effects Model, which standardizes advanced hazard prediction and modeling and simulation for JWARN.

On July 11, 2003, the Under Secretary for Defense (Acquisition, Technology, and Logistics) approved the program for entry into the System Development and Demonstration phase and directed that an updated Acquisition Program Baseline and Acquisition Strategy be submitted for approval within 60 days. With that decision, the program management responsibility was changed from the Marine Corps Systems Command to the Space and Naval Warfare Command.

TEST & EVALUATION ACTIVITY

The DOT&E approved the Test and Evaluation Master Plan for JWARN Block II on June 23, 2003.



The Joint Warning and Reporting Network will share information with command and control host databases and other DoD databases providing information on friendly and enemy forces, terrain, weather, and other combat information.

TEST & EVALUATION ASSESSMENT

DOT&E provided the new Program Manager a test and evaluation concept paper and specific guidance for the Block III Test and Evaluation Master Plan. Timely warning and reporting within a systems-of-systems test with JWARN, the C4ISR networks, the JWARN JCID, the Joint Effects Model, and NBC sensors will be key in test planning during Block III.

Teleport

The DoD Teleport System will provide deployed Satellite Communications (SATCOM) users access to Defense Information System Network (DISN) services and will provide cross-banding between different SATCOM systems. The Teleport program was established to satisfy the communications requirements and objectives specified in the DISN Capstone Requirements Document. The DoD Teleport directly supports the DISN Capstone Requirements Document requirements of worldwide coverage and connectivity, interoperability, responsiveness, and technology insertion. The Teleport system will perform its mission from six teleport core facilities, (Northwest, Virginia; Ramstein/Landstuhl, Germany; Lago Patria, Italy; Fort Buckner, Japan; Wahiawa, Hawaii; and Camp Roberts, California), and will be operated by the local operations and maintenance command at each installation or facility.

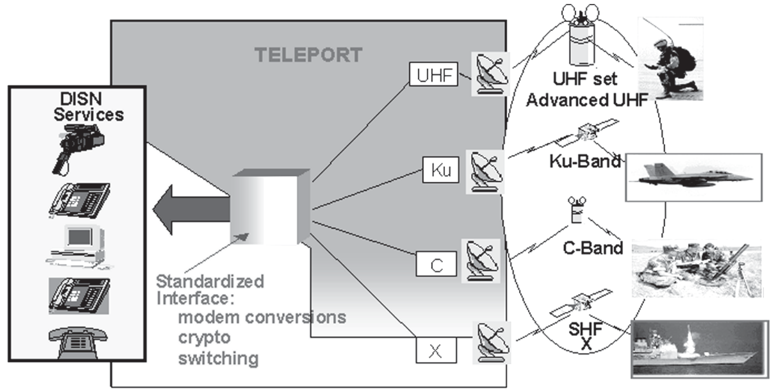
The Teleport fielding plan uses a spiral acquisition process for three generations of the Teleport System. Generation One Initial Operational Capability (IOC) 1, scheduled for 1QFY04, provides upgraded X-band, C-band, and Ku-band capabilities and capacities at existing Standardized Tactical Entry Point sites. Generation One IOC 2, scheduled for 3QFY04, provides Ultra High Frequency (UHF) capabilities. Generation Two, scheduled for completion during 4QFY05, incorporates Extremely High Frequency (EHF), L-band, and commercial/military Ka-band SATCOM capabilities, as well as High Frequency (HF) radio capability. Generation Three, Full Operational Capability, scheduled for 4QFY10, incorporates advanced Military SATCOM systems, including Advanced EHF and the Advanced Wideband System, into the Teleport design. The Defense Information Systems Agency is the lead agency for system development. The Joint Interoperability Test Command (JITC) is the lead operational test agency (OTA) for this program.

TEST & EVALUATION ACTIVITY

The Test and Evaluation Master Plan (TEMP) was initially written to support the Generation One program initiation at Milestone C. The primary focus of this version of the TEMP was the Operational Assessment (OA) supporting Milestone C and the IOT&E supporting the IOC 1 declaration. A TEMP update was approved July 2003, which supports Generation Two program initiation.

In support of Generation One program initiation, JITC performed an OA at the Northwest Interim Teleport during 2QFY02. The Northwest facility is one of the Standardized Tactical Entry Point sites selected as Engineering Development Model for the Teleport initial testing. An OA for EHF was conducted in 1QFY03 to support a Generation Two Milestone C decision for EHF long-lead items and a Milestone B for the remainder of the Generation Two program. The OA consisted of two major parts, a field demonstration using Marine EHF terminals at Camp Le Jeune, South Carolina, and Fort Bragg, North Carolina, to access DISN services, and observation of operational Navy EHF communications at the Naval Computer and Telecommunications Area Master Station Atlantic Area. Because the Navy was in the process of correcting several problems with the shipboard EHF terminal, the data collection for the OA will continue into the winter of 2003 to verify that these problems have been corrected.

During 4QFY03, JITC and the Service OTAs conducted the IOT&E at the Northwest Teleport facility in Virginia. The deployed users pulling services from the Northwest Teleport included one ship, five Air Force terminals, one Marine Corps terminal, and two terminals at JITC. During the three-week event, the deployed users exchanged five of the six DISN services over X-band, C-band, and Ku-bands, and demonstrated multiple hop, cross-banding and hub-spoke configurations. Availability of operational units was significantly limited by real world operations.



The Teleport program was established to satisfy the communications requirements and objectives specified in the DISN Capstone Requirements Document.

JITC will conduct a follow-on test and evaluation (FOT&E) in 3QFY04 to support the Generation One IOC 2 decision. There will then be a subsequent FOT&E to support Generation Two IOC in 4QFY05 and a FOT&E to support Generation Three in FY10.

TEST & EVALUATION ASSESSMENT

Generation One IOC 1 Capabilities. In support of IOC1, JITC conducted the IOT&E in conjunction with the Service OTAs. Although several critical operational issues were not fully resolved, the results that were obtained were positive and indicate that the Teleport program is on track toward delivery of an effective and suitable system. Because the program follows an evolutionary strategy for both acquisition and fielding, capabilities will be added and tested in future system increments. The Teleport demonstrated effectiveness in coverage and quality of service and an ability to connect to five of the six DISN services. There were no operational Joint Worldwide Intelligence Systems (JWICS) suites available to test the connectivity into the JWICS, but testers will observe operational connections of these suites through overseas teleports as a follow-up activity. Testers also were unable to observe all of the required management and control functions, so this will be deferred until follow-on testing in 3QFY04. A Red Team performed an Information Assurance assessment but results of this test have not yet been released. With the exception of interoperability using JWICS, the Generation One system met all suitability requirements.

Although the Generation One Teleport will be operational in 1QFY04 with commercial gateways to support Ku-band and C-band deployed users, the Navy will continue to use its own commercially leased gateways because the DoD Teleports will not give the Navy the assured C-band access they now have and require. Under the Teleport Concept of Operations, the Combatant Commanders (COCOM) specify the priority for access and usage of the Teleports, so the Navy could risk losing access to its leased transponders if a COCOM gave higher priority to another Teleport mission. The COCOMs need to work with the Navy and the Teleport Program Office to evolve a flexible strategy that effectively utilizes the DoD Teleport capabilities.

Generation Two Capabilities. The JITC conducted an OA of the proposed DoD Teleport's Generation Two capabilities in October 2002. The OA focused on providing DISN service access to deployed users over a Milstar EHF connection. During the field demonstration, deployed Marines at Camp Le Jeune used a SMART-T EHF satellite link with a SMART-T at Fort Bragg to place Defense Switched Network (DSN) phone calls and send unclassified-but-sensitive Internet Protocol Router Network (NIPRNET) and Secret Internet Protocol Router Network (SIPRNET) messages. The exchanges successfully provided proof of concept for accessing DISN services via EHF using the general architecture proposed for DoD Teleport. A similar exchange of DSN phone calls and electronic mail messages demonstrated the feasibility of cross-banding from super high frequency to EHF. To complement the field demonstration, JITC also observed operational NIPRNET and SIPRNET traffic at the Naval Computer and Telecommunications Area Master Station Atlantic Area. This confirmed that deployed users are already using EHF satellite links to access DISN services and provided an assessment of the Navy medium data rate appliqué terminal.

Theater Medical Information Program (TMIP)

The Theater Medical Information Program (TMIP) is a Tri-Service system that integrates information from existing medical information systems and provides it to deployed medical forces. TMIP supports all medical functional areas, including command and control, medical logistics, blood management, patient regulation and evacuation, medical threat/intelligence, health care delivery, manpower and training, medical capability assessment, and sustainment analysis. The Program Manager (PM) is developing TMIP in blocks of increasing functionality and integration. The Services fund their own infrastructure (networks and communications) and computer hardware to host the TMIP software in the theater environment.

TMIP Block 1 integrates information from existing medical systems such as the Composite Health Care System (CHCS), CHCS II, Defense Blood Standard System, and Defense Medical Logistics Standard Support. Future blocks will eventually integrate other medical applications that have been developed for use during deployment, such as the Transportation Command Regulating and the Command and Control Evacuation System. The Joint Requirements Oversight Council approved a Capstone Requirements Document in January 1999 and a TMIP Block 1 Operational Requirements Document (ORD) in October 2000. JROC revalidated the ORD in August 2001.

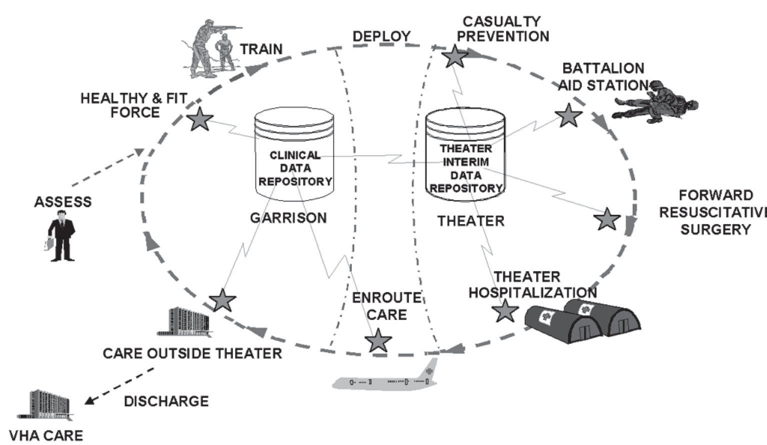
In March 2001, the Army Test and Evaluation Command (ATEC) conducted a limited user test on a prototype version of TMIP Block l at Fort Sam Houston, Texas, using the Army's TMIP hardware and infrastructure. ATEC determined that all of the features and capabilities that were available for testing were operationally effective, but these included only about half of those planned for the initial operational capability. TMIP successfully demonstrated limited administrative processing of patients, integration of CHCS, management of supply and equipment assemblages, and preparation of several Joint Task Force (JTF) reports. ATEC assessed the TMIP Block 1 prototype not suitable due to deficiencies in continuity of operations, security, and information assurance. There were also shortfalls in training and documentation. The PM continued to develop the software and in January 2003, the system achieved Block 1 Milestone C and Block 2 Milestone B.

TEST & EVALUATION ACTIVITY

In April 2001, DOT&E approved a Capstone Test and Evaluation Master Plan and an annex that addressed TMIP Block 1. DOT&E approved updated versions of these documents in October 2002.

All four Services conducted developmental testing in February and March 2003. ATEC performed continuous evaluation during the event, which included typical users at Diego Garcia; Brooks Air Force Base, Texas; and Norfolk, Virginia. Army TMIP equipment and users were not available, having been deployed to Kuwait. However, technicians at an Army laboratory site in Largo, Maryland, simulated Army users. The Joint Forces Command simulated a JTF headquarters at Portsmouth, Virginia. Testers and subject matter experts directed activities from a test operations center at Pacific Fleet headquarters in Pearl Harbor, Hawaii.

Testers conducted a follow-on developmental test from July 28 - August 1, 2003, from a test operations center in the Washington, D.C., area. Participants included Army users at Fort Gordon, Georgia; Air Force users at Brooks Air Force Base, Texas; Navy users



The Theater Medical Information Program is a tri-Service system that integrates information from existing medical information systems and provides it to deployed medical forces.

aboard two ships of the 7th Fleet; and Marine Corps users in Okinawa. The Joint Forces Command again simulated a JTF at Portsmouth, Virginia.

TEST & EVALUATION ASSESSMENT

TMIP must integrate several existing and developmental systems into a single system that can be easily used by theater commanders and medical personnel in combat environments. Its heavy dependence on the successful operation of the other systems presents additional technical challenges. The functional and operational testing of each TMIP application is supposed to occur prior to delivery to the TMIP PM for integration. This can impose a scheduling problem for TMIP since a delay in or problem with, any application can impact the delivery of that TMIP block. In the past, this and other factors resulted in schedule slippage, and there were difficulties in sharing data with the various applications. However, the system successfully completed Block 1 integration and independent software qualification testing in October 2002. In December 2002, the PM issued the joint TMIP software to the Services for training and developmental testing.

Developmental testing during 2003 showed that all of the planned TMIP Block 1 applications were working as designed and that required information from multiple sources could be received, processed, and displayed at JTF headquarters. The second round of developmental testing conducted in a simulated user environment showed that computer systems aboard Navy ships could be adapted to use TMIP and transmit medical information to a fleet headquarters and then forwarded to a JTF. Following the successful developmental testing, TMIP hardware and software were retained for real world use at a naval clinic in Diego Garcia, aboard two 7th Fleet ships, and at Pacific Fleet headquarters. Meanwhile, Army equipment with installed TMIP software remains in Kuwait, where it is available for real world use as required.

ATEC led the efforts to develop a comprehensive System Assessment Plan that focused its continuing operational evaluation during the joint developmental testing and will also guide future planning for OT&E. Independent operational testing was not practicable during FY03 due to the real world deployment of potential users during Operation Iraqi Freedom. The latest TMIP software release was available for developmental testing in November 2003. Among other things, this software release upgrades the TMIP operating system from Windows NT to Windows 2000®. While developmental testing is ongoing, planning for IOT&E continues.

Aerial Common Sensor (ACS)

The Aerial Common Sensor (ACS) is an Army reconnaissance, intelligence, and surveillance system. The system consists of four major components: the aircraft, the sensor payload, the data link, and the processing capabilities in an Army ground station. The aircraft will be a medium size jet aircraft that is capable of worldwide deployment, ready to fight anywhere on the globe within 72 hours. The sensor payloads consist of multi-intelligence (MULTI-INT) systems that include a mix of sensors for signals intelligence (SIGINT), including communications intelligence (COMINT) and electronic intelligence (ELINT), as well as imagery intelligence (IMINT) and electro-optical/infrared sensors. The IMINT sensors include synthetic aperture radar and moving target indicator radar modes. The data links include direct line-of-sight communications to ground stations within the theater of operations or satellite communications that can be used to send intelligence data back to a home station operations center within the United States or to a secure rear area. The Distributed Common Ground System-Army (DCGS-A) will serve as the ground station for the ACS aircraft. Much of the software required to process intelligence data from the ACS will be resident at the DCGS-A.

The ACS will replace the Army's current Guardrail Common Sensor and Aerial Reconnaissance Low aircraft. Both of these systems fall short in meeting the requirement for deployment to a distant battlefield in a timely manner in advance of, or with, early entry forces. The ACS is intended to provide timely and accurate detection, threat identification, target tracking, and precision geo-location of highly-mobile and moving targets. The ACS will support force protection, force maneuvers, targeting, and battle management operations.

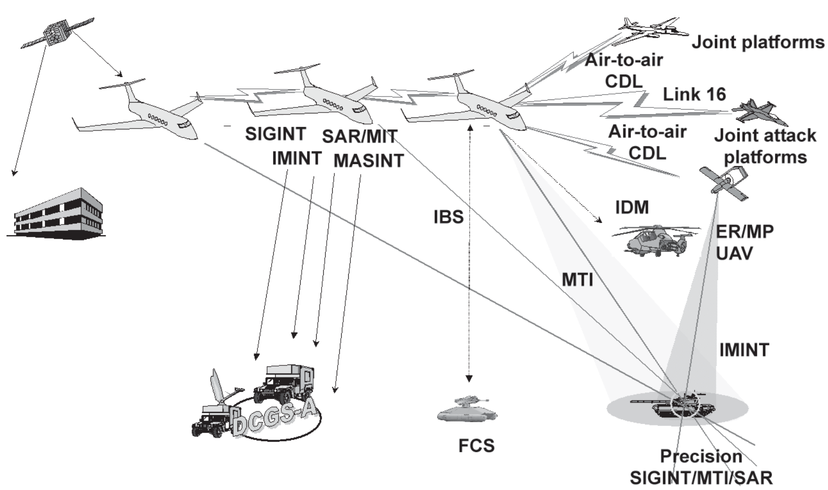
TEST & EVALUATION ACTIVITY

The ACS program completed a series of technology demonstrations in FY03. Two different contractor teams (Northrop Grumman and Lockheed Martin) participated in the technology demonstration phase. Each contractor team set up a series of demos in their systems integration labs that was used to reduce the risk to the SIGINT sensor design, MULTI-INT integration, and man-machine interface design. The contractors had to demonstrate their ability to meet key performance parameters and to demonstrate a mature system architecture. The government approved the plans for the demonstrations and then subsequently witnessed their execution. Data from this phase, along with other analyses, will be used to support a contract award in FY04.

The ACS program completed a Test and Evaluation Master Plan that lays out a robust test program. A series of developmental tests will verify that the ACS has achieved its technical performance goals, including airworthiness certification of the aircraft and performance specifications for the various sensors. Force developmental tests and experimentation will focus on developing and refining the tactics, techniques, and procedures required to operate the system. The operational test phase will assess the ability of the ACS to accomplish its MULTI-INT intelligence, surveillance, and reconnaissance missions in support of a range of different operations.

TEST & EVALUATION ASSESSMENT

The technology demonstration phase conducted in FY03 allowed the Army to assess the technology readiness level of the SIGINT and MULTI-INT portions of the ACS system. The technology was sufficiently mature to proceed to the system design and development phase. The demonstrations also provided the Army with valuable information in selecting a system contractor.



The Aerial Common Sensor is an Army reconnaissance, intelligence, and surveillance system.

Several issues will be of importance to the successful execution of the ACS program. The ACS calls for the MULTI-INT integration of COMINT, ELINT, IMINT, and electro-optic/infrared sensors onto a single aircraft. This integration will be complex and will have to overcome the potential co-site interference between the different sensors. Processing the data from the different sensors will also require a system architecture that can prosecute MULTI-INT missions at both the aircraft and at the DCGS-A ground station. A significant amount of processing will have to occur at the DCGS-A in order to complete many missions. The ACS will also need to be interoperable and integrated with joint Service networks to conduct joint operations with other Services.

There are concerns about the size, weight, and power requirements of the aircraft required to carry and operate the MULTI-INT sensor payload. Associated with this issue, there are concerns about the growth potential of the aircraft to add additional systems and capabilities in the future, consistent with the growth experienced with most other U.S. aircraft platforms.

AH-64D Longbow Apache & Longbow Hellfire Missile

The Army is remanufacturing and upgrading the AH-64A Apache helicopter into the AH-64D Longbow helicopter. The primary modifications to the Apache are the addition of a millimeter-wave Fire Control Radar (FCR) target acquisition system, the fire-and-forget Longbow Hellfire air-to-ground missile, upgraded T700-GE-701C engines, and a fully-integrated cockpit. In addition, the aircraft has improved survivability, communications, and navigation capabilities.

The Army is fielding the AH-64D in two configurations. The full-up AH-64D includes all of the improvements listed above. The other version of the AH-64D does not have the FCR, Radar Frequency Interferometer, or the improved engines. The AH-64D without FCR is more affordable, yet remains capable of employing Longbow Hellfire missiles autonomously or in cooperation with the FCR-equipped AH-64D. The Army acquisition strategy intends to upgrade 501 AH-64A Apaches in the fleet to the AH-64D configuration while only equipping approximately half (227) with the FCR.

The Army's plan to activate and field eight Longbow Apache battalions since fielding began in FY98 is on schedule. As aircraft are being fielded, configuration changes are being planned to improve system effectiveness, reliability, and survivability. The changes include a modernized target acquisition designation system (M-TADS), the possible integration of the Suite of Integrated Infrared Countermeasures (with a focus on the advanced flare dispenser and the advanced flares), and the integration of the internal auxiliary fuel system (IAFS) (a new crash-worthy and ballistically tolerant fuel tank and ammunition magazine located internal to the aircraft). DOT&E will continue to monitor development and testing of these, and other, configuration changes.

The Longbow Hellfire missile is a radar-guided version of the laser-guided Hellfire anti-tank, air-to-ground missile. The Army manages Longbow Hellfire missile as a separate program. The Longbow Hellfire features an active millimeter wave seeker and a dual tandem warhead designed to defeat reactive armor. Either the FCR or the Target Acquisition and Designation Sight can provide target location data to the missile prior to launch. The Longbow Hellfire can engage moving or stationary vehicles. The missile is being upgraded through the Home-on-Jam/Anti-Jam (HOJ/AJ) and Counter-Active Protection System (CAPS) programs. The HOJ/AJ upgrade is a software revision that changes the guidance logic to improve effectiveness against self-screening and standoff jammers. The CAPS upgrade includes hardware and software to provide active counter-countermeasures for the missile.

TEST & EVALUATION ACTIVITY

Testing on the IAFS during FY03 is complete. Concerns with the accuracy and adequacy of the performance tables found in the operator's manual for the AH-64D prompted the initiation of Airworthiness and Flight Characteristics (A&FC) testing of the AH-64D Longbow Apache in February 2002. A&FC testing continues and will require approximately 300 flight hours to complete. The Army anticipates completion of this testing in early FY04. The Army Aviation Technical Test Center will test handling qualities and the latest software releases for the Embedded Global Positioning System Inertial Navigation System and the Flight Management Computer.

The Longbow Apache is a remanufactured and upgraded version of the AH-64A Apache Attack Helicopter.

The Army plans to complete Lot 7 Preliminary Airworthiness Evaluation (PAE) early in FY04. The PAE consists of flight-handling qualities verification, crew workload assessment, crew interface evaluation, and verification of avionics system functionality associated with new and legacy capabilities.

The only remaining LFT&E item for the Longbow Apache concerns the engine fire and detection and suppression system (FDSS) test. The FDSS test, required by the Apache Longbow Test and Evaluation Master Plan, is being deferred so that it might be conducted with the Army Aviation Halon replacement. However, since a suitable drop-in halon replacement is not forthcoming, the Program Management Office is in the process of planning to conduct this test with the existing Halon 1301 system. The Army intends to use a fully operational representative, but not flightworthy, aircraft as the ground test article to conduct this series of tests in 2QFY04.

The Army conducted ten Hellfire missile flight tests in FY03 to support the HOJ/AJ software regression testing and determine its effectiveness in countermeasure environments. Analysis of this testing is ongoing with results expected during 2QFY04. For the CAPS upgrade, pre-qualification testing was conducted in FY03 to address the radome design, antenna design, effective radiated power, guidance section performance, and radar cross-section. Because the CAPS is added to the exterior of the existing missile, aerodynamic impacts of the upgrade are being studied; sub-scale wind tunnel testing was proposed for FY04.

Opportunities to analyze and evaluate the effectiveness, suitability, and survivability of the AH-64A/D aircraft under combat conditions abounded during operations in FY02 against al Qaeda and Taliban fighters in Afghanistan and in FY03 during Operation Iraqi Freedom.

TEST & EVALUATION ASSESSMENT

The Army found the IAFS effective and suitable and is fielding the subsystem. This addition/modification to the aircraft provides the units in the field with an aircraft that has an extended range capability with a fuel system that is crashworthy and ballistically tolerant. This is a much-needed improvement in the system, even though 30 millimeter round carrying capability is reduced from 1,200 rounds to 300 rounds due to the modification.

As expected, the A&FC aircraft testing confirms that the published performance charts for the AH-64D need refinement, but the magnitude and extent of the changes is not yet known. Early results of ongoing software regression testing show no significant anomalies.

The Lot 7 interoperability assessment confirms the aircraft's ability to send/receive joint variable message format and tactical fire direction system messages. In-flight workload assessment surveys and low airspeed testing are complete. Testing of the final software configuration is complete and a safety confirmation recommendation was forwarded to the Army Developmental Test Command for approval.

Four missile flights supported software regression testing and evaluation under benign conditions while six additional missile flights provided data to demonstrate HOJ/AJ performance under electronic countermeasure (ECM) conditions. Analysis is ongoing to reconcile differences between pre-flight predictions and actual flight-test results for at least one of the six ECM flights. A test report and simulation verification and validation report are expected in early CY04. "Rocket Ball" testing, a series of contractor-run engineering tests, reportedly confirmed good radio frequency performance of three CAPS prototype systems. This series of tests also showed that there was no discernable difference in performance due radome-to-radome variability. There was a small increase in baseline radar cross section with the addition of CAPS to the missile. The ERP test showed that the design has sufficient radio frequency performance margin.

Results of recent combat deployments and training exercises confirm the results of the 1995 IOT&E assessment for the Longbow Apache helicopter - the AH-64D helicopter provides effective air-to-ground combat power. The Army after-action reports from the Iraqi conflict conclude that the Longbow Apache aircraft survives, protects the crew, and can be quickly repaired and returned to combat. Still, improvements to the Apache aircraft and training devices could enhance the aircraft's effectiveness. The Army should consider accelerating the procurement and fielding of M-TADS to enable target identification at standoff ranges. Additionally, the Army should incorporate "running/diving fire" engagement tactics, techniques, and procedures, as well as dynamic engagements during peacetime training. This training would be especially beneficial in the Longbow qualification training at Fort Rucker, Alabama, and during unit aerial gunnery training.

All Source Analysis System (ASAS)

The All Source Analysis System (ASAS) is a network of computer workstations that processes and exchanges sensor data, fuses multi-source data into a single intelligence picture, and supports management of intelligence sensors. It is tactically deployable, supports intelligence and electronic warfare operations at battalion through echelons above corps, and provides interoperability with joint intelligence and sensor systems. Intelligence provided by ASAS allows commanders to identify key points for dominant maneuver and find high priority targets for precision targeting.

The ASAS Block I successfully completed its operational test in 1994 and is fielded to selected theater, corps, and division units throughout the Army. The current Block II development is structured so that the interim capability is attained through a series of stand-alone products that can be tested and fielded when they are ready. The ASAS Remote Workstation (RWS) began fielding after completing its operational test in March 1999. An upgrade to the Communications Control Set obtained a conditional material release in June 1999 following a series of developmental tests. The Analysis and Control Team Enclave, a shelter for the team at brigade, successfully completed testing and started fielding in September 2000. The ASAS Light, a downsized laptop version of the ASAS RWS at battalion, obtained a conditional material release and began fielding in FY01. The Army has decided to replace the ASAS RWS with the ASAS Light configuration. The ASAS requirements are migrating to the Distributed Common Ground Station- Army program and ASAS development will end with Block II.

TEST & EVALUATION ACTIVITY

The Test and Evaluation Integrated Product Team (IPT) continued planning and coordination for the ASAS Block II IOT&E tentatively scheduled for late 2004.

The Analysis and Control Element, the final part of ASAS to undergo testing in Block II, completed contractor and software beta-version developmental testing in August 2003. Continued testing of the beta-version software occurs in November 2003. Security and information assurance testing will be done in conjunction with the November 2003 testing.

The Army consolidated the Limited User Test for the ASAS RWS into the same test event as the Maneuver Control System; the Force XXI Battle Command, Brigade and Below; and the Integrated Systems Control Version 4 IOT&Es. The deployment of the test unit in support of Operation Iraqi Freedom has postponed the test. The Army developed an alternative test and evaluation strategy for ASAS RWS software. However, the Army's decision to use the ASAS Light configuration in place of the ASAS RWS terminals preempted execution of this strategy.

The Army upgraded ASAS Light software to Version 6 and fielded it as a field maintenance upgrade.

A new version of the ASAS Communications Control Set completed security certification testing and a supportability review in April 2003.

TEST & EVALUATION ASSESSMENT

The planning for the ASAS Block II IOT&E continued throughout 2003. Given the deployment of forces to Iraq, designating a unit to support the test is the primary concern. Continued uncertainties will result in the further delay of the Block II IOT&E.

Intelligence provided by the All Source Analysis System allows commanders to identify key points for dominant maneuver and find high priority targets for precision targeting.

The ASAS RWS risk assessment identified four accomplishments to be completed to support fielding of the Version 6 software to non- Army Battle Command System units as an upgrade to Version 4: developmental testing, an operational assessment, intra-Army interoperability certification (IAIC), and joint interoperability certification. The ASAS RWS has accomplished only the developmental test to date. IAIC testing conducted in August 2003 identified a problem sending messages to the Maneuver Control System. A fix has been developed and once successful regression testing is accomplished, the IAIC will be released. The Army's switch from the ASAS RWS to the ASAS Light platform deleted the requirement for an operational assessment of the RWS. However, the plan to use the ASAS Light as a replacement for the RWS in the Analysis and Control Team and the Analysis and Control Element will require developmental and operational test and evaluation of the changes in both software and employment. The joint interoperability certification remains an open issue with sufficient testing unlikely until the Block II IOT&E.

The ASAS is experiencing difficulties obtaining a test unit. The operational tempo and deployments have limited the availability of forces to support Army operational tests. The Army and OSD continue to seek acceptable venues to accomplish required operational testing; however, continued delays will adversely affect program schedules and fielding plans. For programs like ASAS, which are included in the digital Army Battle Command System family, the deployment of the 4th Infantry Division has created an untenable situation in terms of completing required testing. Currently, the 4th Infantry Division is the only unit capable of supporting an adequate operational test of this digital information sharing architecture.

Bradley Fighting Vehicle System Upgrade A-3

The M2A3 and M3A3 Bradley Fighting Vehicle Systems (BFVS) are improved versions of the M2A2 and M3A2 BFVS. Enhancements on the BFVS-A3 improve lethality, mobility, survivability, and sustainability. Additionally, these enhancements provide increased situational awareness and digital command and control capabilities.

The BFVS is designed to provide mobile protected transport of an infantry squad to critical points on the battlefield and to perform cavalry scout missions. The BFVS also provides overwatching fires in support of dismounted infantry and suppresses or defeats enemy tanks and other enemy fighting vehicles. BFVS-A3 enhancements include:

- Force XXI Battle Command, Brigade and Below (FBCB2) Integrated Combat Command and Control. This system shares battle command information and situational awareness with all components of the combined arms team.
- The improved Bradley acquisition system and commander's independent viewer, both second-generation forward-looking infrared (FLIR). This system enhances target acquisition and target engagement.
- A position navigation system with a Global Positioning System receiver and a backup inertial navigation system. This enhances location awareness.
- An integrated maintenance diagnostics and built-in test equipment package.

In March 1994, the Army began the engineering, manufacturing, and developing phases. Previous operational testing included a Limited User Test (LUT) 1 in December 1997; an Operational Experiment in September 1998; a Detection, Acquisition, Recognition, Identification (DARI) Test in October 1998, and a LUT 2 in August- September 1999.

M2A3 vulnerability was based on the full-up, system-level live fire test (FUSL LFT); early M2A3 ballistic shock testing; electronic fault insertion events (controlled damage tests); and laser energy weapon testing. The culminating LFT&E event was the FUSL LFT, which was conducted during the period of December 1998 through September 1999.

TEST & EVALUATION ACTIVITY

The BFVS-A3 IOT&E was conducted in October-November 2000 in accordance with a DOT&E approved plan. DOT&E monitored test events and conducted an independent assessment of the test results and provided an operational and LFT&E Report to the Secretary of Defense and Congress in April 2001. Planning for possible post-Milestone III vulnerability testing is ongoing. Such testing could include exploring fixes to unexpected vulnerabilities revealed in the LFT&E or FBCB2 shock component vulnerabilities.
In 2002 and 2003, the Army conducted several technical test events and demonstrations to evaluate fixes for FBCB2.

Enhancements on the Bradley Fighting Vehicle System-A3 improve lethality, mobility, survivability, and sustainability. Additionally, these enhancements provide increased situational awareness and digital command and control capabilities.

TEST & EVALUATION ASSESSMENT

DOT&E assessed the M2A3 to be operationally effective, suitable, and survivable based on the results of the IOT&E, DARI, and the LUT 2. Overall, the M2A3 showed an improved level of operational effectiveness in comparison to the M2A2, which was fielded during Operation Desert Storm. This improvement is attributed to the M2A3's enhanced capability to detect, identify, and hit targets. The M2A3 also has improved night fighting capabilities through its second-generation FLIR.

The FBCB2 digital command and control, as integrated into the M2A3, demonstrated during the IOT&E that it was neither effective nor suitable and it did not contribute to the operational effectiveness of the M2A3/M1A2 System Enhancement Package-equipped force. Despite this, the M2A3 was able to demonstrate an overall improved level of operational effectiveness in comparison to the M2A2 Operation Desert Storm, predominately because of the capabilities of the M2A3's second-generation FLIR and improved fire control system.

Field Test 5, conducted September 12- 27, 2002, at the Electronic Proving Ground, Fort Huachuca, Arizona, and cold weather testing at the Cold Regions Test Center, Alaska, revealed that significant suitability problems with M2A3 FBCB2 integration still existed. Recent technical test results indicate that FBCB2 reliability significantly improved when using a new Solid State Hard Drive instead of the standard spinning FBCB2 hard drive. A 1,500-mile follow-on production test at Aberdeen Proving Ground, Maryland, and a two-week user demonstration (late November-early December 2003) are planned to confirm the effectiveness and suitability of this solution. Successful results and subsequent evaluation from these tests should close out the digital command and control issues on the BFVS-A3.

CH-47F Improved Cargo Helicopter (ICH)

The Army is remanufacturing the CH-47D Chinook, equipped with the new T55-GA-714A engines, into the CH-47F Improved Cargo Helicopter (ICH). Through this service life extension program, the Army intends to sustain the aging CH-47D airframe and extend the aircraft's life expectancy another 20 years. The CH-47D is a twin-turbine tandem rotor helicopter that conducts combat and combat support heavy-lift cargo missions. ICH improvements include fuselage stiffening (to reduce vibrations in the cockpit area), an integrated cockpit, and digital communications for Objective Force compatibility. The prime contractor, Boeing, will rebuild 300 systems.

OSD's approval for entry into the engineering and manufacturing development (EMD) phase came in FY98 on perceived low-technical risk, and delegated Milestone decision authority to the Army Acquisition Executive. The program has experienced delays, changes to the Operational Requirements Document (ORD), cost overruns resulting in a Nunn-McCurdy breach, and significant program restructuring in FY02. The Army Acquisition Executive's approval for the purchase of up to 30 low-rate initial production aircraft occurred on August 19, 2002. The Army plans to conduct the IOT&E commencing on April 5, 2004, with the full-rate production decision occurring in early FY05.

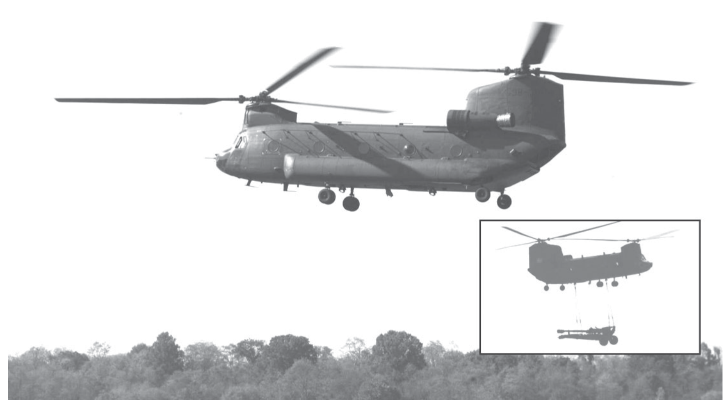
A December 12, 2002, Program Decision Memorandum gave priority for production to the MH-47G (Special Operations Forces) over the CH-47F ICH. Significant differences between the two helicopters require a reconfiguration of the production line after the first CH-47F is complete and rolls off the line. Consequently, the Army will procure five fewer CH-47Fs to offset the production cost increase and postpone the fielding of the first unit of CH-47F aircraft until FY07.

The Army Requirements Oversight Council approved changes made to the ORD and forwarded the document to the Joint Requirements Oversight Council (JROC) for review and approval. The Army expects JROC's approval in early FY04.

DOT&E approved an alternative LFT&E plan after concurring with the Army's request for a waiver from full-up system-level testing in December 1997. The Under Secretary of Defense, Acquisition and Technology provided the waiver certification to Congress in March 1998. DOT&E approved the Army's LFT&E strategy in January 1999. A repaired CH-47D production aircraft was functioning as a live fire ground test vehicle until an accident following a maintenance action damaged it as a test article. LFT&E began in 2QFY99.

TEST & EVALUATION ACTIVITY

Following 158 flight hours of developmental flight-testing, the first EMD aircraft began the reliability and maintainability (R&M) flight-testing phase on January 7, 2003, with the second EMD aircraft first flight occurring on April 15, 2003. Together, the EMD aircraft will complete over 550 flight hours during this R&M phase by the end of 2003. The Army plans to fly an additional 90 flight hours during the IOT&E. During the past year, flying the aircraft from Fort Worth, Texas, to Phoenix, Arizona, to El Centro, California, and to Jupiter, Florida, not only attests to the aircraft's ability to self deploy, but provides the Army an opportunity to conduct and assess operational missions in desert, high-altitude, and tropic conditions. DOT&E and Army concerns involving the possibility of a migration or increase of vibration levels in the aft section of the aircraft prompted the conduct of a vibration/strain comparison test between the CH-47D and the CH-47F model. The Army anticipates the results and analysis of this testing during the 2QFY04.



The CH-47F Improved Cargo Helicopter Upgrade performing an external lift demonstration.

The LFT&E program includes a vulnerability assessment by the U.S. Army Research Laboratory (ARL). ARL is completing their initial vulnerability analyses for the baseline CH-47D and the CH-47F

ICH using ARL-developed modeling tools in conjunction with detailed aircraft descriptions. The live fire test includes cockpit skin panels, cockpit components, fuel subsystem, propulsion system engine nacelle fire suppression system, and will test the fuselage tunnel flight control systems. The vulnerability assessment is in continual update which will result in a comparative analysis to assess the vulnerability of the CH-47F ICH relative to the CH-47D.

ARL completed ballistic testing of the cockpit skin panels, cockpit components, and the T55 engine and fuel subsystem. Damage to the test vehicle requires alternate test plans for testing of the fire suppression system and of the fuselage tunnel. Testing of the fuselage tunnel flight controls system will take place during 1QFY04. As a result of losing the test vehicle, ARL's plan to conduct static and dynamic ballistic tests of the CH-47D rotor blades as part of the DOT&E Joint Live Fire Program during FY03 has been interrupted with only static testing having been completed (analysis of the results pending). Since these blades are the same as those to be used on the CH-47F model, the data derived from the Joint Live Fire Program is directly applicable to the LFT&E of the CH-47F.

OSD approved the Test and Evaluation Master Plan (TEMP) in January 2002. A TEMP update is being staffed and will receive approval early in FY04. ORD, programmatic, and schedule changes are driving the need for an update to the TEMP.

TEST & EVALUATION ASSESSMENT

To date, overall operational and system effectiveness are good. However, program goals for system reliability, vibration reduction, and digital interoperability may not be achieved.

Even though reliability testing to date confirms that failures in the CH-47F are common to legacy CH-47D aircraft, these same testing results suggest that the CH-47F is at low to moderate risk to achieve ORD R&M thresholds.

Fatigue damage on the CH-47F aircraft is similar to damage found in legacy aircraft. However, higher vibration levels at the combiner cooling fan location raise concerns within the test community about the long-term reliability of aircraft components and the potential long-term impact on overall structure damage.

Testing on the CH-47F demonstrates the system's capability to send and receive selected digital messages between aircraft and a ground-based Force XXI Battle Command, Brigade and Below simulator. IOT&E will provide the opportunity to demonstrate aircraft-to-aircraft digital messaging, compatibility with Joint and Army technical architecture, and interoperability with a fully loaded tactical internet.

Test data from the Army's live fire test of the CH-47F and the DOT&E Joint Live Fire Program of the basic CH-47D will support an adequate evaluation of the CH-47F. The only LFT&E concern is that accidental damage done to the ground test vehicle may preclude dynamic testing of the fire suppression system, fuselage tunnel flight controls system, and the main rotor blades.

Chemical Demilitarization Program

The Chemical Demilitarization Program is an Army-managed program responsible for the destruction of the U.S. stockpile of lethal chemical agents and munitions, and non-stockpile chemical warfare materiel. This program is required to comply with the Chemical Weapons Convention (CWC), which is a major arms control and nonproliferation treaty that requires destruction of stockpile unitary chemical weapons by April 29, 2007. OSD placed the Chemical Demilitarization Program on oversight in December 1994. Since then, DOT&E has provided oversight of the stockpile, non-stockpile, and alternate technologies projects within the Chemical Demilitarization Program.

The Chemical Stockpile Disposal Project is responsible for the development of chemical agent disposal facilities collocated with the nine chemical depots. The disposal facilities are government owned and contractor operated. Each site's prime contractor conducts all developmental and operational testing under oversight of the Program Office and the U.S. Army Materiel Systems Analysis Activity. Five disposal facilities are employing the baseline chemical weapons disassembly and incineration process.

The Army has selected chemical neutralization of agents, followed by post-treatment of the neutralized products for the disposal facilities at the two bulk agent storage sites in Aberdeen, Maryland, and Newport, Indiana. The Alternative Technology and Approaches Project is responsible for conducting testing at these two sites. At the direction of Congress, the Assembled Chemical Weapons Assessment Program was established in 1996 to evaluate alternative technologies for the Pueblo and Blue Grass disposal facilities. In 2003, the Army awarded contracts to implement chemical neutralization of agents followed by post-treatment of the neutralized products as an alternative technology for the Pueblo and Blue Grass disposal facilities. Due to the events of September 11, 2001, accelerated destruction is being implemented at the two bulk storage sites, and is being considered for the Pueblo and Blue Grass sites, to reduce the risk of continuing agent storage.

The Johnston Atoll disposal facility completed chemical agent operations in November 2000, and completion of the closure process, including demolition of the facility, is expected in November 2003. The Tooele disposal facility is currently the only fully operational facility. The Aberdeen and Anniston disposal facilities began limited agent operations in April and August 2003, respectively. The Umatilla, Pine Bluff, and Newport disposal facilities are scheduled to begin limited agent operations in 2004. The Pueblo and Blue Grass disposal facilities are in the design phase, and no testing is anticipated for 2004. As of July 13, 2003, the disposal facilities had successfully destroyed approximately 26 percent of the total U.S. chemical weapons stockpile (originally 31,496 agent tons). The Army has met the first two Milestones of the CWC (1 percent and 20 percent destruction, respectively). However, current Army plans for full destruction will not to be complete until April 2012 and a request for a five-year extension to the CWC 100 percent destruction Milestone will be required.

The Non-Stockpile Chemical Materiel Project is responsible for the destruction of non-stockpile chemical warfare materiel, including the components of binary chemical weapons, miscellaneous chemical warfare materiel, recovered chemical weapons, former production facilities, and buried chemical warfare materiel. The Non-Stockpile Chemical Materiel Project has developed, tested, and fielded several mobile systems: the Explosive Destruction System (EDS), Phase 1, Unit 1 (EDS-1/1); the Rapid Response System; the Mobile Munitions Assessment System; and the Portable Raman System. Two additional variants of EDS and two other mobile systems are in or have recently completed testing: EDS, Phase 1, Units 2 and 3 (EDS-1/2,3); EDS, Phase 2 (EDS-2); Single Chemical Agent Identification Set Access Neutralization System (SCANS); and Large Items Transportable Accessing and Neutralization System (LITANS). The Pine Bluff Arsenal Ton Container Decontamination Facility is a fixed, non-stockpile facility in testing at Pine Bluff Arsenal, Arkansas. Three other fixed, non-stockpile facilities are in development: the Munitions Assessment and Processing System at Aberdeen Proving Ground, Maryland; and the Pine Bluff Non-Stockpile Facility and Pine Bluff Binary Destruction Facility, both at Pine Bluff Arsenal, Arkansas.

As of July 13, 2003, the disposal facilities had successfully destroyed approximately 26 percent of the total U.S. chemical weapons stockpile.

TEST & EVALUATION ACTIVITY

The test and evaluation program for each stockpile incineration disposal facility consists of developmental test (DT), combined DT/operational test (OT), and OT phases. The DT phase consists of subsystem component testing. The DT/OT phase employs surrogate agents in all test events, culminating in trial burns of the furnaces and end-to-end operations of the facility. The OT phase consists of agent trial burns and initial operations with agent. The OT is tailored to a specific agent/munition campaign. The OT will support a decision whether to proceed to fully operational status for that specific agent/munition campaign. After completion of the campaign, the facility will revert to OT status for the next planned agent/munition campaign. This process will be repeated until destruction of all agent/munition configurations in the site's stockpile is complete.

For the two bulk agent storage sites implementing accelerated destruction, there is only a DT phase that culminates in end-to-end testing of the facility with surrogate agent, and an OT phase that consists of initial operations with agent. In implementing accelerated destruction at the Aberdeen and Newport sites, the program office has replaced the approved Test and Evaluation Master Plans for those sites with Test Concept Plans (TCPs). The TCPs are still subject to DOT&E approval. DOT&E has reviewed a draft of the TCP for the Newport site and approved the TCP for the Aberdeen site in 2003.

DOT&E monitors the test activity and independently analyzes test data for all stockpile facilities and non-stockpile systems. The test activity and test data support decisions on whether to proceed to the next test phase and determine readiness of either a stockpile facility to begin fully operational status or of a non-stockpile system to be operationally fielded at the conclusion of OT. Test activity for stockpile facilities and non-stockpile systems is summarized in the table below.

Chemical Demilitarization Test and Evaluation Activity

Facility/System	Technology	FY03 Activity	Agent Tested	Planned FY04 Activity
Anniston	Incineration	DT/OT; OT[a]	Surrogate/Sarin[b]	OT
Umatilla	Incineration	DT/OT	Surrogate	DT/OT; OT
Pine Bluff	Incineration	DT; DT/OT	Surrogate	DT/OT; OT
Aberdeen	Neutralization	DT; OT	Surrogate, Mustard	OT
Newport	Neutralization	DT	Surrogate	DT; OT
EDS-1/2,3	Neutralization	FOT&E[c]	Mustard, Sarin, Phosgene	FOT&E (Lewisite, VX)
EDS-2	Neutralization	DT/OT	Mustard, Sarin, Phosgene	DT/OT
SCANS	Neutralization	DT/OT; Follow-on DT	Mustard, Lewisite	DT/OT
LITANS	Neutralization	DT	None	DT; OT
PBA TCDF	Neutralization	OT	Potential trace agent (Lewisite observed)	OT

[a] Start of the OT phase was delayed for over six months due to the need to address safety concerns.
[b] Sarin filled M-55 rockets are the munitions being tested.
[c] An Operational In-Process Review conditional fielding decision for EDS-1/2,3 was made in October 2002.

TEST & EVALUATION ASSESSMENT

Army testing of stockpile and non-stockpile systems in the Chemical Demilitarization Program has been adequate to ensure the safe and efficient disposal of the inventory of chemical warfare materiel. The implementation of accelerated destruction at the bulk storage sites increases the amount of manual handling of agent materiel and places increased emphasis on maintaining program schedules, thereby increasing the risk of safe operation of these facilities. To date, results at the bulk storage sites have not provided a clear indication that the intended schedule and cost benefits of the accelerated destruction process will be realized. Emphasis on maintaining the program schedule at the Aberdeen facility led to a hastily conducted final DT prior to the start of OT. The numerous problems and subsequent delays that are occurring during the OT can, in part, be attributed to the haste with which the final DT was conducted. For the Tooele facility, unexpected events that have occurred during operations and maintenance have led to lengthy delays and greatly increased program costs, illustrating the need for robust event-driven testing to minimize the possibility of such occurrences for these facilities when they become fully operational. DOT&E will continue to monitor the safety issue closely during testing of these facilities.

Operational testing of EDS-1/2,3 at Aberdeen and the remediation site at Spring Valley was adequate for DOT&E to determine that the system is operationally effective and suitable. All munitions were safely and successfully destroyed by the EDS-1/2,3 during testing. DOT&E participated in the Operational Readiness In-Process Review in November 2003, which supported the Program Manager's decision to declare EDS-1/2,3 fully operational for use with mustard, sarin, and phosgene. The EDS-2 DT/OT at Porton Down, United Kingdom, and Aberdeen is currently going well. The DT/OT testing is being conducted similarly to a dedicated OT in that operational crews and procedures are being employed with a production representative system. Therefore, a dedicated OT phase is not anticipated for EDS-2, and an Operational Readiness In-Process Review that will support a Program Manager's fielding decision is planned for 2004. At DOT&E's direction, all EDS variants now have a defined vessel vacuum "go/no go" criterion as part of their operating procedures that is based on past test data. This will reduce the risk of inadvertent agent release from the EDS vessel that could result if detonation occurs without a proper vessel seal.

The original test plan for the SCANS DT/OT was for a configuration that included a sampling port that would not be part of the production configuration. At DOT&E's request, additional production representative SCANS items were included in the DT/OT to ensure an adequate test plan. Results of the SCANS DT/OT indicated a need for an engineering design change in the system. The Army determined that the break pin assembly was susceptible to cracking during operation, potentially leading to a system leak. The assembly was redesigned and additional DT was conducted to confirm the effectiveness of the new design. DOT&E determined that the system is operationally effective and suitable based on SCANS testing. DOT&E actively participated in a Conditional Operations In-Process Review that supported a Program Manager's decision to field in September 2003.

The LITANS system began DT in 2003, and OT is planned to begin in January 2004 at Porton Down. The Pine Bluff Ton Container Decontamination Facility began OT in September 2003. Several treated ton containers contained residual lewisite agent contamination during the test. Therefore, the Army suspended the OT and the system is being redesigned.

The U.S. Army Materiel Systems Analysis Activity is providing effective independent oversight of the testing of both stockpile and non-stockpile programs.

Comanche (RAH-66)

The RAH-66 Comanche is a twin-engine, two-pilot, stealthy armed reconnaissance/attack helicopter. The Comanche intends to feature low observable composite technologies with retractable landing gear and weapons pylon to achieve a low radar cross-section (RCS) and a unique engine exhaust system to suppress its infrared signature. A five-bladed main rotor and a shrouded tail rotor minimize the acoustic and radar signatures. A fly-by-wire flight control system and fully integrated digital avionics assist in piloting the aircraft. The Mission Equipment Package integrates the radar, a forward-looking infrared sensor, and an image-intensified television sensor for night flying and target acquisition. The Comanche armament systems are to consist of the Joint Missile/Hellfire Missile, 2.75-inch aerial rockets, a turreted 20mm gun, and an air-to-air missile.

The Army intends for Comanche to be a key enabler in achieving the air-ground synergy required for the Army's Future Force. As a component of a Future Force air-ground task force, Comanche units will conduct reconnaissance, mobile strike, close combat with ground forces, and vertical maneuver. Comanche's primary role in these operations is to collect and share intelligence information and destroy enemy forces.

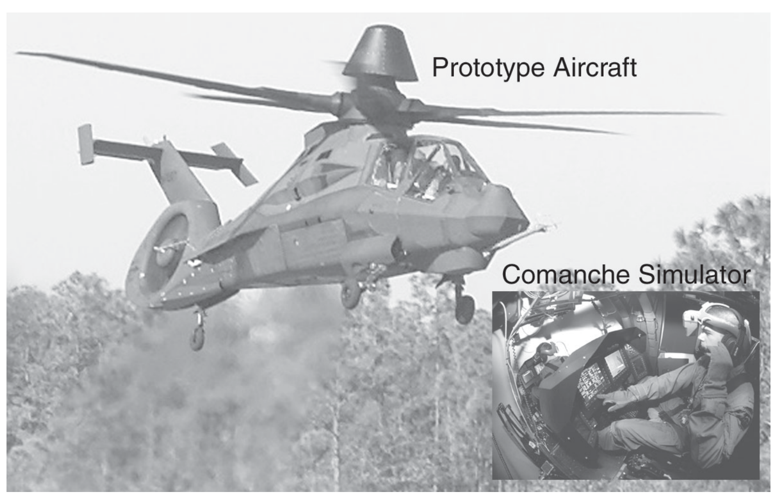
The Army received OSD approval for a sixth program restructuring in order to reduce risk and accommodate emerging Future Force requirements in October 2002. The new schedule will add 30 months to Engineering Manufacturing and Development (EMD), establish a blocked acquisition strategy, and reduce the amount of concurrent developmental testing, training, and operational testing. The schedule includes a low-rate initial production (LRIP) decision in FY07, delivery of an initial operational capability in FY09, and a full-rate production decision in FY10.

The Comanche program is a covered system for LFT&E. The latest revision date for the OSD approved LFT&E Strategy is June 2003. This strategy is an integral part of the updated Test and Evaluation Master Plan. The LFT&E Strategy presents a sequential test program, progressing from components to subsystems and, ultimately, to full-up system-level testing. The full-up system-level test article will be a Block I production representative aircraft. In addition, the strategy includes the lethality testing for the new XM1031 20mm ammunition being developed for the Comanche.

Comanche program actions during FY03 necessary to implement the restructure include the reorganization of the government-contractor development team and the completion of the system-level critical design review. Major assembly of the first EMD aircraft began in August 2003.

TEST & EVALUATION ACTIVITY

Testing has featured the flight-testing of two prototype aircraft (program totals at the conclusion of FY03 include 530 flights resulting in 630 flight hours), the use of a Propulsion System Test Bed for dynamic component testing, RCS testing of a full-scale model, contractor testing of mission equipment, (sensors, antennas, communications, armament) and crew- and team-level simulation events.



Testing to date has featured flight testing of the prototype aircraft and crew and team-level simulation events.

LFT&E activities include the completion of the initial vulnerability assessment and the start of a series of risk reduction ballistic and structural tests on evolving designs for the main rotor blade, the lightweight crew armor, and several tail rotor components. These components are being redesigned to reduce weight and cost, as well as to reduce the vulnerable area against high explosive incendiary (HEI) projectiles. The risk reduction ballistic effort will provide data to assist in the validation and verification of a finite element analysis model that will be used to determine the dynamic structural response of the tail rotor system when impacted by HEI projectiles. There is still an open issue with the Army to determine the specific configuration of the full-up system-level test article with specific emphasis on deciding whether to have fully operational avionics components installed versus representative non-functional ones. The latter approach could avoid damaging valuable avionics hardware; yet still have necessary avionics operation for the test. An Event Design Plan describing the lethality evaluation for the 20mm projectile is complete and OSD-approved.

TEST & EVALUATION ASSESSMENT

Technical challenges remain for software integration and testing of mission equipment, weight reduction, radar signatures, antenna performance, gun system performance, and aided target detection algorithm performance. Since the restructure, the Program Office identified engineering solutions to the known technical challenges. The efficacy of those solutions and identification of the unknown issues will not become apparent until developmental testing begins in FY05. The approved Comanche test program will provide ample opportunity to evaluate these technical issues and determine the effectiveness and suitability of the Comanche helicopter.

The Comanche program retains a medium-risk strategy for integration and testing of mission equipment on the aircraft. Software for delivery prior to LRIP will have minimal function (no armament, radar, aircraft survivability equipment, or digital communications). Integration testing of most mission equipment software and advanced functionality occurs in the last year of EMD. Memory requirements, software throughput, and bus requirements for several subsystems are projected to exceed allocations.

Empty weight projections for Block I, II, and III aircraft are slightly higher than weight goals for each block. Projected aircraft performance at these projected weights meet ORD requirements for vertical rate-of-climb. To achieve these projections, the Army must keep weight growth during development lower than historical averages and also successfully implement weight reduction initiatives.

Based on analysis of current designs and limited testing on a contractor range, the radar warning receiver and two communications antennas do not meet some RCS allocations. The satellite receiver antenna does not meet performance requirements, and the radar warning receiver sensitivity is marginal. Efforts to reduce the RCS are likely to adversely affect the performance of already marginal antennas.

While the Program Office has taken steps to begin design of a telemetry antenna for the Operational Test and Training Instrumentation System (OTTIS) that will limit the effect of the system on the RCS of the Comanche platform, this remains a risk area. The OTTIS system requires the installation of an external antenna that could have a large RCS signature, perhaps eclipsing the radar signature of the remainder of the aircraft. In testing and training environments, the Comanche radar signature could potentially be much larger than the wartime signature. If so, the Army's maxim to "train as you fight" will be compromised and the validity of susceptibility testing will be degraded.

The current turreted gun system design features a lightweight (312 pounds) 20mm armament system that makes it difficult to stabilize the gun and maintain accurate fire. Gun firing will also produce elevated barrel temperatures that rapidly approach the temperature limits of nearby composite components. After firing, the gun must remain deployed until the barrel cools. Leaving the gun deployed increases the aircraft's radar and infrared signatures compared to the stowed position.

In laboratory testing, Comanche Aided Target Detection-Classification algorithm performance in known terrain environments is outstanding; however, in environments with complex thermal and spatial clutter, performance can be degraded.

The LFT&E program remains adequate under the new acquisition strategy for Comanche. The LFT&E strategy anticipates completion of the program to support the Milestone III review in 1QFY10. The strategy includes component qualification and subsystem level ballistic testing for over 20 critical components, and dynamic testing on the full-up production-representative aircraft. However, because of the late (2QFY08) delivery of the LFT&E aircraft, correction of vulnerabilities discovered during LFT&E will be difficult to implement on initial production aircraft.

Excalibur Family of Artillery Projectiles

Excalibur is a family of precision-guided, extended-range modular projectiles incorporating three unique payload capabilities divided into Block configurations. Block I consists of high-explosive, fragmenting, or penetrating unitary munitions to enhance traditional fire support operations with increased range, improved accuracy, and reduced collateral damage against personnel, light materiel, and structure targets. Block II consists of smart munitions to search, detect, acquire, and engage fleeting and short-dwell targets common to open-terrain battlefields. Block III consists of discriminating munitions to selectively identify and engage individual vehicular targets in urban environments by distinguishing specific target characteristics. Excalibur's precision capabilities are intended to be used by Future Combat System (FCS) Non-Line-of-Sight (NLOS) Cannon units to provide close support to maneuver units in urban or complex terrain. Digitized lightweight 155mm howitzer systems will be used to develop and test Excalibur's capabilities before FCS NLOS Cannon is fielded.

The Excalibur development team combines U.S. guidance expertise with Swedish airframe experience. The projectile will employ Global Positioning System (GPS)-aided inertial guidance and navigation, free spinning base fins, four-axis canard airframe control, base bleed technology, and a trajectory glide to achieve increased accuracy and extended ranges beyond 30 km. The FCS NLOS Cannon will incorporate an inductive fuze setter to transfer target and fuze data to the integral fuze.

Excalibur system development began in 1997 with a dual-purpose improved conventional munitions variant, but shifted to the Unitary projectile in January 2001. In November 2001, the Army Acquisition Executive merged the Raytheon Excalibur (U.S.) and Bofors (Sweden) Trajectory Correctible Munition programs. In February 2002, Army leadership directed Excalibur to follow a block acquisition strategy. The Block I (Unitary) Milestone C is scheduled for FY06, and an initial operational capability (IOC) in FY08. For Block II (smart) and Block III (discriminating), Milestone Bs are scheduled in FY08, Milestone Cs in FY13, and IOCs in FY16.

TEST & EVALUATION ACTIVITY

DOT&E worked with the Excalibur Test and Evaluation Integrated Product Team (IPT) to develop a Block I Excalibur Test and Evaluation Master Plan, including a comprehensive LFT&E strategy that fully integrates lethality with developmental and operational test events. Test events thus far have been limited to component-level testing. In a March 2003 contractor firing, a functional guidance section acquired and tracked 11 GPS satellites and the control actuation system exercised flight control canards. LFT&E activities this year included preliminary developmental testing of the Unitary warhead.

Excalibur's precision capabilities are intended to be used by Future Combat System Non-Line-of-Sight Cannon units to provide close support to maneuver units in urban or complex terrain.

TEST & EVALUATION ASSESSMENT

Key technical risks for the Unitary program include reliable fin deployment, airframe maneuverability, warhead fuze development, inertial measurement unit hardening, and GPS acquisition. In the last year, gun-hardening tests demonstrated integrated GPS acquisition and tracking and inertial measurement unit mechanical performance to 12,000g acceleration levels. The canard actuator system functioned after firing. Accuracy required for engaging area targets should be achievable, but achieving the greater accuracy required for structures and other point targets is higher risk.

Smart projectiles such as SADARM (U.S.), Smart155 (Germany), and Bonus (Sweden) that employ millimeter wave variants and infrared sensors to engage armored targets have shown success against benign targets, but are less successful against countermeasured targets. Germany and Sweden are working on product improvements that should make the technology more effective by the start of the Block II and III programs. Technology that discriminates between individual targets is unproven.

The testing for the XM982-Unitary munition described in the draft LFT&E strategy is fully integrated with planned developmental and operational testing, in order to efficiently use available test resources. There are no dedicated, full-up, system-level, LFT&E events. Realistic gun-fired lethality testing is planned during developmental test events using a live fire target array consisting of mixed personnel and light materiel targets, and threat representative structure targets of specified construction. Warhead technical testing, and some gun-fired testing, will be completed in time to support a Milestone C decision review.

Excalibur may be susceptible to GPS jamming. If GPS jammers are employed in the vicinity of the target, then the Army expects Excalibur to use its inertial navigation system to hit the target. However, if jamming prevents initial GPS acquisition, then the round will follow a ballistic trajectory instead of achieving guided flight and may endanger friendly forces in the area of the ballistic round's impact.

Excalibur will require accurate target location data in order to achieve desired effects for the Unitary variant. Target location errors will need to be 35 meters or less for personnel targets, and approximately 10 meters or less for targets requiring a direct hit.

Test and evaluation issues to be resolved during the Test and Evaluation Master Plan development include the selection of an adequate test site that can accommodate testing in a GPS-jammed environment at the extended range Excalibur offers, and identification of appropriate targets and quantity of fire missions for the IOT&E.

Family of Medium Tactical Vehicles (FMTV)

The Family of Medium Tactical Vehicles (FMTV) is a family of 2.5-ton and 5-ton vehicles and trailers based on a common truck cab, chassis, and internal components. The trucks' components are primarily non-developmental items integrated in rugged tactical configurations. The light-medium tactical vehicles are 2.5-ton payload capacity models consisting of cargo, airdrop cargo, and van variants. The medium tactical vehicles are 5-ton payload capacity models consisting of cargo (with and without material handling crane), long wheel base cargo (with and without material handling crane), airdrop cargo, tractor, wrecker, dump, and airdrop dump variants. New variants not yet operationally tested or in production are a 5-ton expansible van, a load handling system (palletized loading) truck-with-trailer, and a 10-ton dump truck. The Army designated the first 11,000 of the trucks produced the A0 version; subsequent production trucks are designated the A1 version. The Army has a total acquisition objective of 83,000 trucks and 10,000 trailers; and has fielded over 21,000 A0 and A1 trucks and 1,300 trailers.

The Army conducted initial operational testing at Ft. Bragg, North Carolina, in three phases. Phase I, conducted September-December 1993, was terminated for poor demonstrated reliability. Phase II, conducted June-November 1994, was interrupted and cancelled when the soldiers of the test unit deployed to Haiti. Phase III, conducted April-July 1995, was the basis of the DOT&E test and evaluation report to Congress.

The Army made the first full-rate production decision in August 1995. During 2003 the contract was re-competed in a program called the FMTV Competitive Re-buy. The Army awarded the contract to Stewart and Stevenson Tactical Vehicle Systems (the incumbent).

TEST & EVALUATION ACTIVITY

FMTV testing during FY03 included follow-on production testing to verify the performance and quality of current production A1 vehicles. Testing also included government competitive testing to verify performance, reliability, maintainability, and conformance to the technical data package of the upgraded A1 vehicles submitted by the two Competitive Re-buy contractors.

Limited User Tests are planned for the expansible van in June 2005, the load-handling system in October 2005, and the 10-ton dump truck in May 2006.

TEST & EVALUATION ASSESSMENT

Based on prior operational test and evaluation and current production testing, the FMTV trucks continue to be effective and suitable. The reliability for each of the variants has improved from the A0 to the re-buy trucks. The minor changes between the A1 truck and the re-buy trucks do not require additional operational testing. Residual concerns can be addressed in the planned production verification tests and the limited user tests of the expansible van, the load-handling system truck-with-trailer, and the 10-ton dump truck. The Test and Evaluation Master Plan will be updated to reflect this. The program intends to provide armor kits for use on trucks deployed to Iraq. The Test and Evaluation Master Plan will include plans to conduct survivability testing of trucks with these armor kits. Although safety issues related to failed drivelines have been addressed with modified driveshafts, the program office is investigating an improved driveshaft. DOT&E will follow this development.

The program intends to provide armor kits for use on trucks deployed to Iraq.

Force XXI Battle Command, Brigade & Below (FBCB2)

The Force XXI Battle Command, Brigade and Below (FBCB2) is a digital battle command system that provides information to support a brigade task force. Its primary purpose is to accurately and quickly disseminate and display friendly and enemy unit locations, and to communicate orders, overlays, and graphical tactical control measures throughout the force. The system consists of a small-rugged computer and a display, and uses the Tactical Internet for line-of-sight communications (either Single Channel Ground and Airborne Radio System (SINCGARS) or Enhanced Position Location and Reporting System (EPLRS)). It can also be configured using L-band satellite, thus it is known as FBCB2 Blue Force Tracking (BFT). The system also has a connection to a Global Positioning System receiver for self-location and feeds into the Global Command and Control System.

At the brigade and battalion tactical operation centers, the Tactical Internet interfaces with the Army Tactical Command and Control System (ATCCS) – an Ethernet-based local area network of computers representing the functional areas of intelligence, maneuver, air defense, combat service support, and fire support. This interface permits the information collected and disseminated via ATCCS systems to be rapidly passed through the Tactical Internet to FBCB2 computers. Likewise, the position reports of individual and unit locations are passed upwards through the FBCB2 and Tactical Internet into the ATCCS systems for dissemination throughout the force via the Global Command and Control System. Network initialization and management functions are performed by the Tactical Information Management System at the brigade tactical operation center.

Army systems with computer processors and displays mounted in them will receive the FBCB2 software often referred to as Embedded Battle Command software. Examples of Army systems that employ the Embedded Battle Command software include the M2A3 Bradley Infantry Fighting Vehicles and the M2A2 System Enhancement Package main battle tanks. In addition to the tactical vehicles, the ATCCS component computers have Embedded Battle Command software installed to facilitate the interface between FBCB2 and ATCCS.

TEST & EVALUATION ACTIVITY

The Army conducted a developmental test (Field Test 5) at Fort Huachuca, Arizona, in September 2002 in preparation for the then-scheduled IOT&E in FY03. This Field Test 5 was followed by Limit User Test 2A in December 2002.

A cold weather test was conducted at the Cold Regions Test Center, Alaska, in February 2003. This small-scale cold region test was conducted at the request of DOT&E, and involved about ten FBCB2 platforms mounted in High-Mobility Multipurpose Wheeled Vehicle (HMMWVs) that were operated by soldiers in a field environment at Fort Greely, Alaska.

The Force XXI Battle Command, Brigade and Below is a digital battle command system that provides information to support a brigade task force.

In early 2003, the Army notified DOT&E that they were postponing further testing of the FBCB2 program due to the imminent operational deployment of the test unit the 4th Infantry Division (4th ID) to Operation Iraqi Freedom. Prior to the deployment of the 4th ID, the Army made substantial changes to the architecture of the FBCB2 system, changed the name to BFT, and installed the systems in the 3rd Infantry Division, the 101st Air Assault Division, the 1st Marine Expeditionary Force, and the 1st United

Kingdom Armored Division – also as a part of Operation Iraqi Freedom. The BFT system relied upon L-band satellite radio rather than the terrestrial EPLRS network of FBCB2, and was distributed in a much smaller density per division than the terrestrial FBCB2 in the 4th ID. In contrast to FBCB2, the purpose of BFT was to create a situational awareness picture for higher headquarters for use in tracking friendly units on a macro scale.

TEST & EVALUATION ASSESSMENT

The FBCB2 system continued to improve in performance through the test events conducted in 2003. During Field Test 5 at Fort Huachuca, Arizona, the command and control message traffic achieved a message completion rate of over 90 percent, including message traffic sent to the Army Battle Command System computers. Although there was message success, the system was plagued by the inability to reliably pass operational graphics between the FBCB2 and Maneuver Control System. The point estimate of the mean time between failures for FBCB2 computers at Field Test 5 was about 500 hours. While short of the requirement of 700 hours, this represented the best performance yet achieved by FBCB2.

The cold weather testing at Fort Greely likewise achieved improved performance. Darkened screens which previously presented an issue in earlier test events were no longer a problem, and the Tactical Internet and FBCB2 performance were not seriously affected by the cold weather. The temperature range experienced at the test site during the test was +12 degrees to -30 degrees.

The performance of FBCB2 and BFT during Operation Iraqi Freedom was also generally favorable. DOT&E had access to after-action reports from all of the units that employed either FBCB2 or BFT (with the exception of the 4th ID), and user response to the system has been positive. The BFT system in particular has been well received for the job it was intended, which is providing an outline of friendly unit locations to senior commanders. In addition, the BFT system communications through the L-band satellite has, in many cases, been reported as the only means of reliable communications available due to the extended ranges between units during the operation. The BFT system is to track movements, to navigate (particularly in periods of poor visibility), and to orient and plan for fires. Users have reported it as very helpful in coordinating unit linkups, and in avoiding fratricide incidents at unit boundaries.

In recognition of the capability that FBCB2 BFT provides, the Army will conduct a developmental test/operational test of Block I in February 2004. This, combined with other events and assessments, will constitute an IOT&E to support a full-rate production decision review for Block I. Following a full or conditional material release decision, the FBCB2 program will need to provide a Test and Evaluation Master Plan to reflect the new operational concept, acquisition strategy, and test requirements for the follow-on testing required to demonstrate completion of FBCB2 Block II requirements. However, there are FBCB2 Block II requirements that have not been met, especially the interfaces between the FBCB2 and the other Army Battle Command System computers. The Army will continue to develop the FBCB2 Block II program with another IOT&E required for that block to be held in the future, probably in FY05.

Future Combat Systems

Future Combat Systems (FCSs) are a family of advanced, networked air and ground maneuver, maneuver support, and maneuver sustainment systems that include both manned and unmanned platforms. FCSs are connected via an advanced network architecture that will enable levels of situational awareness, understanding, and synchronized operations heretofore unachievable. The Army expects FCS-equipped units of action (UA) to balance deployability and sustainability with responsiveness, lethality, survivability, agility, and versatility characteristics.

FCS is the core building block of the Army's Future Force. This force will include Combined Arms Battalions, a Non-Line-of-Sight (NLOS) Cannon Battalion, an aviation squadron that includes the Comanche Helicopter, and a Forward Support Battalion. UAs will be the Army's tactical warfighting echelons, comprised of echelons at brigade and below that will fight tactical engagements and win battles. Although optimized for offensive operations, the FCS-equipped UA will have the ability to execute full spectrum operations.

One of FCS's transformational objectives is to significantly improve the deployability of the Army without sacrificing lethality or survivability. Accordingly, the FCS family-of-systems maximum essential combat configuration weight will be 19 tons. This facilitates both rapid strategic (inter-theater), multi-modal (air, land, and sea) deployment and operational (intra-theater) maneuver by assets similar to C-130 profile aircraft.

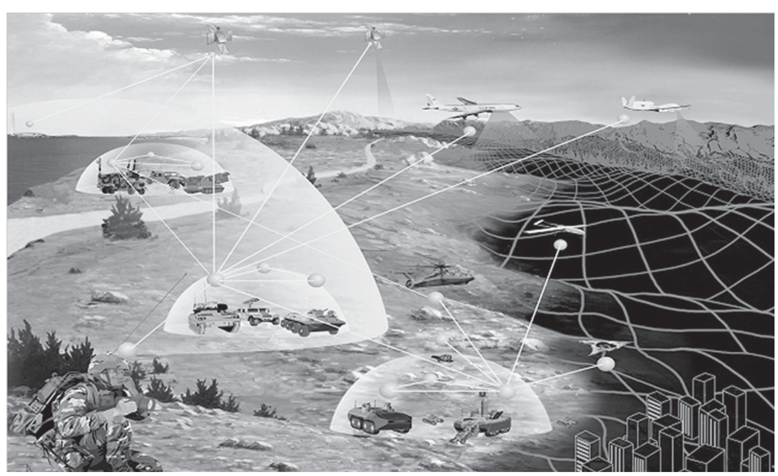
FCS Block I consists of fifteen FCS-equipped UAs, which will be fielded between 2010 and 2020. FCS will replace the majority of the combat vehicles in the Army's current inventory, including main battle tanks, infantry fighting vehicles, howitzers, and mortars.

FCSs include eight manned ground vehicles; four classes of unmanned aerial vehicles organic to platoon, company, battalion, and UA echelons; three classes of unmanned ground vehicles, the Armed Robotic Vehicle, the Multifunctional Utility/Logistics and Equipment Vehicle, and the Small Manpackable Unmanned Ground Vehicle; two unattended munitions- the Intelligent Munitions System and the NLOS-Launch System; and unattended ground sensors.

TEST & EVALUATION ACTIVITY

DOT&E approved the Test and Evaluation Master Plan on April 25, 2003, and will update it prior to the Defense Acquisition Board Review in November 2004. FCS platforms will be tested and evaluated individually, while concurrently being integrated into a larger system-of-systems (SoS) test and evaluation plan. SoS testing will begin early in the System Design and Demonstration phase with system models connected to a SoS Integration Laboratory (SOSIL). SOSIL will include a software system virtual test framework that provides a wrap-around synthetic environment to immerse these models into a simulated UA combat-like situation. The test program follows using live components, maturing designs, emulators, and finally, use of full-up prototypes. The FCS Block I development schedule calls for a series of limited user tests beginning in FY07 culminating in an IOT&E in FY12.

FCS LFT&E will be complete before the full-rate production decision, now planned for mid-FY14.



Future Combat Systems is the core building block of the Army's Future Force. This force will include Combined Arms Battalions, a Non-Line-of-Sight Cannon Battalion, an aviation squadron that includes the Comanche Helicopter, and a Forward Support Battalion.

TEST & EVALUATION ASSESSMENT

A program of this magnitude, timeline, and payoff does not come without technical or programmatic risks. The Army's plan is to organize, train, test, and equip a mission-capable FCS by FY12. As such, the development of a family of highly complex vehicles and the sophisticated command and control network associated with these platforms will be a challenge given the current schedule.

In particular, the Army's FCS concept rests upon a network of sensors, platforms, and command nodes linked by reliable high-bandwidth and high-speed communications – all capabilities that do not yet exist. In addition, advanced modeling and simulation (M&S) is expected to support both the execution of live operational testing and FCS ballistic survivability evaluations. The current ballistic M&S is deficient in several areas, namely structural response of composite structures, ballistic shock, blast and mine damage, characterization of behind-armor debris, and quantification of component vulnerability to such debris. In order to mitigate these known deficiencies, sufficient resources will have to be set aside in order for M&S to be an effective modeling tool for live operational testing or survivability evaluations. Efforts are also ongoing within the Army to gain a real-time casualty assessment capability, which will be critical to adequate IOT&E.

Global Combat Support System - Army (GCSS-A)

The Global Combat Support System- Army (GCSS-A) is a Major Defense Acquisition Program (Acquisition Category 1D) that the Army is restructuring and working like a new start, except there is about $750M of sunk costs in the previous effort. GCSS-A will provide a technologically advanced Enterprise Resource Planning (ERP) system capable of managing the flow of Combat Service Support (CSS) resources and information for users at all echelons. Processes will be reengineered to adapt to the ERP functionality whenever practical. Additional functionality requirements may be satisfied by a combination of additional commercial off-the-shelf applications, existing government off-the-shelf software, and specific extensions to the ERP package. Every effort will be made to minimize modification of the commercial off-the-shelf core code and the addition of application interfaces.

GCSS-A will assist Army commanders in anticipating, allocating, and synchronizing the flow of CSS resources to equip, deploy/project, sustain, reconstitute, and re-deploy forces in support of the national military strategy. Integrating total asset visibility will allow a better matching of supply to demand, resulting in fewer supplies and equipment requiring movement. GCSS-A will provide maneuver commanders sustainment information concerning supplies across all echelons of employment, from the unit to strategic level. Ultimately, this effort should result in reductions in the logistics footprint. The capability to coordinate maintenance operations among all echelons of support activities, improved accuracy and timeliness of requisitions, and total asset visibility will result in an improved ability to manage readiness. GCSS-A is expected to lead to more accurate trend analysis and improve anticipatory logistics.

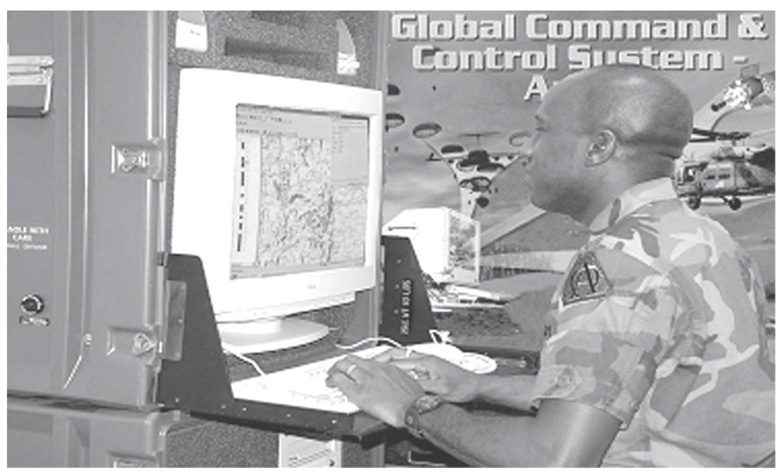
TEST & EVALUATION ACTIVITY

This program is pre-Milestone B. Test activities focused on development of a viable test strategy and the Test and Evaluation Master Plan, as well as early involvement by the Army Test and Evaluation Command in planning for risk reduction testing.

TEST AND EVALUATION ASSESSMENT

DOT&E and the Army are discussing operational test strategies that are aimed at ensuring that the IOT&E will be adequate. Early test activity and benchmarking efforts will need to address the issue of communications bandwidth required by the Guard and Reserve components to successfully implement and use the new GCSS-A system. The Test and Evaluation Master Plan is expected to be submitted to OSD in mid-2004.

The Army is implementing early involvement in the GCSS-A system. Participation in test and evaluation working group meetings since the program's redirection has helped define Critical Operational Issues and Criteria that will be operationally meaningful and measurable for assessing GCSS-A's contribution to operations. Early cooperation in the development and test phase of the GCSS-A Program will provide meaningful assessments for future decisions.



The Global Combat Support System – Army will provide a technologically advanced Enterprise Resource Planning system capable of managing the flow of Combat Service Support resources and information for users at all echelons.

Guided Multiple Launch Rocket Systems (GMLRS)

The Guided Multiple Launch Rocket System (GMLRS) consists of two variants of rockets fired from the M270A1 or High Mobility Artillery Rocket System (HIMARS) launchers. The GMLRS Dual-Purpose Improved Conventional Munition (DPICM) variant carries 404 bomblets, while the GMLRS Unitary rocket will have a single, 200-pound class, high-explosive, Unitary warhead. Both variants use an inertial measurement unit guidance system that is aided by the Global Positioning System.

With the planned capabilities of the new rockets, the Army intends that a unit equipped with GMLRS will shoot farther (over 60 km versus 30 km) and achieve desired effects with fewer rockets (due to improved accuracy) and fewer duds (for GMLRS DPICM) or reduced collateral damage (for GMLRS Unitary) than the currently fielded MLRS rocket. GMLRS is used primarily in general support of maneuver divisions and corps. GMLRS DPICM is employed against lightly armored, stationary targets such as towed artillery, air defense units, and communication sites. GMLRS unitary will have three fuze settings for use against personnel in the open (proximity fuze); lightly fortified bunkers (delayed fuze); or a single, lightly armored target (point detonating fuze).

GMLRS DPICM is multi-national, cooperative development and production program that had its Milestone C decision in March 2003. It is scheduled for a 2QFY05 full-rate production decision and 2QFY06 initial operational capability. GMLRS Unitary had its Milestone B decision in March 2003. It is scheduled for a 4QFY06 Milestone C, 2QFY08 initial operational capability, and a full-rate production decision in 3QFY08. Depending on the results of initial testing and a validated need, an early version of the rocket could be fielded sooner than 2008.

TEST & EVALUATION ACTIVITY

All six engineering design tests and eleven Production Qualification Tests have been completed for GMLRS DPICM. The program executed all tests in accordance with the DOT&E-approved test strategy.

LFT&E of the DPICM warhead will be integrated with the developmental and operational testing against surrogate targets. Individual target element damage will be assessed after each mission to determine the achieved fractional damage.

DOT&E is working with the Army to finalize the Test and Evaluation Master Plan for the GMLRS Unitary variant.

TEST & EVALUATION ASSESSMENT

To date, tests demonstrate that the GMLRS rocket has the accuracy and range needed to meet its requirements; however, the hazardous dud rate continues to be a problem.

The GMLRS engineering development tests fired nine rockets in six tests. All of the seven rockets that dispensed sub-munitions were well within the accuracy needed to meet effectiveness requirements. One rocket did not dispense its sub-munitions. The ninth rocket did not launch. The contractor identified fixes and included them in the production qualification flights. The problems have not recurred. The program successfully fired twenty-two of the scheduled 26 rockets during Production Qualification Tests. These rockets were within the accuracy needed to meet

The Guided Multiple Launch Rocket System consists of two variants of rockets fired from the M270A1 or High Mobility Artillery Rocket System launchers.

requirements. Four separate problems caused the four failures, in which three rockets failed to dispense their sub-munitions, and one rocket failed to launch. The contractor has identified the causes and will incorporate fixes into the production design. Rocket reliability is within the requirement for the program at this time; however, a higher reliability will be required for the production rockets.

The required dud rate (less than 1 percent) has not been achieved. The Army hoped to achieve this requirement by making adjustments to the fuze of the current DPICM bomblet. Even with these changes, the dud rate varies as a function of range between 1.2 and 7.6 percent. This is significantly better than the current MLRS M26 rocket, which has average dud rates of 10 percent at 17 km and 8 percent at 37 km. The Army continues to experiment with fuze adjustments, but it is unlikely the bomblet will meet the dud rate requirement for all ranges. Therefore, the Army requested changing the GMLRS sub-munition dud rate requirement to two percent averaged between ranges of 20 and 60 km and four percent averaged for ranges between 15 to 20 km and 60 to 70 km. The Joint Requirements Oversight Council approved this proposal in November 2003. The international partners are developing a self-destruct fuze, which might reduce the dud rate to less than one percent. Inclusion of this new fuze on the bomblet in production rockets depends on the results of upcoming tests and production costs.

Additional tests, including operational and live fire testing, are planned to demonstrate GMLRS DPICM effectiveness against countermeasured targets and to show its interoperability. All flight tests to date have been accomplished with a modified Improved Position Determining System launcher, as opposed to an operationally representative one. Planned interoperability testing, therefore, will demonstrate that GMLRS can be fired from the M270A1 and HIMARS launchers.

GMLRS Unitary will begin developmental testing in 2004.

High Mobility Artillery Rocket System (HIMARS)

HIMARS, the newest member of the Multiple Launch Rocket System (MLRS) family, will provide light, medium, and early-entry contingency forces with an all-weather, indirect, area fire weapon system to strike high-payoff threat targets at all depths of the tactical battlefield. HIMARS units will perform the same types of general support, general support reinforcing, and reinforcing missions as current MLRS units.

A HIMARS section consists of a launcher, two resupply vehicles (RSVs) and two resupply trailers (RSTs). The HIMARS launcher is self-loading with a crew cab, a hydraulic control system, and onboard fire control and navigation systems. HIMARS fire control system, electronics, and communications units are interchangeable with the M270A1 MLRS launcher. The launcher module is mounted on a Medium Tactical Vehicle, 5-ton chassis. The HIMARS launcher has a three-man crew. It carries a single pod of six surface-to-surface artillery rockets or one Army Tactical Missile System (Army TACMS) missile. The RSV is a medium tactical vehicle truck with an onboard Hiab crane and secure radio communications. The RST is a standard M1095 5-ton trailer. Both the RSV and RST can carry two rocket or missile launch pods. HIMARS is transportable by C-130 aircraft for inter- and intra-theater deployability.

The Army initiated the HIMARS program in January 1995 as part of the Rapid Force Projection Initiative Advanced Concept Technology Demonstration (ACTD). The demonstration provided three of the four prototype launchers to the 3rd Battalion, 27th Field Artillery (3/27 FA) at Fort Bragg, North Carolina, for a 2-year extended user evaluation. The 3/27 FA retained those launchers for normal operations, which included use in Iraq.

The HIMARS program entered Engineering and Manufacturing Development as an Acquisition Category (ACAT) II system following the November 1999 Milestone II. In 2002, OSD elevated HIMARS to ACAT IC, and placed it under operational test oversight. The Army deferred the HIMARS ballistic survivability test program until ballistic protection is added to the crew cab in a planned product improvement.

The Army awarded the low-rate initial production (LRIP) contract in March 2003 and plans to equip its first MLRS unit with HIMARS in March 2005. The Army's full-rate production decision review is scheduled for June 2005.

TEST & EVALUATION ACTIVITY

HIMARS completed a Milestone C Review in March 2003. DOT&E approved the Milestone C Test and Evaluation Master Plan on April 28, 2003.

In 1QFY03, the launcher underwent climatic chamber testing, executed convoy operations at the Cold Regions Test Center in Alaska, and conducted component survivability experimentation.

A low reliability estimate from the 4QFY02 Extended System Integration Test (ESIT) prompted initiation of a reliability growth program and development of a Reliability Growth Model that combines data from multiple non-firing and live-firing test events. A 2QFY03 Reliability Growth Test produced a reliability model estimate that exceeds the requirement. System integration and system qualification testing of LRIP upgraded launchers began in fall 2003. Those tests include a second combined developmental/operational ESIT (with two launchers and soldier crews), a two-day operational tempo firing exercise, and a C-130 operational deployment and live-fire demonstration.

High Mobility Artillery Rocket System units will perform the same types of general support, general support reinforcing, and reinforcing missions as current Multiple Launch Rocket System units.

TEST & EVALUATION ASSESSMENT

The launcher chassis, RSV, and RST are mature, fielded, production vehicles, and the Hiab crane is a commercial item. Ninety-five percent of HIMARS software is common with the fielded M270A1 launcher, and the 1QFY04 ESIT will test an engineering release of MLRS/HIMARS software Version H. All but one of the Fire Control System line replaceable units are common with the M270A1, and that HIMARS launcher interface unit has completed system integration testing. HIMARS successfully fired all of the fielded MLRS family of munitions in qualification tests and demonstrated timeline and interoperability key performance parameters during the FY02 ESIT. However, the low-cost fire control panel developed by the M270A1 program experienced problems when initially fielded, and its requalification forced a 3-week delay to the HIMARS launcher upgrades. The low cost fire control panel and an improved weapons interface unit developed for firing Guided MLRS rockets were included in the fall 2003 testing.

A HIMARS Project Office accuracy analysis of HIMARS flight test results suggests that there is no statistically significant difference in the accuracy of basic rockets fired from a HIMARS launcher and those fired from an M270 MLRS launcher. DOT&E will conduct its own analysis of data from flight tests with LRIP configured launchers.

HIMARS is susceptible to ground attack and counterfire. Since the HIMARS cab does not provide ballistic protection for the crew, the crew must rely on concealment between missions, and rapid displacement after missions, to survive. The HIMARS initial operational test, scheduled for 4QFY04, will include a counterfire threat.

Integrated System Control (ISYSCON V4)

ISYSCON is a family of systems that provide personnel the capability to maximize the availability of communications and data distribution systems in support of the combat commander. Two variations of the ISYSCON provide a block strategy in accordance with the requirements document. One variation consists of three upgrades and is referred to as Versions 1-3 ((V)1-3) and the other variation is ISYSCON (V)4. The IOT&E for ISYSCON (V)4 will validate that Block 4 requirements are met.

The ISYSCON (V)4 supports information operations and automation in support of the Army's digitized combat forces, their weapon systems, and the other related battlefield automation systems. It performs two main functions: management of the combat net radio (commonly referred to as the Lower Tactical Internet or wide area network (WAN)) and the Tactical Operations Center local area network (LAN). The ISYSCON (V)4 consists of commercial off-the-shelf, government off-the-shelf, and government-developed software applications implemented on the Force XXI Battle Command, Brigade and Below (FBCB2) Appliqué hardware and the Panasonic CF-28 Toughbook. Although most functions can be performed on both hardware platforms, ISYSCON (V)4 is a bifurcated system as some functionality can only be performed on one of the platforms. At division through battalion, ISYSCON (V)4 provides signal personnel a system to manage the combat net radio based WAN for the digitized force. The ISYSCON (V)4 also provides LAN management services for wired and wireless LANs at all echelons. LAN management includes planning, configuring, fault identification, and fault resolution for all LAN network devices located within the Tactical Operations Centers that support internal, as well as external, communications.

TEST & EVALUATION ACTIVITY

The ISYSCON completed System Segment Acceptance Testing at the contractor's facility in May 2002, and participated in the combined FBCB2/Manuever Control System (MCS)/ISYSCON (V)4 Field Test 5 in September 2002 (development test).

The FBCB2/MCS/ISYSCON (V)4 IOT&E was scheduled in April/May 2003, but has been indefinitely postponed due to deployment of the 4th Infantry Division which was the scheduled test unit.

TEST & EVALUATION ASSESSMENT

The ISYSCON (V)4 Block 4 software successfully completed technical testing at the contractor facilities in May 2002. All three programs went to Field Test 5 in September 2002. Results of Field Test 5 indicate that ISYSCON (V)4 software met two of the five IOT&E entrance criteria and was not on course to participate in the combined IOT&E. However, the Army evaluator assessed that the ISYSCON (V)4 software was ready to deploy, but would require substantial contractor support with network database/address-book management. Field Test 5 results also indicate that MCS was not able to meet its IOT&E entrance criteria. The combined IOT&E was delayed indefinitely because of real world deployments and immature software.

The development of key enablers like Integrated System Control has shown the increased importance of system-of-systems testing.

The ISYSCON (V)4 devices used with the Blue Force Tracker variant of FBCB2 as deployed during Operations Iraqi and Enduring Freedom were at the theater level and operated by contractors. A single Toughbook running modified ISYSCON (V)4 software monitored the locations of all Blue Force Tracker systems. The ISYSCON (V)4 contractor-operators were able to monitor the status of the network and have the satellite providers update location reports when they failed to meet currency requirements.

ISYSCON(V)4 is deployed within the original terrestrial-based communications architecture with the digitized forces of the 4th Infantry Division in Iraq. DOT&E has received no information as to ISYSCON (V)4 performance in support of the 4th Infantry Division.

It is not known when the combined FBCB2/MCS/ISYSCON (V)4 IOT&E can be scheduled due to test unit deployments. The Army is planning to conduct a development test/operational test in 2QFY04 and, combined with available data from Operation Iraqi Freedom, is seeking a full-rate production decision for FBCB2 Blue Force Tracker in FY04. ISYSCON (V)4 is developing a test and evaluation strategy to also support a full-rate production decision in FY04. DOT&E is working with the Army to ensure IOT&E standards are met.

The development of key enablers like ISYSCON has shown the increased importance of system-of-systems testing, and the difficulties that arise in coordinating requirements, development and fielding schedules, threats, scenarios, and test architectures. As the Army continues to move towards the Future Force and Future Combat System, it should derive many lessons learned from these programs and the challenges associated with combined test events.

Joint Land Attack Cruise Missile Defense Elevated Netted Sensor (JLENS)

The Joint Land Attack Cruise Missile Defense Elevated Netted Sensor System (JLENS) is an airborne radar platform designed to provide surveillance and fire control quality radar data on Land Attack Cruise Missiles and other air-breathing targets. The system also acquires and tracks moving surface targets and supports detection of tactical ballistic missiles.

A JLENS system consists of two aerostats, one containing a Surveillance Radar (SuR) and one containing a Precision Track Illumination Radar (PTIR). The aerostats are non-developmental, 71-meter, unmanned, tethered, non-rigid aerodynamic structures filled with helium and air. Each aerostat is tethered to a mobile mooring station and attached to a processing station via a fiber optic/power tether. The SuR provides the initial target detection and then cueing to the PTIR, which generates a fire control quality track. The JLENS system is integrated into the Joint Tactical Architecture via Link 16, Cooperative Engagement Capability, Single-Channel Ground and Air Radio System, and Enhanced Position Location Reporting System. The system provides key contributions to generation of a Single Integrated Air Picture, through the fusion of high accuracy long-range tracking and target classification information with that of other sensors in the Joint Air and Missile Defense architecture. Both radar systems will include Identification, Friend or Foe interrogators.

Weapons systems, such as Patriot, Navy Standard Missile, the Marine Corps Complementary Low Altitude Weapons System, and the Army Surface Launched Advanced Medium-Range Air-to-Air Missile (SLAMRAAM), can use the JLENS PTIR data to engage low-flying terrain-masked cruise missiles before their own ground-based sensors can detect them. JLENS supports air-directed surface-to-air-missile and air-directed air-to-air missile engagements through both the engage-on-remote and forward-pass mechanisms.

The Army restructured the JLENS program in FY03. The Block 1 program now consists of three spirals. The first spiral involves the integration of AN/MPQ-64 radars on 32-meter aerostats. Spiral 1 will demonstrate the JLENS concept; support the development of Tactics, Techniques and Procedures (TTP); and support the SLAMRAAM program. Only one Spiral 1 system will be produced. Spiral 2 consists primarily of hardware and software upgrade in a laboratory environment. Spiral 3 is the development and integration of the PITR on 71-meter aerostats.

The JLENS program deployed a 15 meter aerostat to Afghanistan in support of Operation Enduring Freedom. The aerostat carried an electro-optical/infrared package to support force protection activities.

TEST & EVALUATION ACTIVITY

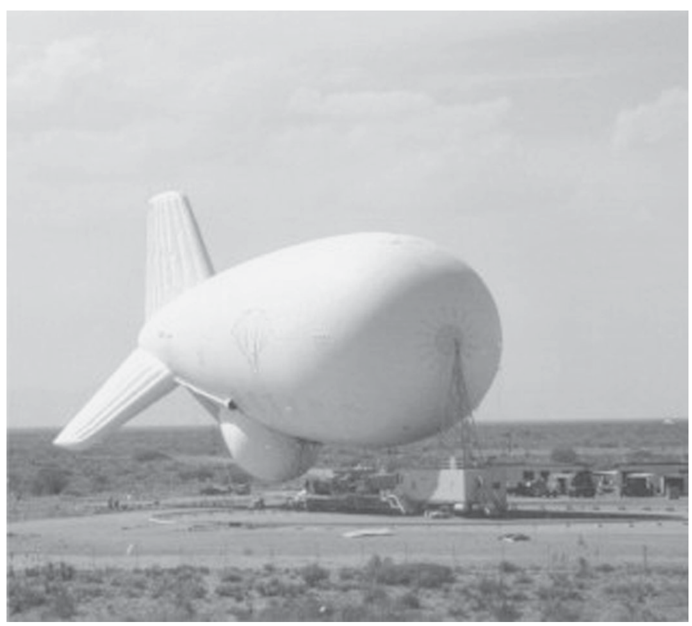
The Army initiated test planning with the formation and convening of a JLENS Test and Evaluation Working Integrated Product Team.

The draft Test and Evaluation Master Plan is being updated to reflect the program’s spiral acquisition strategy.

Completion of the Test and Evaluation Master Plan remains dependent on the approval of a Capability Development Document.

TEST & EVALUATION ASSESSMENT

JLENS was scheduled for demonstrations during Roving Sands 03, which was cancelled due to Operation Iraqi Freedom.



The Joint Land Attack Cruise Missile Defense Elevated Netted Sensor System is an airborne radar platform designed to provide surveillance and fire control quality radar data on Land Attack Cruise Missiles and other air-breathing targets.

Joint Simulation System (JSIMS)

The Joint Simulation System (JSIMS) is a single, distributed, and seamlessly integrated simulation environment that permits integration of real-world and simulated assets of the United States military Services and their allies on a virtual battlefield. The JSIMS virtual battlefield is simulated by a high-level architecture-compliant federation of component models. The component models include the National Air and Space Model, Warfighters' Simulation (WARSIM), WARSIM Intelligence Model, JSIMS Maritime, the Defense Intelligence Agency's Deployable Intelligence Simulation for Collaborative Operations, Joint Signals Intelligence Simulation, and National Simulation. JSIMS will provide a real-time simulation capability that can be configured for use in exercises of differing duration, scenarios, and complexities. It interfaces with real-world command, control, communications, computers, and intelligence (C4I) systems, providing a training environment that is transparent to the training audience. JSIMS will include scenarios that reflect the transition of military forces into less conventional roles such as multi-national peacekeeping and humanitarian assistance. At initial operational capability, JSIMS will provide an accredited simulation environment to support joint training for unified combatant command staffs, joint task force commanders and staffs, and joint task force component commanders and staffs. At full operational capability, JSIMS will evolve to support professional military and senior officer education, mission planning, mission rehearsal, and doctrine development.

TEST & EVALUATION ACTIVITY

In October 2002, the Joint Warfighting Center (JWFC) conducted System Functional Assessment 2 in Suffolk, Virginia – the second in a planned series of user evaluations of interim product deliveries from the JSIMS Program Office.
In December 2002, the JSIMS program conducted the systems test, the developmental test preceding release of JSIMS Version 1.0 to the JWFC, in the JSIMS Integration Facility in Orlando, Florida.

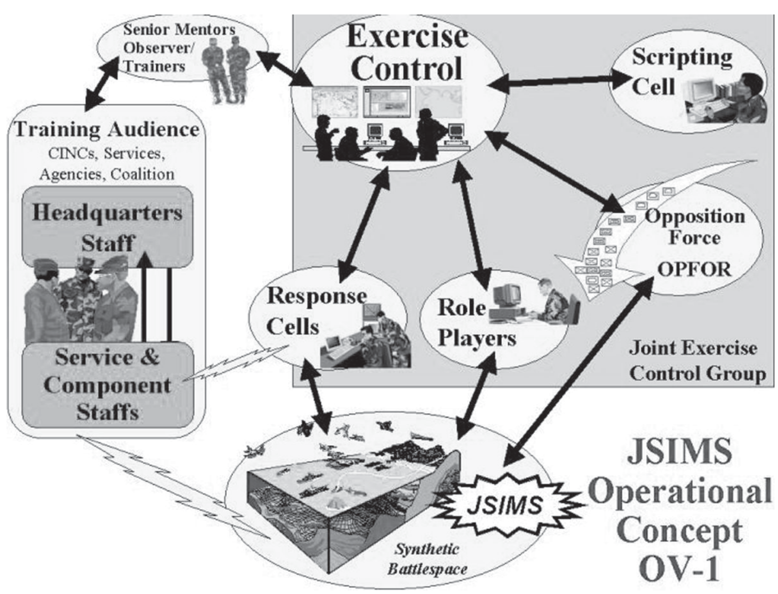
Shortly after the completion of the system test, the Deputy Secretary of Defense issued a Program Decision Memorandum in December 2002 that terminated JSIMS development at the end of FY03.

In March 2003, the JWFC conducted System Function Assessment 3 of JSIMS Version 1.0 at the JWFC. The United States Joint Forces Command (USJFCOM) chaired a flag officer review of the validation results in April 2003.

From April through May 2003, the JWFC continued domain-specific validation testing of JSIMS Version 1.0.1, the first maintenance update to JSIMS Version 1.0, at the JWFC.

The JSIMS program delivered JSIMS Version 1.0.2, the new record maintenance update, in May, but the JWFC did not resume validation testing, as the product was still incomplete. The JSIMS program delivered JSIMS Version 1.0.3, the third maintenance update in July, and the JWFC resumed validation testing in September.

The JSIMS program office conducted its final verification test in September 2003 at its integration facilities in Orlando, Florida.



As the result of formal program termination, an initial operational test of Joint Simulation System has been indefinitely postponed and it has been removed from the OSD test and evaluation oversight list.

TEST & EVALUATION ASSESSMENT

The developmental and user tests have demonstrated that JSIMS Version 1 consistently has problems with setup at user sites, initialization of a federation of component models, stability of operations, running at the required rate of real time even with small scenarios, interfacing with C4I systems, and incomplete and error-prone functionality. All of these difficulties justified suspension of validation testing at the JWFC after the USJFCOM review in April 2003.

The scheduled events continued to slip. In accordance with the Program Decision Memorandum, user validation was to be complete by the end of FY03. Due to the immaturity of the software, validation has now been extended into 1QFY04. USJFCOM has suspended planned use of JSIMS in support of joint task force training exercises until the software can meet the required standards.

The Program Decision Memorandum directed an Analysis of Alternatives (AoA) be conducted in FY04 to determine options for Joint Task Force Commander Training. DOT&E will support the AoA as needed. As the result of formal program termination, an initial operational test of JSIMS has been indefinitely postponed and it has been removed from the OSD test and evaluation oversight list.

On October 1, 2003, the JSIMS Program Office was closed and the JWFC took responsibility for JSIMS. The Program Decision Memorandum provides limited funding to maintain the existing software and to fix known problems. At this point, no new development on JSIMS is expected.

Joint Tactical Radio System (JTRS)

The Joint Tactical Radio System (JTRS) is a family of high-capacity, programmable, multi-band/multi-mode tactical radios that provides both line-of-sight and beyond-line-of-sight communication capabilities to the warfighter. The JTRS program will eventually replace DoD's current inventory of some 750,000 hardwired tactical radios of various, independently developed families and versions with some 250,000 modular, programmable JTRS radios. JTRS uses software defined radio technology to achieve flexibility, interoperability, and ease of upgrade. The Joint Requirements Council validated the updated JTRS Operational Requirements Document Version 3.2 in March 2003.

The Software Communications Architecture (SCA), a nonproprietary open systems architecture, is an essential component of the JTRS strategy and is the basis for software waveforms. The JTRS Joint Program Office maintains the SCA and software waveforms, while the Services develop the Joint Tactical Radio (JTR) sets in Service-led acquisition efforts (called clusters). The Army-led Cluster 1 is developing JTR sets for Army and Marine Corps ground vehicular, Air Force Tactical Air Control Party ground vehicular, and Army rotary wing applications. The Special Operations Command-led Cluster 2 is upgrading an existing handheld radio, the Multiband Inter/Intra Team Radio, to SCA compliance. The Navy-led Cluster 3 is developing JTR sets for maritime and fixed-station applications. The Air Force-led Cluster 4 program will develop airborne JTR sets. The Army-led Cluster 5 program is developing handheld, manpack, and small form-fit sets suitable for embedding in the Army's Future Combat Systems and other platforms requiring a small radio. A cluster for space applications is also being considered.

The JTRS SCA originally applied to waveforms operating at frequencies from 2 megahertz to 2 gigahertz. In June 2003, the ASD(NII) expanded the scope of the JTRS SCA to all waveforms operating at frequencies above 2 gigahertz.

TEST & EVALUATION ACTIVITY

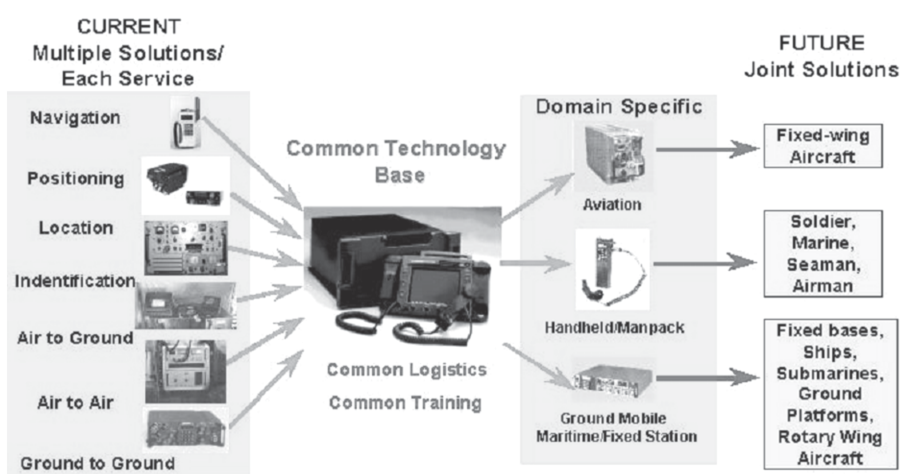
Cluster 1 completed several designs in a series of design reviews and continued planning for the early operational assessment scheduled for December 2004 using pre-engineering development model radios. Government developmental testing, followed by a limited user test, is scheduled in FY05/FY06 using engineering development model radios.

Cluster 3 initiated activities for a Milestone B review in 2QFY04. The Test and Evaluation Integrated Product Team met in September 2003 to develop the test strategy and begin work on the Test and Evaluation Master Plan.

Cluster 4 initiated pre-Milestone B activities and coordinated the Single Acquisition Management Plan. Cluster 4 is planning completion of Milestone B in 2QFY05.

Cluster 5 was established as an Acquisition Category 1C program in a May 2003 Acquisition Decision Memorandum. The Cluster 5 program has begun development of program documentation to support Milestone B in 2QFY04. The Test and Evaluation Integrated Product Team has met to develop the overall test strategy and Test and Evaluation Master Plan.

OSD approved the JTRS Joint Test and Evaluation Master Plan in October 2002.



The Joint Tactical Radio System is a family of high-capacity, programmable, multi-band/multi-mode tactical radios.

TEST & EVALUATION ASSESSMENT

The JTRS Cluster 1- Ground and Rotary Wing is aggressively executing the planned program and refining the design of the Cluster 1 radios. The Program Office delayed the early operational assessment by four months, to December 2004, to accommodate concerns over the maturity and anticipated functionality of the JTR sets. The functionality of the JTR sets for the early operational assessment continues to evolve. The program schedule, identified as high-risk at Milestone B, continues as high-risk.

The JTRS Cluster 3- Maritime/Fixed Station is planning Milestone B in 2QFY04. The program is coordinating required documentation through the various integrated product teams. The basic acquisition strategy states that contracts are awarded at Milestone B to two prime system contractors. The program will then select one of the prime system contractors to continue into system demonstration at the Critical Design Review in 2005. The system demonstration phase culminates with an operational assessment and Milestone C decision in 2007 for the program to enter low-rate initial production in order to support an operational test and full-rate production decision in 2008/2009. Risks are similar to those identified for the JTRS Cluster 1, particularly risks associated with the success-oriented schedule and budget.

The JTRS Cluster 4- Airborne initiated its pre-system development and demonstration phase for requirements definition, conceptual design efforts, and airborne network architecture definition. DOT&E provided comments on the Single Acquisition Management Plan and identified concerns with the schedule and proposal to possibly use engineering developmental models in the IOT&E. When started, the Test and Evaluation Integrated Product Team will further discuss these concerns when developing the test strategy and the Test and Evaluation Master Plan.

The JTRS Cluster 5- Handheld, Manpack, and Small Form-Fit sets initiated activity as a result of the May 2003 Acquisition Decision Memorandum. The Test and Evaluation Integrated Product Team met to develop a test strategy starting in July 2003. Concerns include the aggressive schedule, ability of initial products to fulfill all requirements of the Block I Operational Requirements Document, and the proposal to use engineering developmental models for the Block I operational test. The Test and Evaluation Integrated Product Team will address these concerns when developing the Test and Evaluation Master Plan.

An emerging concern across the JTRS Clusters is the proposal to use engineering developmental models in their IOT&E to alleviate aggressive development and fielding schedules. The various definitions and maturity standards for engineering developmental models could encompass production representative equipment. However, OSD policy is that the equipment used in operational testing be production-representative in functionality and essential physical characteristics to support accurate and valid assessments of operational effectiveness, operational suitability, and survivability. DOT&E will continue to apply this standard to any equipment entering IOT&E regardless of its designation.

Kiowa Warrior (OH-58D)

The OH-58D Kiowa Warrior is a two-seat, single engine armed reconnaissance helicopter. It features a mast-mounted infrared sensor, television sensor, and laser range-finder/designator. Universal weapons pylons are mounted on both sides of the aircraft, capable of accepting combinations of the semi-active laser Hellfire missile, the Air-to-Air Stinger missile, 2.75 inch Folding Fin Aerial Rocket pods, and a 0.50 caliber machine gun. In addition to targeting and weapons systems, recent Kiowa Warrior upgrades include improvements in air-to-air and air-to-ground communications, mission planning and management, available power, survivability, night flying, and reductions in crew workload through the use of on-board automation and cockpit integration. The primary mission of the Kiowa Warrior is armed reconnaissance in air cavalry troops and light attack companies. In addition, the Kiowa Warrior may be called upon to participate in Joint Air Attack operations, air combat, limited attack operations, or artillery target designation. The prime contractor is Bell Helicopter Textron, Inc.

The Kiowa Warrior is an Acquisition Category II program with an Army acquisition objective of 411 Kiowa Warriors. Due to attrition, the current fleet inventory is 373 aircraft.

Over time, concerns surfaced regarding the impact of weight growth on the aircraft's power margin, endurance and auto-rotation performance, and the impact of several important Interim Statements of Aircraft Qualification restrictions on the operational utility of the Kiowa Warrior. To address these and other concerns, the Army is executing a Safety Enhancement Program (SEP) for the OH-58D Kiowa Warrior that incorporates an improved engine with full authority digital electronic control, crashworthy crew seats, air bags, improved master controller processor, and data modem. The intention of the SEP is to improve engine reliability and crew crash protection, reduce pilot workload during emergency maneuvers, and provide additional digitization capabilities. Current funding for the SEP will modify 301 of the required 354 aircraft. There is an unfunded Army requirement of approximately $90 million for the additional aircraft. The SEP began in FY98. As of December 2003, the upgrade is complete on 192 aircraft.

TEST & EVALUATION ACTIVITY

The Army conducted flight-testing and assessments of upgraded Control & Display System (CDS) software during FY03. Elements of the assessment include software verification; generation of data necessary to support the evaluation of the operational effectiveness and suitability of the Improved Data Modem (model 304); assessment of the Common Transponder (CXP) performance; and conduct of a preliminary airworthiness evaluation addressing the aircraft's handling qualities.

The participation of the Kiowa Warrior in Operation Iraqi Freedom continues to provide information concerning effectiveness and suitability for the system and the units who fly and employ the system.

The DOT&E approved LFT&E strategy identifies the resources (hardware, tests, and schedule) necessary for an adequate vulnerability assessment program and outlines a two-phase ballistic program. The ballistic program will investigate the vulnerability of the main rotor blade and the main rotor mast mounted sensor system. The intention of the two-phase strategy is to assess ballistic damage tolerance under static (loaded and unloaded components) and dynamic (fully rotating rotor system) conditions. The Kiowa

The Kiowa Warrior performing a reconnaissance mission in support of Stabilization Forces in Bosnia.

Warrior live fire testing for the static (Phase I) effort is complete. The Army Research Laboratory intends to conduct the Dynamic (Phase II) testing during 1QFY04.

The Army is proposing to concede some dynamic testing of the mast-mounted sensor - given that it failed the static testing - and desires to replace that segment of the test with a new additional test of the crew seat armor.

TEST & EVALUATION ASSESSMENT

The Kiowa Warrior is making steady progress in integration testing of its latest control and display system (CDS-4) with the improved data modem, the tactical internet, and fire control systems. Testing results reflect no significant issues. In Operation Iraqi Freedom, SEP-modified aircraft and the addition of engine barrier filters (EBFs) greatly increased the operational effectiveness, suitability, and survivability of Kiowa Warrior units. Prior to the fielding of EBFs, Kiowa Warrior units were experiencing engine failures in sand and dust environments in as little as seven hours of operation. About the best that units could expect the aircraft to operate, without engine failure related problems, was 300 hours. The engine is designed to last between 1,500 and 1,750 hours between overhauls depending on the model. EBF fielded units are experiencing no incidents of engine or compressor erosion and are getting full 1,500- 1,750 hours out of their engines. As a result, units are able to focus more on their mission.

The Army is conducting an adequate live fire test program. The Phase I static test effort is complete as of the end of FY03 with no significant issues identified. During the dynamic Phase II of the live fire test program, the Army plans to utilize a crashed OH-58 to serve as the operational ground test vehicle; restoration and repair of the vehicle is complete. Plans call for the Army to complete this second phase in early FY04.

Land Warrior

The Land Warrior is a first-generation integrated fighting system designed to enhance Infantry team combat power and situational awareness. The Army purports Land Warrior will enhance small-unit lethality, command and control, survivability, mobility, and sustainment. Land Warrior integrates everything that the soldier wears or carries into a system-of-systems.

Land Warrior consists of five sub-systems:

- Computer/radio sub-system including a computer, soldier intercom, leader radio, and navigation/Global Positioning System.
- Integrated helmet assembly sub-system including a helmet-mounted display and a night image intensification device.
- Weapon sub-system with currently fielded M4 modular weapon system, thermal weapon sight, close combat optic, infrared aiming light, laser range finder, and digital compass capabilities.
- Software sub-system.
- Protective clothing and individual equipment sub-system including body armor, nuclear, biological, and chemical protective clothing, laser protective eyewear, and load-bearing equipment.

The program integrates a combination of Land Warrior-developed equipment, organizational clothing and individual equipment, and other government furnished equipment. When completely fielded, Land Warrior will be fully interoperable with digital command and control systems of other platforms.

The Land Warrior acquisition strategy has changed from what was reported last year. Previously, the Program Office intended to field three versions of the Land Warrior system: Land Warrior- Initial Capability (LW-IC), Land Warrior- Stryker Interoperable, and Land Warrior- Advanced Capability. These versions were designed to meet one of the three blocks of requirements defined in the Land Warrior Operational Requirements Document (ORD). The Block I Land Warrior-Initial Capability acquisition was terminated because of technical and reliability issues. The current acquisition strategy is to acquire Block II Land Warrior- Stryker Interoperable systems that are interoperable with Stryker Medium Armored Vehicles. Block I and II functionality requirements will be met with this version. The Program Office will add functionality to provide the system with additional capabilities to allow interoperability with the Army's Future Combat Systems. The Land Warrior- Advanced Capability version will be designed to meet undefined Block III requirements.

The Land Warrior is a first-generation integrated fighting system designed to enhance Infantry team combat power and situational awareness.

The Army Acquisition Executive approved a restructured Acquisition Strategy and Program Baseline on September 30, 2003.

An Early Operational Experiment (EOE) with ten surrogate prototypes was conducted from October to December 1996 at Fort Benning, Georgia. This EOE provided human factors information on helmet and load-bearing equipment. Additionally, the EOE was used to aid in the development of tactics, techniques, and procedures. Land Warrior was originally scheduled to begin operational testing in FY98. Due to hardware problems during technical testing in April 1998, the Program Manager halted further system development pending an overall program review and subsequent program restructuring. As a result, OSD placed Land Warrior on oversight in April 1998.

TEST & EVALUATION ACTIVITY

There have been no operational tests to date. Land Warrior participated in the Joint Contingency Force Advance Warfighting Experiment (JCF AWE) conducted at the Joint Readiness Training Center, Fort Polk, Louisiana, in September 2000. During the JCF AWE, a platoon from the 82nd Airborne Division, equipped with prototype Land Warrior systems, demonstrated the potential of Land Warrior to enhance tactical movement, survivability, and situational awareness. Combined contractor and developmental testing for the restructured program began in August 2002 and demonstrated the presence of LW-IC functionally while also establishing a program reliability baseline.

LW-IC met developmental testing criteria in September 2002. Government testing during November 2002 indicated that the LW-IC reliability was low. An early functional assessment by U.S. Army Rangers during February 2003 concluded that the LW-IC systems were not reliable. The Program Manager halted developmental testing in March 2003.

The Land Warrior Test and Evaluation Master Plan (TEMP) was approved at the Army level in October 2003 and forwarded to OSD. The revised Land Warrior TEMP that reflects the restructured acquisition strategy is under review. The Program Manager has scheduled the initial operational test for FY06.

TEST & EVALUATION ASSESSMENT

The LW-IC effort was canceled because of low reliability in developmental testing. Two Limited User Tests will be conducted prior to the IOT&E in order to reduce the risk of previous reliability and power problems associated with the program. In addition, Land Warrior and Future Combat Systems integration will likely be a challenge in any future operational test events linking the two systems.

Line-of-Sight Anti-Tank Missile (LOSAT)

The Line-Of-Sight Anti-Tank Missile (LOSAT), an Acquisition Category II anti-tank weapon system, is intended to provide lethal fire to defeat any known or projected armor systems at ranges greater than 4,000 meters. It uses kinetic energy as its kill mechanism and is the first of the Army's Kinetic Energy Missile programs. The Army will mount LOSAT on a High Mobility Multi-Purpose Wheeled Vehicle (HMMWV) chassis, as a supplemental anti-armor capability for light divisions equipped with tube-launch optically-controlled wire-guided and Javelin anti-tank systems. The basic organizational unit for LOSAT will be a five-man squad equipped with two HMMWVs and a high-mobility missile resupply trailer. One HMMWV, called the Fire Unit (FU), will be the LOSAT missile launch vehicle and will carry four ready-to-fire missiles. The fire control system in the FU is based on the Improved Bradley Acquisition System, which features an acquisition system using a second-generation forward-looking infrared sensor and a daylight TV. The resupply HMMWV will tow the resupply trailer, which will carry eight additional missiles. The system will be deployable by strategic and tactical airlift (C-5, C-17, C-130) and external air transport (via UH-60L and CH-47 helicopters).

TEST & EVALUATION ACTIVITY

During 2003, the government continued manrating and early soldier involvement. Manrating assures the system is safe for manned use in an operational environment. Early soldier involvement is a human systems integration activity to ensure operator displays, controls, and other man/machine interfaces are appropriate and useful.

DOT&E approved the LFT&E strategy as a part of the Test and Evaluation Master Plan in June 2003. Shortly after, the LOSAT Lethality Event Design Plan and Detailed Test Plan were also approved.

The first developmental test (DT) shot that provided data for the LFT&E lethality assessment occurred in July 2003 against a simulated reinforced urban structure. The missile struck the target and destroyed it. Several other DT shots, not intended to provide LFT&E data, were fired at moving and stationary tank targets in FY03.

Additionally, the Army will conduct Dismounted Battlespace Battle Lab Demonstrations in FY04 at Eglin Air Force Base, Florida, and Fort Bragg, North Carolina, to examine tactical deployability and military utility. A Limited User Test in 2QFY04, to support the low-rate initial production decision, will follow these demonstrations. The seven DT shots planned to support lethality LFT&E are planned for 2QFY04. LFT&E vulnerability testing will begin in early FY04, with expected completion by early FY06, to support the LFT&E independent assessment of the LOSAT lethality and vulnerability prior to the full-rate production milestone. The Army will conduct an IOT&E consisting of live firings and combined vulnerability and lethality evaluation portions of the LFT&E strategy. The Army Test and Evaluation Command will conduct these events concurrently with IOT&E force-on-force exercises in the second half of FY05.

TEST & EVALUATION ASSESSMENT

The kinetic energy missile is lethal when it hits its intended target. Live missile firings in DT established the missile's ability to hit and destroy a reinforced urban structure and a moving tank at relatively close range off-angle. Test firings against more challenging targets (e.g., evasively moving and multiple targets) and under more demanding conditions (e.g., extreme environments and countermeasures) remain.

The Line-of-Sight Anti-Tank Missile uses kinetic energy as its kill mechanism and is the first of the Army's Kinetic Energy Missile programs.

Recently, the Army delayed the missile flight program so the Program Manager can investigate cracks that appeared in a heat-conditioned missile motor. The heat cracks are a safety concern and the delay in the firing program will impact the safety release for man-in-the-cab missile firings.

The survivability of the overall system is an issue. The Program Manager chose to trade some ballistic protection for enhanced deployability (to ensure that the LOSAT system remains sling-loadable from a UH-60L helicopter). The LFT&E program will assess the degree to which the LOSAT system, including the missile, both HMMWV vehicles, and the loaded trailer, is vulnerable to the expected threats. This program describes critical vulnerability and lethality issues and the scope of testing needed to address them, including the need for more than one FU for full-up, system-level LFT&E to support the planned full-rate production decision.

Maneuver Control System (MCS)

The Maneuver Control System (MCS) is the command and control system for Army maneuver elements in battalion through corps echelons. MCS consists of a network of computer workstations that integrate information from subordinate maneuver units with those from other Army Battle Command System (ABCS) battlefield functional areas to create a single, integrated common operational picture. Tactical information products, such as situation maps and reports, allow the display and manipulation of this information. MCS also provides a means to create, coordinate, and disseminate operational plans and orders. MCS's role in communicating battle plans, orders, and enemy and friendly situation reports makes it a central component of the Army's ongoing effort to digitize the battlefield. MCS capabilities are being developed in blocks. The MCS Block III initiated, and the current Block IV increases, the integration between the ABCS components: All Source Analysis System; Forward Area Air Defense C3I System; Advanced Field Artillery Tactical Data System; Combat Service Support Control System; and Force XXI Battle Command, Brigade and Below. MCS Block V development began in FY03. Block V shifts development away from the Unix-based MCS workstation environment to a Microsoft Windows-based laptop.

The Army conducted the MCS Block III IOT&E in June 1998. DOT&E concluded that MCS Block III was neither operationally effective nor operationally suitable. The Army subsequently restructured the MCS program, did not field the Block III, and designated the Block IV as the version planned for testing in IOT&E to support the full-rate production decision. In 2002, the Army reviewed the operational requirements for all of the ABCS components to better support the Army transformation to the objective force and the Future Combat System. The resulting requirements support the MCS Block IV testing and the planning for development of future MCS versions.

TEST & EVALUATION ACTIVITY

The Army indefinitely postponed the MCS IOT&E, originally scheduled for April/May 2003, due to deployment of the test unit. The Army has not been able to reschedule the IOT&E. The Army and DOT&E are exploring venues to complete an IOT&E for the MCS.

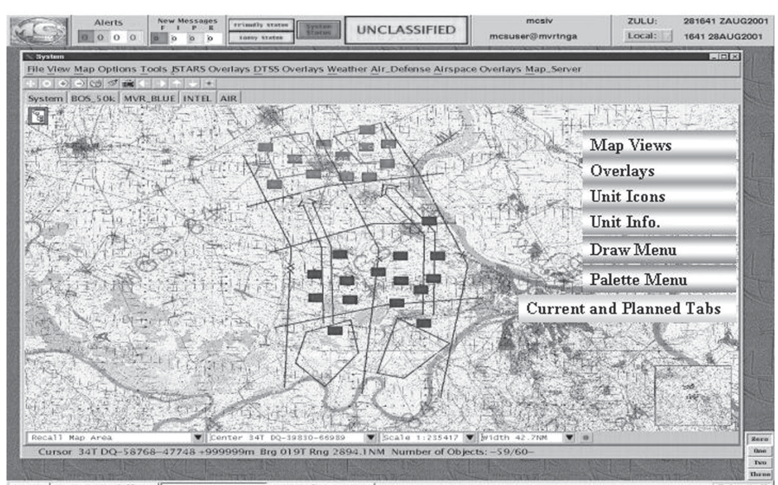
The Joint Requirements Oversight Council approved the revised Operational Requirements Document on December 10, 2002.

The MCS completed a customer test in May 2003 to complete open software discrepancy reports and to provide information on system maturity.

The Army will submit the MCS Test and Evaluation Master Plan for OSD approval when the IOT&E strategy and schedule are defined.

TEST & EVALUATION ASSESSMENT

The Army postponed the MCS IOT&E when the test unit deployed to Operation Iraqi Freedom. At the time of the postponement, the MCS did not meet the entrance criteria for the IOT&E. Because of the uncertainty of this schedule and synchronization of ABCS software products, MCS has not been able to execute a more extensive test event to resolve remaining deficiencies. The Program Office has solutions to the high priority deficiencies that will be demonstrated in a coordinated manner as the other ABCS products mature.



The Maneuver Control System consists of a network of computer workstations that integrate information to create a single, integrated common operational picture.

The test unit, 4th Infantry Division, deployed to Operation Iraqi Freedom with its full complement of MCS systems and digital tactical operations centers. No information has been made available to DOT&E as to how these systems are performing in support of current operations.

The May 2003 customer test successfully demonstrated correction of several software discrepancy reports. However, due to test limitations, several software discrepancy reports remain open. System maturity continues to improve and the MCS individual workstation functions were stable during the test. However, the network and database functions and procedures that integrate MCS and the Army Battle Command Systems into a digital command and control system remain problematic and fragile.

The Army and DOT&E are working to find acceptable alternative venues, such as warfighter exercises, to accomplish an IOT&E in support of a full-rate production decision as soon as possible.

Precision Guided Mortar Munitions (PGMM)

Precision Guided Mortar Munition (PGMM) is a 120mm mortar munition that will provide the maneuver Commander with an organic capability for precision attack of critical point targets, to include those in urban environments or restrictive terrain, under all weather conditions to ranges beyond current 120mm mortar capabilities. PGMM is intended to incapacitate personnel in standard brick over block masonry structures, collapse earth and timber bunkers or incapacitate personnel inside, and defeat stationary lightly-armored vehicles or incapacitate personnel inside. PGMM will be compatible with all current and future mortar and mortar fire control systems. PGMM's terminal guidance will employ a man-in-the-loop laser designator to ensure precision engagement and to minimize collateral damage.

PGMM is an Acquisition Category II evolutionary development program. Increment I will provide the ability to engage and defeat/incapacitate point targets at ranges comparable to current 120mm mortar munitions: 7.2 km when fired from current mortar systems and 8.0 km when fired from the Future Combat System, non-line-of-sight (Mortar). Increment II is planned to increase the engagement range to 12 km. Increment III is planned to increase the engagement range to 15 km, adding the capabilities to defeat moving, lightly-armored vehicles, to destroy additional masonry targets, and to maneuver off of the gun-target line.

The PGMM program began as part of the Rapid Force Projection Initiative Advanced Technology Demonstration (ATD) in 1995. By 2001, the ATD produced a technology demonstrator 120mm mortar round that incorporated gyroscopic guidance with a laser seeker on a maneuverable airframe capable of a controlled-glide flight profile. Following the ATD in 2002, a Component Advanced Development (CAD) effort focused on the identification and selection of warhead and fuze technologies to support threshold lethality requirements.

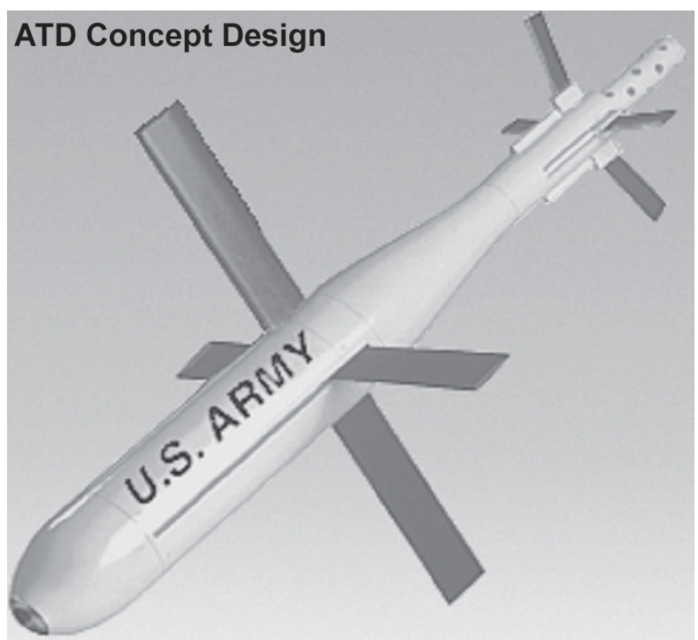
PGMM's Increment I entered its System Development and Demonstration (SDD) Phase with a conditional Milestone B decision in September 2003. The program has scheduled a Milestone C decision in 4QFY06, an IOT&E in 1QFY08, and a full-rate production (FRP) decision at the end of 3QFY08. The Army plans Milestone B decisions for Increments II and III in FY08 and FY10, respectively.

DOT&E placed PGMM under oversight in March 2003.

TEST & EVALULATION ACTIVITY

Testing in 2003 focused on fuze and warhead design and technology demonstration. Dynamic air-gun test firings against bunkers, masonry walls, and light-armor vehicle plating characterized the penetration capabilities of multiple munition and fuze designs. Static test firings of the CAD design high explosive warhead provided fragmentation panel and overpressure data to support estimates of lethality. In February, the Army published a request for proposal for the PGMM SDD/low-rate initial production (LRIP) contract. The Army received five proposals and plans to select a contractor for SDD and LRIP and award the contract by the end of 2003.

DOT&E worked with the PGMM Integrated Product Team to develop an adequate Milestone B Test and Evaluation Master Plan (TEMP). This TEMP includes a comprehensive LFT&E strategy that integrates LFT&E with developmental and operational test events. A formal TEMP update will be done after SDD contractor selection.



Precision Guided Mortar Munitions will be compatible with all current and future mortar and mortar fire control systems.

TEST & EVALUATION ASSESSMENT

In ATD and CAD testing, guidance, airframe, control actuation, sensor (laser detector), and warhead/fuze subsystems demonstrated appropriate technology readiness levels for entry into the SDD phase of acquisition.

The Milestone B TEMP establishes appropriate LRIP and IOT&E entrance criteria and describes sufficient operational and live fire testing to support major program decisions. A Limited User Test will support an operational assessment before the Milestone C LRIP decision, and robust LFT&E and IOT&E programs will support the FRP decision. End-to-end firings of all-up rounds will constitute the principal source of live fire test data; there will be no dedicated LFT&E events. The TEMP update after the contractor selection will provide details of SDD contractor and government developmental test plans and may modify portions of live fire and operational test plans. This update will also include a comprehensive and executable Reliability Growth Program.

Because soldiers have not previously employed laser designators for the terminal guidance of mortar munitions, DOT&E's system evaluation will include an assessment of the effectiveness of the tactics, techniques, and procedures for the employment of PGMM, to include limitations on laser designator employment.

Since the PGMM ORD requires the minimization of collateral damage, as compared to that caused by other available munitions, DOT&E will require a detailed plan to assess this capability.

The January 2003 PGMM Acquisition Strategy and Acquisition Plan stated that the Army plans to award an FRP contract through full and open competition. Should a contractor other than the SDD/LRIP contractor be selected for this award, additional testing will be required for an adequate assessment of operational effectiveness and suitability.

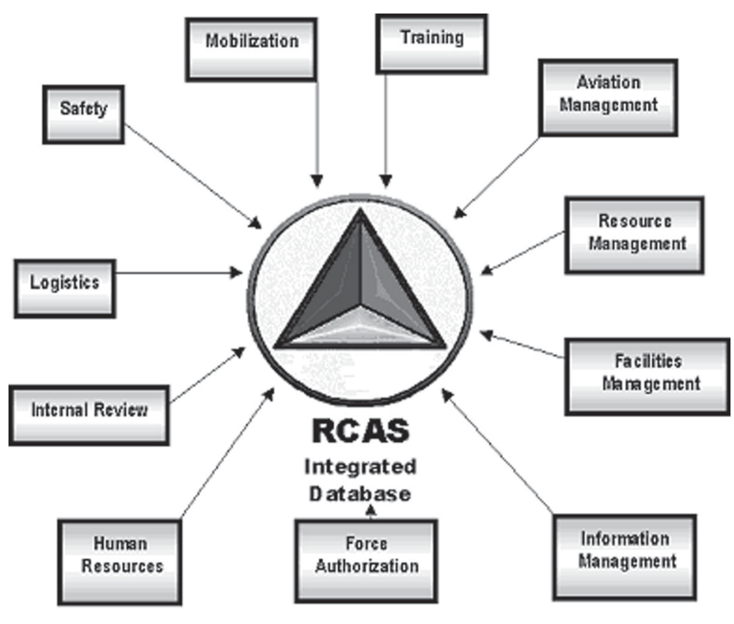
Reserve Component Automation System (RCAS)

The Reserve Component Automation System (RCAS) is a scalable, open-systems environment, automated information system that supports commanders with information needed for Reserve Component mobilization and day-to-day administrative operations. It is a sustaining base networked system of workstations, primarily employing commercial off-the-shelf (Microsoft Office® and Windows NT®, etc.) and government off-the-shelf software applications (Unit Level Logistics System, Standard Property Book System-Redesigned, and Standard Installation/ Division Personnel System - ARNG, etc.). RCAS will interface with numerous DoD and Army systems, and certain National Guard and Army Reserve designated standard systems. RCAS will not deploy with mobilized units, but will supply data to support mobilization.

RCAS was developed and deployed in eight increments. The RCAS Increment 8 Limit User Test (LUT) tested all the administrative functionality in the RCAS Increment 8 software package. The LUT included regression testing to ensure the new software functionality and operating system upgrades did not negatively affect previous installed functionality at all operational integration sites. The test consisted of mobilization scenarios with focus on specific tasks related to unit mobilization. The test consisted of a planned continuity of operations plan. During the continuity of operations plan, the team observed the unit's ability to shut down the RCAS server and conduct recovery operations without loss of data. These eight increments of RCAS were found effective and suitable. Increment 8 was fielded in August 2003.

TEST & EVALUATION ACTIVITY

The Army Test and Evaluation Command executed an operational test for RCAS Increment 8 from February 14 to April 11, 2003. The objective of the test was to determine the effectiveness, suitability, and survivability of RCAS with the addition of Increment 8 software. Primary among the enhancements of Increment 8 software were three new RCAS applications. They are External Interface Error Reporting (EIER), Integrated Data Viewer – Safety and Occupational Health (IDV-SOH), and Permanent Order System (POS). EIER provides the system administrators a consolidated error reporting capability for external interfaces. IDV-SOH provides RCAS regional/state sites the capability to view, but not edit, safety and occupational health data entered regional sites. POS supports the creation, modification, and dissemination of permanent orders for Modified Table of Organization and Equipment and Table of Distribution and Allowances Reserve Component units. Two previously fielded applications were enhanced with additional capabilities in Increment 8. They were the Force Authorization Enhancement III (FA) and the Mobilization Planning Data Viewer – II (MPDV-II). The FA Enhancement III has new search filter elements and ad-hoc reporting. MPDV-II now includes logistics functions and enhanced the form for integration of soldier readiness.



The Reserve Component Automation System is a scalable, open-systems environment, automated information system that supports commanders with information needed for Reserve Component mobilization and day-to-day administrative operations.

The general test concept was to observe users performing typical actions in their normal operational environment, and collect user inputs regarding the new RCAS functionalities using web-based questionnaires and direct user interviews. Additional data was collected by server-installed monitoring software and tester reviews of relevant logs, reports, and other documentation. The data collected was evaluated against 117 published measures of effectiveness and performances. Test units included the National Guard and Army Reserve

Headquarters, Delaware Army National Guard, and sites of the 99th Army Reserve Regional Support Command in Pennsylvania and Virginia.

Regression testing conducted on all seven previous increments showed that Increment 8 did not adversely effect the system's operations. Continuity of Operations testing was successfully exercised by the Delaware Army National Guard.

TEST & EVALUATION ASSESSMENT

The Increment 8 operational test found that, although some features had shortcomings, all five new or enhanced RCAS applications operated in an acceptable fashion. The threshold for successful completion of RCAS developed application transitions is 95 percent. The POS was used extensively with the activities to support Operation Enduring Freedom and Operation Iraqi Freedom. POS, IDV-SOH, and EIER each exceeded the threshold of a 95 percent success rate in attempted transactions. The enhancements made to the previously delivered mobilization application significantly reduced the time to mobilize, once paper mobilization records were converted to electronic documents. A few common data elements in the Unit Personnel System application were not shared in the MPDV-II application and this caused two of seven functionalities to fail to achieve the desired threshold for the Army National Guard. This was corrected in a Maintenance Release 8.1 that was successfully installed and tested in May 2003.

The RCAS logistics support, interoperability, and overall security features operated at acceptable levels. Policies and procedures for Continuity of Operations are adequate. Some network and server vulnerabilities were discovered during the vulnerability assessments. These were primarily due to lack of training on installation of security oriented software patches. RCAS provides the user with tools that significantly improve their day-to-day management of soldiers and it ingrate personnel, mobilization, and logistic functions which allows sharing of soldier readiness.

DOT&E finds, with the full fielding of Increment 8, RCAS to be operationally effective, suitable, and survivable. This final Increment completes DoD oversight of the development and deployment of RCAS, effective August 2003.

Suite of Integrated Infrared Countermeasures (SIIRCM)/Common Missile Warning System (CMWS, AN/AAR-57) Includes: Advanced Threat Infrared Countermeasures (ATIRCM, AN/ALQ-212)

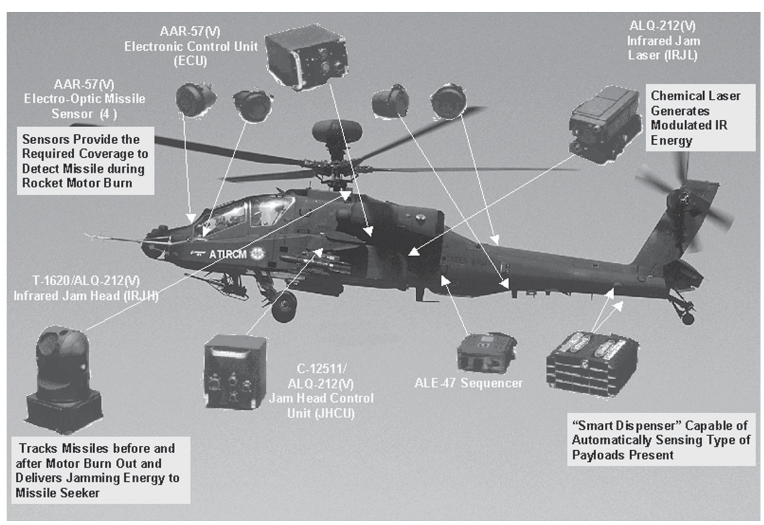
The Army intends for the Suite of Integrated Infrared Countermeasures (SIIRCM)/Common Missile Warning System (CMWS) to enhance individual aircraft survivability against advanced infrared (IR) guided missiles. The SIIRCM concept of IR protection includes new IR flare decoys, the Advanced Infrared Countermeasures Munitions, and passive IR features. These passive IR features include host platform modifications such as engine exhaust/heat suppression and special coatings intended to reduce the platform IR signature.

The Advanced Threat Infrared Countermeasure (ATIRCM) is a sub-set of the SIIRCM program and is specifically comprised of an active IR jammer for use on helicopters and the passive CMWS. CMWS was originally to be used on both helicopters and fixed wing aircraft, but the Air Force and Navy have dropped out of the program. The initial application of ATIRCM/CMWS will be on Special Operations Command helicopters. The Service's will begin installing ATIRCM on helicopters in FY05. The Army controls the funding for both the Army and Special Force's programs. The focus of the aircraft testing is for the ATIRCM jam head and CMWS warning system.

The Army's lead platforms for Engineering and Manufacturing Development (EMD) are the MH-60K and the EH-60. The first operational application will be on the Special Operating Forces' MH-47 helicopters. One ATIRCM laser jam head will be the normal configuration for most helicopters. The objective for CMWS is to provide passive missile detection, threat declaration, positive warning of a post-launch missile that is homing on the host platform, countermeasures effectiveness assessment, false alarm suppression, and cues to other on-board systems. ATIRCM adds active directional countermeasures via an arc lamp and laser. The Army and Special Operations Command intend for ATIRCM to demonstrate integration with the Army's Suite of Integrated Radio Frequency Countermeasures (SIRFC), when it becomes available.

In 1999, CMWS sensor and jam head laser production difficulties, Operational Flight Plan development delays, and other EMD issues resulted in a cost and schedule breach and subsequent re-baselining. ATIRCM/CMWS entered government development and combined developmental testing/operational testing (DT/OT) in early FY01. In response to the September 11, 2001, attacks, and based on the positive test results on the CMWS in FY01, the Services recommended CMWS for accelerated fielding. Subsequently, the Army awarded a limited production contract to BAE for up to 96 CMWS systems. In addition, in FY01 the Army integrated the program into the Aircraft Survivability Equipment's office, under the Information, Electronic Warfare, and Surveillance Office.

During FY01, the Program Manager decided to make a change in the CMWS hardware configuration. The initial EMD version of CMWS was used for early test and evaluation. The UK is buying a production version of CMWS that was advertised to have better performance, fewer parts, and greater reliability. Although the EMD version of CMWS performed well, the Program Manager decided that the cost, reliability, and performance advantages of the production design upgrade (PDU) version of CMWS (also being purchased by the UK) were sufficient to warrant a change late in the test program.



The Advanced Threat Infrared Countermeasure is a sub-set of the Suite of Integrated Infrared Countermeasures program and is specifically comprised of an active IR jammer for use on helicopters and the passive Common Missile Warning System.

During FY04, the Army plans to award a limited production contract for 59 ATIRCM systems. The Army plans to buy a total of 619 systems beginning in FY05. The Army will not field any of these ATIRCM systems until the successful completion of the FY04 DT/OT tests and the FY05 IOT&E.

TEST & EVALUATION ACTIVITY

Contractor testing of the ATIRCM redesign and of software upgrade for CMWS were the predominant test activities in FY03. The Special Operating Forces will conduct a limited users test in the FY04 for the CMWS-only configuration on the MH-47 helicopter, primarily to assess the pilot vehicle interface. A second live fire test will be conducted at the ACR starting in FY04. Together, with the Reliability Development Test (RDT) and the logistics demonstration, these will comprehensively test the overall redesigned ATRICM/CMWS system. Successful completion of these is the criterion for entering IOT&E in FY05. DOT&E approved a revised Test and Evaluation Plan in March 2003 that covers these tests.

Hardware-in-the-Loop (HITL) modeling capabilities are essential to providing an assessment of the operational effectiveness and operational suitability of the ATIRCM/CMWS system. Developing new T&E concepts, which employ modeling and simulation, reduced actual missile firings and drone target requirements from 400 to 175 events. Contractor HITL testing in FY01 was beneficial in validating modeling and simulation conclusions.

TEST & EVALUATION ASSESSMENT

The ATIRCM/CMWS has demonstrated adequate performance to date. The tests have shown the need to modify the software for certain operational conditions and these modifications need to be re-evaluated during subsequent testing, especially with live fire shots at the aerial cable facility. The redesigned jam head has performed satisfactorily in the contractor tests to date.

With the changes incorporated into the laser jam head and the limited testing on the newer PDU CMWS sensor, the FY04 RDT, logistics demonstration, and live fire tests are essential to ensure system performance has not been degraded. The newer PDU sensor is much lower risk than the updates to the ATIRCM jam head redesign.

During the FY01 tests, the IR jammer experienced a number of reliability problems, requiring some significant mechanical redesign. The redesign is now complete and the contractor environmental tests to date have shown satisfactory progress. The redesigned units will enter into a 1,100-hour RDT in July FY04 as part of the DT/OT. Also during the FY01 tests, the built-in test performed unsatisfactorily. The built-in test has since been redesigned and will be tested during the Logistics Demonstration scheduled for FY04.

Modeling and simulation is a critical element of the T&E program because the matrix of potential missile-aircraft interactions would require a substantial increase in the number of test firings. The development of the end-to-end model has progressed this past year and, in addition to being used for pre-test predictions and post-test analyses, has some utility for scenario evaluations. The Army has not completely verified, validated, or accredited the model for use in an operational evaluation. Verification and validation have progressed satisfactorily in FY03. The accreditation requirement remains a significant challenge. The overriding issue for SIIRCM/CMWS is the need to conduct OT&E on the upgraded SIIRCM/CMWS.

Stryker Armored Vehicle

The Stryker program was formerly called the Interim Armored Vehicle program. It is a family of medium armored vehicles intended to equip the Army's Stryker Brigade Combat Team (SBCT). Based on the Light Armored Vehicle III, it consists of two basic variants, the Infantry Carrier Vehicle (ICV) and the Mobile Gun System (MGS). The ICV is the baseline vehicle for eight additional configurations. These configurations are the mortar carrier (MC), the anti-tank guided missile vehicle, the reconnaissance vehicle, the fire support vehicle, the engineer squad vehicle, the commander's vehicle, the medical evacuation vehicle, and the nuclear biological chemical reconnaissance vehicle (NBCRV).

The Army initiated the Stryker program in FY00. SBCT is intended to use enhanced strategic deployability and be capable of immediate employment upon arrival. The Army envisions the SBCT as more strategically deployable than current Army heavy forces, but with greater tactical mobility than current light forces. The SBCT is designed to conduct operations across the depth and breadth of an area of operations, against both traditional and asymmetric adversaries. Though optimized for small scale contingencies, the SBCT is designed to engage in all types of military conflicts, including Major Theater Wars when augmented or when operating as part of a larger force.

TEST & EVALUATION ACTIVITY

DOT&E approved the initial Stryker Test and Evaluation Master Plan (TEMP) in November 2000 and an updated TEMP in May 2003 in conjunction with the Milestone B decision.

The 2001 National Defense Authorization Act required that a Medium Armored Vehicle Comparison Evaluation would be conducted between the Stryker and the current Medium Armored Vehicle. This Comparison Evaluation took place at Fort Lewis, Washington, during September 2002. DOT&E monitored this event and prepared a report.

The 2002 National Defense Authorization Act required that an operational evaluation (OE) would be conducted to assess the SBCT's unit design and readiness. DOT&E approved the Army's evaluation plan in 2QFY03. The OE took place over several months, culminating with brigade deployments to the National Training Center at Fort Irwin, California, and the Joint Readiness Training Center at Fort Polk, Louisiana.

The Stryker IOT&E took place at Fort Knox, Kentucky, from March through September 2003. Two Stryker companies participated in this evaluation; a third company participated through simulation. In addition, battalion and brigade level assets participated in this event. These assets included reconnaissance, engineer, and anti-tank elements. A brigade tactical operations center provided the command and control for this evaluation through the Army Battle Command System. A light infantry battalion was the baseline unit used for comparison. Both the light infantry battalion and the Stryker battalion executed the same scenarios and missions.

The Stryker Brigade Combat Team is is intended to use enhanced strategic deployability and be capable of immediate employment upon arrival.

All Stryker variants and configurations, with the exception of the MGS and NBCRV, participated in the IOT&E. During the

IOT&E, the MC had a dismounted mortar only (designated MC-A). A soft-recoil 120mm mounted mortar (designated MC-B) began developmental testing in June 2003. In addition to developmental testing, a separate IOT&E for the MC-B is planned for early 2004, which will supplement the results of the IOT&E. A three-shot live fire test is planned for the MC-B as well. This is scheduled to be complete prior to the February 2004 Milestone III review.

Additional operational test events are planned for variants, which were not available during the IOT&E. The MGS will undergo a limited user test in 2004 at Fort Knox, Kentucky and an IOT&E in 2005.

NBCRV Production Qualification Testing was conducted from June to December 2003. Key tests included sensor performance; automotive safety and performance; environmental testing; eletro-magnetic interference, and system overpressure testing. This variant contains a variety of chemical and biological sensor systems. Additional side-by-side testing is being conducted between the Joint Service Light Standoff Chemical Agent Detector and the M21 Rascal chemical standoff detection device to validate requirements.

The Army conducted an NBCRV limited user test at Dugway Proving Ground, Utah, in October 2003. Two systems were evaluated in three 72-hour NBC reconnaissance and security scenarios. Results from these tests are pending. Of major concern with this variant is the ability to conduct standoff chemical detection.

The Stryker LFT&E program will support the system's survivability evaluation. Base-vehicle armor coupon testing addressing small arms (through 14.5mm heavy machine gun fire) and fragments from high explosive artillery munitions began in FY02 to qualify and characterize armor recipes used in production. Testing continued into FY03 as the contractor refined armor recipes to address specific performance shortfalls. 4QFY03 was marked by a period of high-priority armor coupon testing following the revelation that inadequate internal controls between the vehicle contractor and its armor subcontractors resulted in the installation of untested, unqualified armor configurations on some vehicles in the first and second Stryker brigades. This investigative-type testing and corresponding mitigation program supported the Army's short-term SBCT needs to deploy the SBCT to Iraq. Government qualification of each armor configuration is currently ongoing and expected to be complete before the Milestone III review in February 2004. Stryker vehicles already fielded will be retrofitted with appropriately tested and qualified configurations as necessary.

Production Qualification Testing of the rocket-propelled grenade-level add-on armor began in May 2003 and found that the armor performance did not meet Army requirements. As a result, the Stryker program experienced delays in all add-on armor related testing to allow the contractor to refine its armor solution to meet Army requirements. Re-qualification of the new add-on armor solution resumed in September 2003 and will continue through February 2004.

Full-up system-level (FUSL) testing of production-representative configurations began in July 2002. Fifty-one of sixty-five system-level test events have been completed to date for six different Stryker configurations: the ICV, the engineer squad vehicle, the commander's vehicle, the reconnaissance vehicle, the anti-tank guided missile, and the medical evacuation vehicle. The fire support vehicle was removed from the test series due to commonality with other configurations so it can be evaluated using data provided by other testing. FUSL testing for the Stryker vehicle with add-on armor is expected to resume in November 2003 and for the Mortar Carrier B in December 2003. DOT&E will address Stryker FUSL test results in the classified beyond low-rate initial production (BLRIP) report to Congress.

The Army will include additional details of the survivability test programs supporting the later Milestone reviews for the NBCRV and MGS in the next TEMP. DOT&E continues to participate in the test planning, execution, and reporting of each system-level test event.

TEST & EVALUATION ASSESSMENT

The Stryker test and evaluation program is challenging because of the requirement to test and evaluate ten different variants. The Army's OE Report concludes, "current design and training performance of the first SBCT meets the requirements of the Organizational and Operational Concept." Based on the Army's assessment, DOT&E does not believe there are any unit design issues. However, the OE was not sufficient to completely address the operational effectiveness and suitability of an SBCT, nor did it address the operational effectiveness, suitability, or survivability of the Stryker vehicles themselves. Stryker vehicle effectiveness, suitability, and survivability will be assessed in the BLRIP report.

The Army recently completed the Stryker IOT&E. DOT&E's independent evaluation is ongoing. This evaluation will determine the operational effectiveness and suitability of eight of ten Stryker vehicles types that were available for testing. This BLRIP report will be disseminated in 2QFY04.

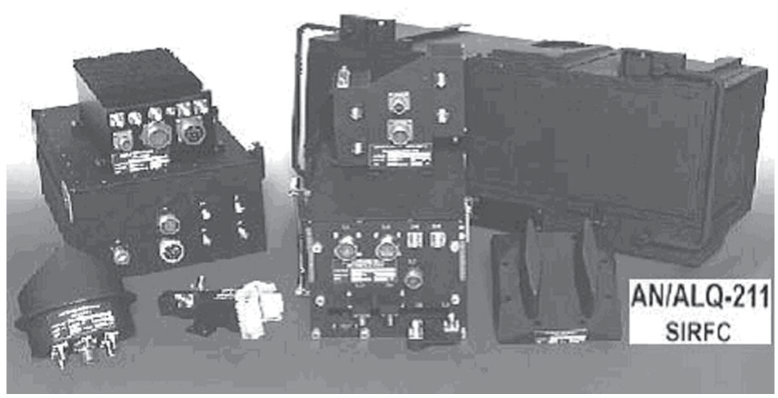
Suite of Integrated Radio Frequency Countermeasures (SIRFC) (AN/ALQ-211)

The Army and Special Operations Command intend for the Suite of Integrated Radio Frequency Countermeasures (SIRFC) to be an integrated aircraft survivability system that provides defensive, offensive, active, and passive countermeasures to ensure optimum protection for the host aircraft. Original plans called for integration of the system on the AH-64D, MH-60K, and MH-47E helicopters, and the CV-22 and U-2 fixed-wing platforms. The lead aircraft for SIRFC integration and test and evaluation was the AH-64D Longbow Apache; however, the Army decided that SIRFC is no longer required on that platform. Development continues for Special Operations Command Aircraft, MH-47G, MH-60M, and CV-22.

SIRFC consists of two required sub-systems, the Advanced Threat Radar Jammer and the Advanced Threat Radar Warning Receiver. The system provides warning (situational awareness), active jamming (self-protection), and when necessary, expendable countermeasures control to defeat threat radar guided weapon systems. Future integration of SIRFC with the Suite of Integrated Infrared Counter Measures on the MH-47G and MH-60M will optimize multi-spectral threat countermeasures for those aircraft. SIRFC achieved Milestone II in FY95 resulting in an Engineering and Manufacturing Development (EMD) contract to produce five test articles supporting Test and Evaluation through IOT&E.

The contractor delivered the first EMD test articles in FY99 and installed them on the AH-64D Longbow Apache for integration testing. Upon SIRFC installation on the AH-64D Apache, the test team encountered several integration performance problems with the Operational Flight Program software. These problems led the Program Manager to stop test efforts on the AH-64D until integrated performance issues could be resolved. An additional year was inserted into the EMD Phase to allow time in the schedule to sufficiently analyze discovered deficiencies, develop and implement corrections, and properly evaluate software performance.

The government conducted developmental flight tests in July and August 2001 and a limited user test (LUT) in September and October 2001. Analysis of the performance in the developmental test and the LUT indicated that, while SIRFC effectiveness as a radar warning receiver (RWR) was superior to that of other RWRs tested, there were some deficiencies in its performance. The effectiveness of its jamming in increasing the survivability of the host aircraft in a threat environment was poor. As a result, the Army awarded a correction of deficiencies contract to the system development contractor for development of corrective actions. The Technology Application Program Office at Fort Eustis, Virginia, assumed test responsibilities following the Army's decision to not continue development other than for Special Operations applications. The Army Test and Evaluation Command concluded its test support on the SIRFC system in 2001. The Army made a low-rate initial production (LRIP) decision to produce additional units for test and integration on follow-on platforms in May 2002, with full-rate production Milestone III scheduled for FY05. The corrective actions will be implemented in the LRIP units for further testing. SIRFC has not yet undergone an IOT&E and will undergo operational testing, planned for FY2005, before the full-rate production decision. However, two additional LRIP buys totaling 18 systems are planned prior to the conduct of IOT&E.



Suite of Integrated Radio Frequency Countermeasures consists of two required sub-systems, the Advanced Threat Radar Jammer and the Advanced Threat Radar Warning Receiver.

TEST & EVALUATION ACTIVITY

Test activity in FY03 consisted of laboratory tests at Fort Monmouth, New Jersey, and was to evaluate performance of the corrective actions and incremental software drops.

TEST & EVALUATION ASSESSMENT

Results of the tests at Fort Monmouth have shown promise; however, a true indication of the performance of the upgraded SIRFC will not be available until the developmental test and operational flight tests that begin in FY04.

SIRFC consists of two required sub-systems, the Advanced Threat Radar Jammer and the Advanced Threat Radar Warning Receiver. Development continues for Special Operations Command Aircraft, MH-47G, MH-60M, and CV-22.

Surface-Launched Advanced Medium Range Air-to-Air Missile (SLAMRAAM)

The Surfaced-Launched Advanced Medium Range Air-to-Air Missile (SLAMRAAM) is the Army's future short-range air defense weapon. The SLAMRAAM program is intended to eventually replace all the Army's short-range air defense weapon systems that employ the Stinger missile. The SLAMRAAM system intends to give the Army the capability to engage targets (including cruise missiles and helicopters) to beyond line-of-sight and at greater ranges than the Stinger-based systems. SLAMRAAM is also intended to defend against the evolving air threat from unmanned aerial vehicles (UAVs) and cruise missiles.

The SLAMRAAM fire unit consists of four to six ready-to-fire AIM-120C-7 AMRAAMs mounted on an Army High Mobility Multi-Wheeled Vehicle (HMMWV). The SLAMRAAM system also consists of a Battle Management Command, Control, Computers, Communications, and Intelligence (BMC4I) system. The BMC4I system will include the sensors, command posts, and communications systems necessary to pass targeting data to the SLAMRAAM fire units.

The United States Marine Corps (USMC) is also developing a surfaced-launched AMRAAM system called the Complementary Low-Altitude Weapon System (CLAWS). The USMC CLAWS program is also an HMMWV-based fire unit capable of launching AIM-120C AMRAAM missiles. The operational requirements for the Army's SLAMRAAM and USMC's CLAWS programs are very similar, but not identical.

The SLAMRAAM program plans to select the system contractor in FY04. The program will then enter the system development and demonstration phase.

TEST AND EVALUATION ACTIVITY

The SLAMRAAM program developed a Test and Evaluation Master Plan in support of the Milestone B review, which occurred in 4QFY03. The Test and Evaluation Master Plan lays out a test and evaluation strategy of developmental, live fire, and operational testing. Developmental testing, conducted by both the system contractor and the government, will assess the contractual requirements in the system performance specifications. Force developmental test and experimentation will be used to develop the soldier crew drills as well as tactics, techniques, and procedures used to operate the system on the battlefield. LFT&E will evaluate lethality of the AMRAAM against the expected SLAMRAAM target set. Since the SLAMRAAM fire unit does not include features designed to protect its users in combat, SLAMRAAM is not a covered system for vulnerability testing. However, the Army Test and Evaluation Command will complete an assessment of vulnerability issues related to the expected ground threat to the SLAMRAAM system. Operational testing will evaluate the ability of the SLAMRAAM system to perform its air defense mission. The SLAMRAAM test program will consist of two phases: a live missile firing phase and an acquisition/tracking phase. During the live missile firing phase, actual AIM-120C missiles will be fired from the SLAMRAAM fire unit against threat-representative drone targets. The Marine Corps started developmental testing of the CLAWS program in FY03.

The Surfaced-Launched Advanced Medium Range Air-to-Air Missile system intends to give the Army the capability to engage targets beyond line-of-sight and at greater ranges than the Stinger-based systems.

The LFT&E strategy will build upon previous lethality testing and live missile firings, and will use modeling and simulation to assess lethality against the expanded target set. Most of the expanded target set vulnerable areas have been characterized and confirmed through previous modeling and testing. Modeling and analysis will determine new target vulnerabilities to SLAMRAAM. Lethality against these targets will be determined using validated and accredited AMRAAM models. This two-year effort will begin in 1QFY04 and complete in 1QFY06.

TEST AND EVALUATION ASSESSMENT

Two issues are critical to an adequate assessment of the operational effectiveness and suitability of the SLAMRAAM program. The first issue is the ability of the AIM-120C AMRAAM missile to perform against the targets of interest to the Army, namely, UAVs, cruise missiles, and helicopters. Firings against these types of targets have not been done throughout the long history of the AMRAAM test program conducted by the Air Force and Navy.

Second, the integration of the BMC4I is critical to the success of SLAMRAAM. The SLAMRAAM system, unlike the Stinger-based weapons, cannot autonomously engage targets. The SLAMRAAM fire unit must receive targeting data from the BMC4I system, including targeting data acquired from sensors operated by other Services. The BMC4I system must also provide target identification of friendly aircraft. This becomes critical since SLAMRAAM provides a beyond line-of-sight engagement capability that cannot rely on visual identification means to distinguish friendly aircraft from enemy threats. The BMC4I system must also be mobile enough to keep up with rapidly advancing maneuver forces.

Transportation Coordination Automated Information for Movement System II (TC-AIMS II)

The Transportation Coordinators' Automated Information for Movements System II (TC-AIMS II) is designed to reduce the buildup time in the movement of materiel and personnel and to integrate current Service-unique transportation information systems into a single joint system. TC-AIMS II automates the processes of planning, organizing, coordinating, and controlling unit deployments, sustainment, and redeployments. Future enhancements will automate the day-to-day transportation operations performed by military bases and installations. TC-AIMS II interfaces with installation, unit and depot-level supply systems, the Global Transportation Network, and the Joint Operational Planning and Execution System. In its current configuration, the system provides a means for transportation personnel at the unit level to receive tasking for deployment of their unit, match assigned personnel and equipment to the requirements, provide the information to higher headquarters in a standard deployment format, and then prepare their unit for movement – to include producing shipping labels and tags. The Program Manager (PM) is following an evolutionary acquisition strategy to periodically release blocks of increasing functionality.

The Joint Requirements Oversight Council approved the Operational Requirements Document in March 1999. Following a series of operational testing and retesting that culminated in 2002, the Army Test and Evaluation Command (ATEC), the lead operational test agency, determined that TC-AIMS II Block 1 was operationally effective, suitable, and survivable for the Army and Navy, but not for the Marine Corps or the Air Force. DOT&E concurred, and Block 1 was subsequently fielded to the Navy, to U.S. Army Europe (USAREUR), to an Army brigade at Fort Lewis, Washington, and to Army units in Hawaii and Alaska. The Marine Corps expects its requirements to be satisfied by the next release, Block 2. The Air Force determined that TC-AIMS II would not contain the functionality to satisfy its requirements (which are primarily at the installation level) until Block 5.

TEST & EVALUATION ACTIVITY

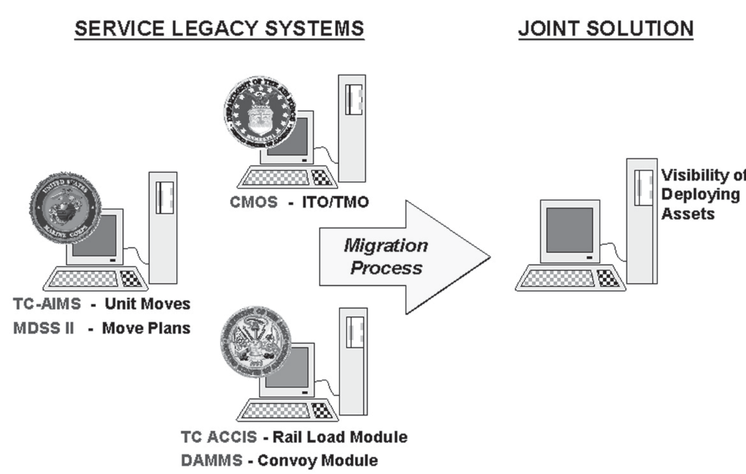
DOT&E approved an updated Test and Evaluation Master Plan and a Block 2 OT&E Plan in July 2003.

The PM conducted developmental testing on Block 2 in June and July 2003. The PM issued software to Army and Navy beta test sites and conducted training of prospective users preparatory to operational testing.

ATEC conducted Army operational testing at Fort Lewis, Washington, in August 2003. ATEC began Navy operational testing late September 2003.

TEST & EVALUATION ASSESSMENT

The TC-AIMS II acquisition suffered from the lack of a common unit movement process across the Services and the absence of a single, authoritative user representative. During 2003, the United States Joint Forces Command assumed the responsibility for this role, but a joint unit movement process has yet to be developed. This has presented the PM with the difficult task of building a single system that is expected to satisfy the separate requirements of all four Services. Driven by the schedule, IOT&E took place before many users had much experience using the system. The first Block 1 system under test did not satisfactorily meet any Services' requirements and many of the required interfaces were inoperable.



The Transportation Coordinators' Automated Information for Movements System II automates the processes of planning, organizing, coordinating, and controlling unit deployments, sustainment, and redeployments.

The users, the PM, ATEC, and Joint Forces Command managed to identify and incorporate effective fixes for many of these problems. The

PM adopted a short-term/long-term plan that identified certain users (Navy and USAREUR) who had achieved relative success during IOT&E and who wished to acquire the system as soon as practicable. The PM made the required short term fixes based on IOT&E data, and ATEC tested them. ATEC's evaluation focused on the fundamental ability of the system to produce timely and accurate critical mission functions. Meanwhile, Army major commands addressed TC-AIMS II techniques and procedures during functional operations at the Fort Lewis beta site. The TC-AIMS II acquisition community adopted a similar strategy for the longer term.

ATEC and DOT&E are evaluating the results of the Block 2 Army operational testing. Preliminary results from the Army testing indicate that the software is still immature and that several deficiencies will need to be corrected before Block 2 is ready for fielding. The Army is pursuing the prospect of establishing of an additional beta site in the Korea in order to validate a stable baseline and help define future requirements. Meanwhile, the PM continues to incorporate Marine Corps-specific capabilities into Block 2 before conducting developmental testing for the Marine Corps version. The Marine Corps Operational Test and Evaluation Agency plans to conduct operational testing in mid-FY04. DOT&E will continue to monitor and assess the TC-AIMS II through the Integrated Product Team process.

UH-60M Black Hawk

The UH-60 Black Hawk is a single main rotor, twin engine, medium-lift helicopter that provides utility and assault lift capability in support of combat and peacetime missions. The Black Hawk is the primary helicopter for air assault, general support, and aeromedical evacuation. The reconfiguration of the Black Hawk enables units to perform command and control, electronic warfare, and special operations missions. In March 2001, the Defense Acquisition Board approved the Army's proposed Acquisition Category ID program to refurbish and modernize the Black Hawk fleet with a digital cockpit, upgraded engines and power train, wide chord main rotor blades, an active vibration control system, and a new high-speed integrally machined airframe. The prime contractor is Sikorsky Aircraft.

The Army began fielding the UH-60A in 1978. A 1989 power train upgrade resulted in a model designation change from UH-60A to UH-60L. Since 1989, the Army has procured 539 of the newer UH-60L models, but does not plan to modernize the previously fielded UH-60A aircraft. Procurement of 80 more UH-60L Black Hawks is funded through FY07. Commencing in 2002, the Army plans to recapitalize 193 UH-60A aircraft, without increasing any capabilities, until these aircraft can be inducted into the UH-60M program beginning in 2006.

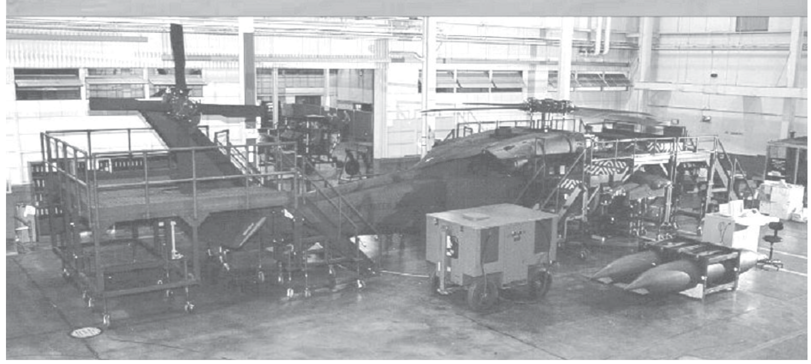
The March 2001 Operational Requirements Document establishes a block approach to development and modernization. The Army intends the Block 1 aircraft to provide the entire UH-60 fleet with a digital cockpit, extended service life, and performance and reliability levels equivalent to the UH-60L. The Army plans for the UH-60M digital cockpit to feature a four multi-function display design to improve pilot situational awareness and enhance capabilities to communicate and operate on the digital battlefield. The Army intends for the long term Block 2 aircraft requirements to leverage new engine technologies that have potential to dramatically increase range and lift capability.

Block 2 aircraft survivability is to be further enhanced by two systems in development now: the Suite of Integrated Radio Frequency Countermeasures and the Suite of Integrated Infrared Countermeasures. The Under Secretary of Defense, Acquisition and Technology waived the requirement for full-up system level LFT&E based on an alternative plan approved by DOT&E.

TEST & EVALUATION ACTIVITY

Preliminary and Critical Design Reviews and the assembly of two prototype aircraft are complete. The first flight of the first prototype aircraft took place on September 17, 2003. The flight lasted 75 minutes and included flight envelope expansion maneuvers up to 120 knots airspeed.

In FY03, the Army conducted an Early User Demonstration 2 (EUD2), a developmental event to assist in refining crew station design. Pilots flew several air assault mission scenarios in a laboratory environment using a UH-60M cockpit simulator. Each 4-hour trial included a mission briefing, execution, debriefing, and completion of questionnaires. Primary areas of evaluation were pilot-vehicle interface, workload, and situational awareness.



The Black Hawk is the Army's primary helicopter for air assault, general support, and aero medical evacuation. Top photo depicts a UH-60 in support of forces in Iraq. Bottom photo depicts the first prototype aircraft on the production line at the Sikorski facility.

The Army and the Navy are conducting a coordinated LFT&E effort between the Army's UH-60M and the Navy's MH-60S and

MH-60R to reduce costs and compress the schedule. The testing to date includes ballistic testing of several flight-critical main rotor drives, flight control components, and the entire fuel system under static and dynamic load conditions. The program is procuring several damaged Army and Navy H-60 aircraft, and a fully operational, but not flight worthy, YCH-60 prototype that is serving as the production representative ground test vehicle. The Army is updating earlier vulnerability models to be more representative of the latest design configuration.

TEST & EVALUATION ASSESSMENT

Technical risks for the UH-60M program include the structural design of the airframe and software integration. The DOT&E-approved UH-60M test program will provide ample opportunity to evaluate these technical issues and determine the operational effectiveness and suitability of the UH-60M helicopter.

Until the prototype aircraft flight-testing is complete, the adequacy of the UH-60M structural design will not be validated. It is possible that unexpected fatigue, dynamic, or vibration loads could be encountered in the newly designed airframe.

Software development and integration issues remain with the processor throughput for some subsystems. The aircraft system computer resource utilization is desired to be less than 50 percent. However, three subsystems exceed the 50 percent utilization goal in the program.

The EUD2 demonstrates that pilots in the UH-60M cockpit can perform today's air assault mission. Pilot vehicle interfaces are adequate with the exception of free text messaging procedures. The messaging procedures are not intuitive and are time-consuming, requiring the copilot to remain focused inside the cockpit for extended periods of time. With respect to workload levels, pilots report that they retain the capacity to perform all desirable additional tasks when operating in the new cockpit. Pilot situational awareness is enhanced by the navigation aids and digital map display systems.

The integrated Army/Navy LFT&E plan takes into account vulnerability reduction features that were incorporated into the Black Hawk since its initial fielding in 1978, combat damage experience, subsystem qualification efforts, computer modeling and simulation, as well as other Services' testing. Test results show improved survivability over prior H-60 model aircraft.

Warfighter Information Network-Tactical (WIN-T)

The Warfighter Information Network–Tactical (WIN-T) is the Army's tactical Intranet from theater and the sustaining base down to the maneuver battalions. WIN-T, which is the Army's communications network of the future, will replace Tri-Service Tactical Communications and Mobile Subscriber Equipment. WIN-T will ensure the warfighter vertical and horizontal integration through a seamless network. WIN-T supports mobile battle command by integrating capabilities into maneuver platforms that support dispersed operations over increased distances.

WIN-T integrates terrestrial, airborne, and satellite-based transport capabilities into a network infrastructure to provide connectivity across the extended battlespace. Major WIN-T elements are network infrastructure, network management, information assurance, and user interfaces that provide voice, data, and video services to the warfighters. WIN-T supports multiple security levels from unclassified to top secret/special compartmented intelligence. It operates in the tactical environment and is mobile, secure, and survivable.

Key components of the ground layer are the Joint Tactical Radio System (JTRS) Cluster 1 radio, the personal communications device, and the secure wireless local area network. The airborne layer will consist of opportunistic commercial or military aircraft and unmanned aerial vehicles or tethered air vehicles with the WIN-T Airborne Communications Node to provide beyond line-of-sight communications. The space layer will include commercial and military satellites such as the Wideband Gapfiller or Advanced Extremely High Frequency satellites to provide reach-back to the Global Information Grid.

The program had dual contractors begin development of the system architecture in 4QFY02. Each contractor team will demonstrate its design in a separate early user test and experimentation event in 3QFY05. A single contractor team will be selected in 1QFY06 to enter a three year low-rate production phase followed by the IOT&E in 1QFY09. The full-rate production decision is scheduled for 3QFY09.

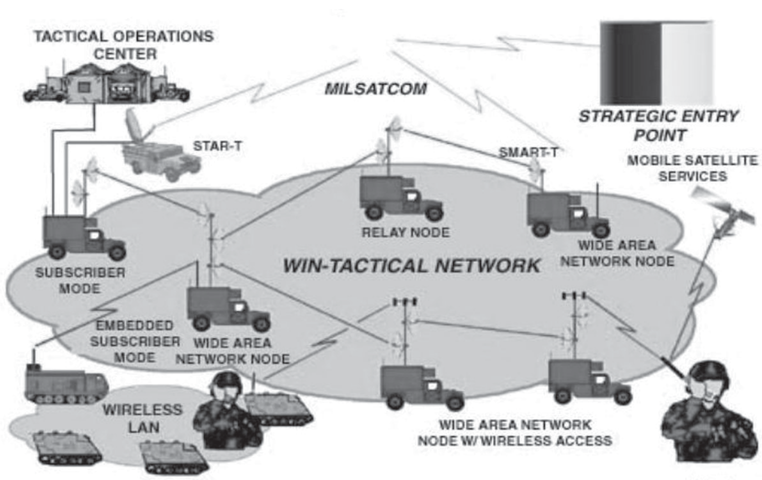
TEST & EVALUATION ACTIVITY

Test activities focused on development of a viable test strategy and coordination of the Test and Evaluation Master Plan, which was signed on July 23, 2003.

TEST & EVALUATION ASSESSMENT

Testers were involved early with the WIN-T program. Participation in test and evaluation working group meetings since the program's inception has helped define critical operational issues and criteria that are operationally meaningful and measurable for assessing WIN-T's contribution to operations. This early cooperation improved the quality of both the system development and test program, and provides meaningful assessments for future decisions.

WIN-T is closely connected to both the JTRS Cluster 1 program and the Future Combat Systems program; each depending on the other. The test strategy meets the requirements of the WIN-T program by having the WIN-T testing follow the development and testing of JTRS (a component of WIN-T). The Future Combat Systems IOT&E schedule follows both the WIN-T and JTRS IOT&Es.



Warfighter Information Network–Tactical integrates terrestrial, airborne, and satellite-based transport capabilities into a network infrastructure to provide connectivity across the extended battlespace.

Acoustic Rapid COTS Insertion AN/BQQ-10(V) Sonar System

The Acoustic Rapid Commercial Off-the-Shelf (COTS) Insertion (A-RCI) AN/BQQ-10(V) Sonar System was initiated as Engineering Change 1000 to the AN/BSY-1 Combat System on improved *Los Angeles* class submarines. The concept uses installed legacy sensors and replaces central processors with COTS personal computer technology and software installed in an open architecture. A-RCI allows for faster, more economical, and more frequent hardware and/or software upgrades. The program expanded to provide improvements that could be back-fit into all nuclear attack (SSN) and ballistic missile (SSBN) submarines totaling over 60 ship sets. The system is now known formally as the AN/BQQ-10 (V) Sonar.

These improvements provide expanded capabilities, particularly in littoral waters, for covert intelligence collection and surveillance and covert insertion and support of Special Forces. Expanded capabilities for anti-submarine warfare focused on diesel-electric submarines, covert mining, and covert strike of targets ashore. Specific software improvements include passive ranging, spatial vernier processing, full spectrum processing, dual towed array concurrent processing, low frequency active interference rejection, passive broadband, passive narrowband and passive detection and tracking processing, track management, on-board training, and port/starboard ambiguity resolution.

The operational test and evaluation plan for A-RCI features four phases followed by periodic testing as evolutionary upgrades are made to the hardware and/or software. A-RCI Phase I added initial improvements to the towed array processing and added the TB-29 towed array.

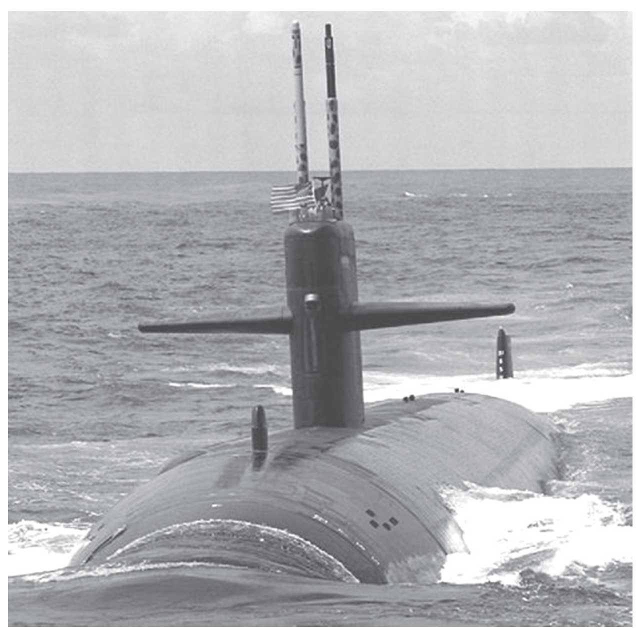
Phase II was the first implementation of the towed array improvements. When DOT&E placed the program under oversight in 2001, Phase II testing was already underway. The Navy provided insufficient submarine test resources for Phase II resulting in the deployment of Phase II equipped ships without operational testing. The importance of the program and the lack of adequate operational testing led to DOT&E putting this Acquisition Category IV program on oversight. Phase II testing was never completed due to repeatedly cancelled tests and equipment failures. Software reliability and configuration management problems continued to slow the program. In April 2001, Operational Test and Evaluation Force (OPTEVFOR) terminated the program testing until the system could be re-certified for testing.

Phase III is a major replacement of the sonar processing hardware and software for the towed, hull, and spherical arrays. The Navy certified Phase III for testing in March 2002.

Phase IV is an upgrade to the high frequency (HF) mine hunting and ice avoidance sonar. The Navy certified Phase IV for testing in August 2002. HF sonar data was collected against the Australian submarine, HMAS *Sheean,* and in a minefield test in the Berry Islands in August 2002.

TEST & EVALUATION ACTIVITY

Following re-certification, test and evaluation activity in FY03 centered on the completion of the operational evaluation (OPEVAL) of Phase III and Phase IV (begun in 2002). A-RCI Phase III OPEVAL testing completed in September 2003. Real world operations, system failures, and TB29/29A array failures required six separate attempts to complete the planned ten-day test plan. A-RCI Phase IV OPEVAL ended in February 2003.



The AN/BQQ-10 (V) Sonar is a major product improvement that will go on all submarine classes.

TEST & EVALUATION ASSESSMENT

OPTEVFOR is evaluating A-RCI Phase III OPEVAL data. DOT&E's initial assessment is that A-RCI Phase III does not meet all requirements and continues to have maintenance and reliability problems, but is an improvement over legacy systems.

OPTEVFOR evaluated A-RCI Phase IV as ineffective and unsuitable because the system failed to meet performance requirements. Despite not meeting requirements, DOT&E assesses Phase IV as an improvement over legacy HF systems.

The procurement and deployment of Phase II and III systems continued in 2003, even though the Director cited the A-RCI program in a letter to the Secretary of the Navy in August 2002. Navy leadership should support OPTEVFOR to ensure that the resources (test submarines and time) are available for the adequate operational test and evaluation of A-RCI before ships are deployed with these systems.

Advanced Seal Delivery System (ASDS)

The ASDS is a combatant submersible developed for the insertion and extraction of Special Operations Forces (SOF) and represents a quantum leap in SOF undersea mobility. Naval Sea Systems Command (PMS 395) manages the ASDS Program under the sponsorship of the U.S. Special Operations Command. The ASDS Program includes the ASDS submersible vehicle, the land transport vehicle, host submarine support equipment, logistics and training, and support documentation.

The development of the ASDS emphasized conformance to SOF mobility and insertion requirements for a warm/dry environment with longer-range endurance than the existing SEAL Delivery Vehicle (SDV). Other features of ASDS include SOF lock-out/lock-in capability, a resistance to underwater shock, low acoustic signature, land, sea and air mobility, and covert transport and insertion by a host attack submarine.

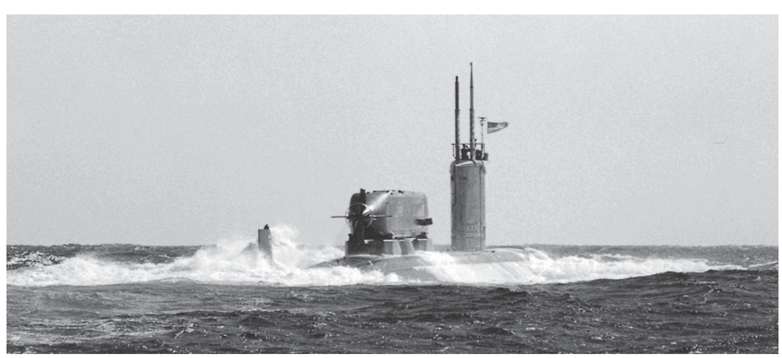
The combatant submersible provides a one-atmosphere, dry environment for SOF personnel and equipment and interfaces to host submarines of the Los Angeles, Seawolf, Virgina classes and the SSGN variant of the Ohio class of submarines. ASDS has a full communications suite connectivity similar to a Los Angeles class submarine; a deployable periscope provides optical sighting and forward-looking sonar for mine detection, navigation, and collision avoidance in the littorals. ASDS will be crewed by two pilots, a submariner in command, and a SEAL co-pilot who is responsible for coordination of mission-specific planning and operations with the embarked SOF unit.

ASDS is designed to provide for rapid lock-out/lock-in of SOF and includes an aft compartment full hyperbaric chamber for the treatment of injured personnel. High-endurance silver-zinc batteries provide onboard power. The submersible displaces 60 long tons with a beam of 6.75-feet, a height of 8.25-feet, and overall length of 65.2 feet. Propulsion is provided by a 62-horsepower electric motor driving a shrouded rear propeller and two forward and two aft thrusters for fine maneuvering.

TEST & EVALUATION ACTIVITY

ASDS completed 24 months of developmental and operational testing in FY03. Developmental testing included docking and undocking from the host submarine and lock-in/lock-out tests for SOF. The development tests revealed problems with the silver-zinc batteries of the ASDS submersible vehicle. These problems led to procedural changes (reduced charging rates) and design modifications (better cooling) which somewhat mitigated, but did not solve, the problem. While improvements have been made, the current battery does not meet the ASDS requirements. The Navy is seeking new battery designs with a Lithium-ion battery identified as a potential solution.

The Operational Test and Evaluation Force (OPTEVFOR) conducted an operational evaluation (OPEVAL) on the current design of the ASDS in April/May 2003. The OPEVAL consisted of two weeks of opposed special mission operations using scenarios validated by the Office of Naval Intelligence. Due to time and availability constraints imposed by real world operations in the Middle East, certain aspects of the ASDS were not tested during the OPEVAL; however, developmental tests data were adequate for evaluation. These aspects, including ASDS transport via aircraft, endurance testing, operational cargo testing, and obstacle (mine) avoidance, were tested and evaluated using developmental test data.



The Advanced Seal Delivery System is a combatant submersible for insertion and extraction of special operations forces on a Los Angeles *class submarine.*

DOT&E, the Navy, and the Special Operations Command convened a Senior Live Fire Working Group to develop an acceptable LFT&E program. The intention is to add the ASDS LFT&E Management Plan as an appendix to the Test and Evaluation Master

Plan. The Navy and DOT&E are nearing an agreement on the nature and content of the LFT&E program, and the LFT&E Management Plan is now close to adequate.

TEST & EVALUATION ASSESSMENT

OPTEVFOR evaluated ASDS operationally effective and suitable under certain specified threats and environments and provided several recommendations including necessary improvements to the battery, sensors, and logistical support. OPTEVFOR recommended correction of deficiencies and vulnerabilities verification in an additional phase of OPEVAL.

ASDS maintainability and reliability is poor due to low battery service life, low charging and cooling rates, and electrical grounds. During OPEVAL, low main motor controller electrical grounds reduced the endurance and cruise speed and resulted in a loss of ASDS propulsion. Onboard crew repairs enabled completion the OPEVAL SOF mission; however, had the crew been unable to affect at sea repairs, the ASDS could have been stranded and required safety ship assistance. Also, during transit in a recent forward site exercise, the ASDS sustained damage. An investigation to determine the cause is underway. In spite of these problems, the ASDS is a clear improvement over the SDV. It has a dry, warm environment, onboard sensor and communications equipment, greater speed, range endurance, and payload capacity.

The ASDS system requires further test and evaluation to verify correction of the deficiencies associated with the battery, electrical system grounds, noise signature, and other identified deficiencies.

Depending on the near-term schedule for ASDS 1, it is desirable to arrange a trial against simulated threat mines to determine likely burst points (e.g., using the Versatile Exercise Mine System). For ASDS 2, a more robust LFT&E strategy could be applied. Any resulting changes to subsequent vehicles could then be evaluated for backfit on case-bases for ASDS 1.

AGM-88E Advanced Anti-Radiation Guided Missile (AARGM) Program

The Navy intends to field a major system upgrade to the AGM-88 High Speed Anti-Radiation Missile (HARM) inventory with the AGM-88E Advanced Anti-Radiation Guided Missile (AARGM). The current HARM weapon system has multiple deficiencies that have directly affected employment. This was specifically highlighted during Operation Iraqi Freedom. The Suppression of Enemy Air Defense Rules of Engagement ROE for that conflict greatly restricted the weapon's use. The AGM-88E AARGM weapon system will address those limitations and provide improved capability in the counter-shutdown scenario, improve lethality against advanced threat air defense units, provide real-time target impact assessment reports, and provide off-board targeting capability with national systems.

AARGM is to be employed in the offensive counter air/suppression of enemy air defenses role in direct support of all the mission areas within the objective force (e.g. strike warfare, amphibious warfare, anti-surface ship warfare, command and control warfare, and information warfare) providing a rapid, organic response to air defense threats ranging from small-scale contingencies to major theater war. The AGM-88E AARGM will be designed to provide a new multi-mode guidance section and modified control section mated with existing HARM propulsion and warhead sections. The new guidance section is designed to have a passive anti-radiation homing receiver and associated antennae, a Global Positioning System/Inertial Navigation System, and an active millimeter wave radar for terminal guidance capability. AARGM is projected to have the capability to transmit terminal data via a weapons impact assessment transmitter to national satellites just before AARGM impacts its target. The Navy intends to incorporate a provision to receive off-board targeting information, via the integrated broadcast system. The AARGM acquisition objective is 1,750 missiles.

TEST & EVALUATION ACTIVITY

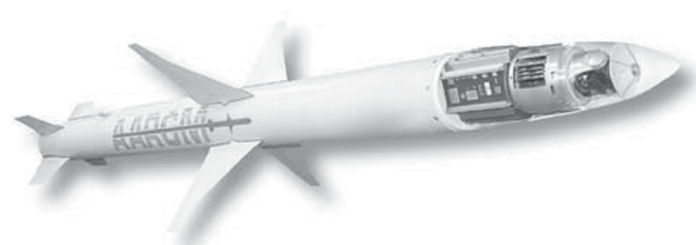
The AN/BQQ-10 (V) Sonar is a major product improvement that will go on all submarine classes. oAGM-88E AARGM entered into the System Development and Demonstration phase in June 2003. The Test and Evaluation Master Plan is in the approval process.

The Navy will evaluate performance during two phases of operational testing (OT):

- OT-B, an operational assessment, will provide data and other information for continued program development and to support a Milestone C low-rate initial production review.
- OT-C operational evaluation will provide data and analysis necessary to support a full-rate production decision review.

TEST & EVALUATION ASSESSMENT

Developmental and operational testing of the AGM-88E AARGM have not yet been performed. The system will potentially face two challenges First, the test range infrastructure does not exist to adequately assess the full capabilities of the design with regard to target discrimination. The target sets must emulate the threat system in physical appearance as well as in the electronic environment. DOT&E is working with the Program Manager to develop and fund adequate targets to support testing. The second challenge is the limited number of missiles available during testing. The number of missiles dedicated to testing is reasonable based on the program's total procurement and available model tools; however, if any test event shot suffers a failure, there is little reserve to retest and verify the results.



The AGM-88E Advanced Anti-Radiation Guided Missile will be designed to provide a new multi-mode guidance section and modified control section mated with existing High Speed Anti-Radiation Missile propulsion and warhead sections.

AIM-9X Sidewinder Air-to-Air Missile

The AIM-9X Sidewinder Air-to-Air missile is a follow-on to the AIM-9M short-range missile for Air Force and Navy/Marine Corps aircraft. The program was initiated in response to foreign missiles assessed to exceed AIM-9M capabilities. AIM-9X is intended to be a day/night, highly maneuverable, launch and leave missile using passive infrared guidance to engage multiple target types. A new infrared seeker, thrust-vectored tail-control actuation system, and signal processor/auto pilot are to provide a high off-boresight capability, countermeasures resistance, and maneuverability/range improvements relative to the AIM-9M. The AIM-9X is designed to work with any on-board aircraft cueing source, including the Joint Helmet-Mounted Cueing System, which is being developed in a parallel program. The missile retains the AIM-9M warhead, fuze, and rocket motor. Threshold aircraft are the F-15C/D and F/A-18C/D. Future plans call for it to be integrated on the F-16, F/A-18E/F, F-15E, F/A-22, and F-35.

AIM-9X is a joint Navy/Air Force program with the Navy as the Executive Service. The demonstration and validation phase began in 1994. Operational test and evaluation began in August 2002, the end of operational test (OT)-IIB was declared on August 29, 2003, and the full-rate production decision is scheduled for 2QFY04.

TEST & EVALUATION ACTIVITY

- USN completed 11 (of 11 total) planned missile shots.
- USAF completed 7 (of 11 total) planned missile shots (four were completed in 2002).
- Modeling and simulation, and evaluation of results are ongoing.

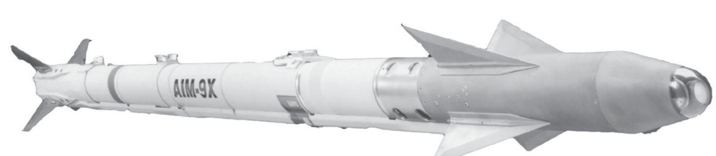
The program conducted 19 guided missile launches in developmental test and 22 shots in operational test. To accept the model results for evaluation, the small shot set must correlate to the model predictions. Thus far, the test shots appear to correlate. Indications are that the weapon has succeeded in addressing the missile disadvantage.

The operational test Captive Carry Reliability Program has continued since 2002. The mean time between critical failure is estimated to be less (lower) than the threshold requirement. Fixes identified in low-rate initial production 2 missiles show they have the potential to meet the identified anomalies and are under evaluation. The AIM-9X Joint Reliability and Maintainability Evaluation Team is considering the reliability fixes that have been implemented.

TEST & EVALUATION ASSESSMENT

The Operational Test Plan was approved in April 2002. The following month, the first operational test shot attempt was terminated for a built-in test failure prior to launch. As a result, the system was de-certified for operational test. The contractor implemented hardware and software solutions and the missile was re-certified in July 2002. Subsequently, all planned test shots were conducted (11 each, USAF and USN).

Problems found during testing included one missile guidance or autopilot failure, resulting in hard pushover after launch and loss of the missile. A circuit card connector change was implemented to correct this. Another failure occurred when the missile motor fired more slowly than intended, resulting in one missile failing to a safe mode, per design. F/A-18 software integration created one situation resulting in slow launch and missile miss. This required software updates and changes in commanded missile launch from the aircraft. The motor fire and guidance issues are being addressed with greater motor screening (missile motors are re-used from older missiles) and production oversight to ensure poor components do not enter production.



AIM-9X includes a new infrared seeker, thrust-vectored tail-control actuation system, and signal processor/auto pilot to provide a high off-boresight capability.

While design problems and test issues contributed to a prolonged test program, the most significant delays were caused by test support resource shortfalls. Poor availability of QF-4 target drones, range airspace, and test squadron aircraft delayed the program. The support priority given to real world combat operations had a particularly strong impact on the Navy's portion of the testing, but both services did complete testing.

Modeling and simulation, in conjunction with flight testing, is key to the development and evaluation of the AIM-9X. Due to this missile's expanded capabilities and the high cost of launches, a family of simulations is used to assess missile performance across a wide spectrum of engagements encompassing various threats, backgrounds, and countermeasures. Actual missile firings validate the simulations. The simulations then assess the required probability of a kill against the threat targets. Simulation initiatives allow the number of guided test missiles to be significantly reduced.

The final operational test report is currently being prepared by the Air Force Operational Test and Evaluation Center and OPTEVFOR. DOT&E will prepare the beyond low-rate initial production report with a goal of supporting a Milestone III review in 2QFY04.

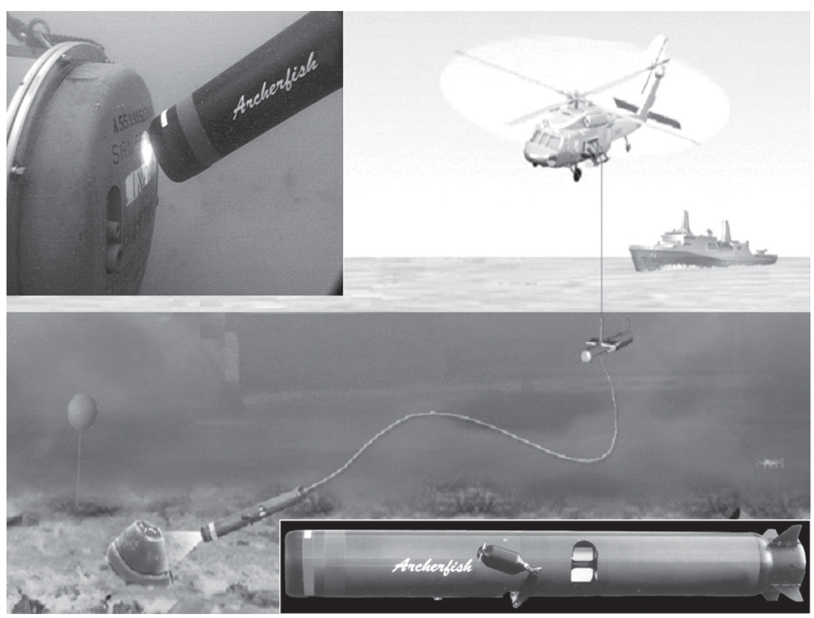
Airborne Mine Neutralization System (AMNS)

The Airborne Mine Neutralization System (AMNS) is a helicopter-deployed mine countermeasure system that is intended to provide rapid neutralization of seaborne mines. The Navy is acquiring two separate and distinct AMNS systems developed by different contractors, one for the MH-53E helicopter (AMNS(53)) and one for the MH-60S helicopter (AMNS(60)). The latter is one of five modular Airborne Mine Countermeasures systems that will be employed from the MH-60S helicopter to provide an organic mine countermeasure capability to Carrier and Expeditionary Strike Groups. The Navy is acquiring seven AMNS(53) systems to provide an interim capability to existing airborne mine countermeasures squadrons. Both systems are designed to relocate, identify, and neutralize mines directly from the helicopter. Target location information obtained from other sources is entered into the AMNS prior to take-off or while the aircraft is flying to the area of operations. The aircraft then hovers at a safe distance from the target position, and lowers an expendable, self-propelled neutralizer device into the water.

The neutralizer can travel autonomously or be driven by the operator to the reported target position to search for the mine. The neutralizer communicates with the operator in the helicopter via a fiber optic cable, sending depth, position, and sensor (sonar and video) information, and receiving control and guidance commands. Once the operator relocates the target and identifies it as a mine, he positions the expendable neutralizer to detonate its shaped charge into the mine. The neutralizer is designed to render the mine inoperable by rupturing its case or causing sympathetic detonation of the mine charge. Each system contains a reusable training version of the neutralizer. An aircraft can carry up to four neutralizers. AMNS(53), derived from a system built for German Navy mine countermeasures ships, uses the Seafox neutralizer vehicle. AMNS(60) will use the British Archerfish neutralizer.

The program sponsor reduced the minimum performance requirements for AMNS(53) in an Operational Requirements Document (ORD) clarification letter on January 27, 2003, citing a compelling fleet need to field the system and the cost/benefit of further system improvements. The Assistant Secretary of the Navy (Research, Development, and Acquisition) (ASN(RDA)) designated AMNS(53) a Rapid Deployment Capability in April 2003, thereby terminating the AMNS(53) Acquisition Category II program and bypasses the planned operational testing described in the approved Test and Evaluation Master Plan and Operational Evaluation Test Plan. ASN(RDA) approved the production of seven AMNS(53) systems and 70 neutralizers and directed an abbreviated operational test known as a Quick Reaction Assessment (QRA) be performed in lieu of an operational evaluation prior to deployment of the system. The Navy plans no additional AMNS(53) procurements.

The Navy's Operational Test and Evaluation Force will conduct the AMNS(53) QRA in February 2004 on production representative systems using the approved ORD as modified by existing clarification letters. The production units will incorporate hardware changes intended to address component obsolescence, water-tightness, and some of the performance issues noted during developmental testing.



The Airborne Mine Neutralization System is a helicopter-deployed mine countermeasure system that is intended to provide rapid neutralization of seaborne mines.

TEST & EVALUATION ACTIVITY

- AMNS(53) concluded developmental testing during 1QFY03 under the direction of the Naval Surface Warfare Center, Dahlgren Division, Coastal Systems Station, located at Panama City, Florida.
- DOT&E observed end-to-end live fire testing at the Underwater Explosive Test Facility at Aberdeen Test Center, Aberdeen, Maryland. Expendable neutralizers were used to detonate moored mines filled with explosive material.
- DOT&E observed high-current testing at Pensacola, Florida, in December 2002.
- DOT&E representatives participated in the development of the Test and Evaluation Master Plan for AMNS(60).

TEST & EVALUATION ASSESSMENT

AMNS(53) performance improved during developmental testing, but did not achieve the minimum performance thresholds for probability of neutralization, expendable neutralizer reliability, and high-current performance required in the ORD. AMNS(53) has not demonstrated satisfactory performance in ocean currents of any appreciable velocity, or the ability of fleet sailors to operate and maintain the system. A team of engineers and technicians provided a higher level of support during developmental testing than would be expected in a typical fleet environment. This system, though purchased, has not demonstrated the necessary performance to allow operational forces to accomplish their mine neutralization mission.

AMNS(53) is lethal against threat mines that are comparable to the U.S. Mark 6 and Mark 56 moored mines when detonated in the correct firing position. Additional data will be collected during the QRA to evaluate the likelihood of correct placement and neutralizer detonation.

AMNS(60) is still in development and has not yet undergone any operational or live fire testing.

Amphibious Helicopter Assault Ships (LHA(R))

The Navy's next class of amphibious assault ships, designated LHA(R), will take the place of retiring *Tarawa* class LHAs. In addition to replacing the amphibious lift provided by the LHA-class ships, the LHA(R) will launch preloaded assault craft (amphibious vehicles and landing craft), tiltrotor aircraft, helicopters, unmanned aerial vehicles, and short take-off and vertical landing fixed-wing aircraft to support both the rapid buildup of combat power ashore and the rapid re-embarkation of the landing force during amphibious operations. As the primary aviation platform within the amphibious task force, the LHA(R) must launch and recover helicopters, tiltrotor aircraft, and fixed-wing aircraft as well as conduct simultaneous well-deck and flight-deck operations day and night. Finally, the ship is expected to have command, control, communication, computer, and intelligence capabilities sufficient to support operational maneuver from the sea/ship-to-objective maneuver operations for Marine Expeditionary Unit/Brigade-size amphibious task forces and other assigned missions in a joint environment.

OSD approved the LHA(R) Mission Need Statement in March 2001. Milestone A occurred in July 2001. Functional design began in FY03 and will continue until Milestone B, currently scheduled for FY06. Although the schedule remains somewhat uncertain as of this report, detail design should start in FY07 with construction beginning in 2009, followed by the first ship delivery in 2013.

TEST & EVALUATION ACTIVITY

To address test and evaluation planning before Milestone B, the Navy prepared a test and evaluation management document to supplement the evaluation strategy that was submitted after Milestone A. The test and evaluation management document is important, since a Test and Evaluation Master Plan is not required until Milestone B. DOT&E held discussions with representatives from the LHA(R) Program Office and Navy staffs to identify LFT&E and OT&E issues that should be addressed.

TEST & EVALUATION ASSESSMENT

The initial OT&E concept emphasizes two planned early operational assessments. These assessments will be largely based on ship plans and specifications, models, test beds, surrogate platform testing, fleet data on fielded subsystems, and developmental testing/operational testing previously conducted on subsystems that will be installed on LHA(R). This process is modeled on similar assessments conducted for the LPD 17-class amphibious ship program and will use functional design plans for the purpose of identifying potential operational deficiencies before construction begins. The Navy and Marine Corps Operational Test Agencies will conduct the early operational assessments with the assistance of subject matter experts selected from various Fleet units and other Navy and Marine Corps Commands.

Early planning and execution of LFT&E for LHA(R) could affect the ship's survivability design. Tasks that should be completed before Milestone B are the surrogate testing, the Milestone B Vulnerability Assessment Report, DOT&E approval of an LFT&E Management Plan, and LFT&E strategy input for the Test and Evaluation Master Plan.

LHA(R) will launch preloaded assault craft, tiltrotor aircraft, helicopters, unmanned aerial vehicles, and short take-off and vertical landing fixed-wing aircraft.

Amphibious Helicopter Dock Ship (LHD 8)

The large-deck amphibious ship fleet includes the five *Tarawa* class LHAs and the seven ships of its successor class, the *Wasp* class LHDs. Beginning in 2011, the five LHAs will reach the end of their 35-year extended service lives. The Navy is building LHD 8 to replace LHA 1; four ships from the new LHA(R) ship class will replace the other four LHAs. In addition to providing amphibious lift, LHD 8 intends to load, launch, and recover assault craft (amphibious vehicles and landing craft), tiltrotor aircraft, helicopters, unmanned air vehicles, and short take-off and vertical landing fixed-wing aircraft, day and night, to support both the rapid buildup of combat power ashore and the rapid re-embarkation of the landing force during amphibious operations. The ship will have command, control, communications, computers, and intelligence (C4I) capabilities sufficient to support operational maneuver from the sea/ship-to-objective maneuver operations for Marine Expeditionary Unit/Brigade-size amphibious task forces and other missions in a joint environment.

There are important changes in the LHD 8 design from the previous LHD 1 class ships. The most significant change is to the propulsion system, where gas turbines replace the previous steam system, a machinery control system, and auxiliary propulsion motors. The LHD 8 gas turbine engines will be based on those currently used on Navy ships, but include modified power turbines, compressors, and inlet guide vanes. Other changes affect internal engineering support arrangements, including enclosures, compressor starting, cooling, bleed-air, fire suppression, fuel service and transfer, lube oil systems, and intakes/exhausts. Drive train changes involve reduction gear modifications (to allow power from both the gas turbine engines and new auxiliary propulsion motors) and the use of controllable pitch propellers. The ship's electrical systems differ significantly from previous LHDs because of the replacement of steam-driven turbine generators with diesel generators and the switch from a 440-volt radial system to a 4160/440 volt zonal distribution system. Other engineering-related changes include the planned installation of all-electric utilities and the replacement of steam evaporators by reverse osmosis units.

LHD 8 will be equipped with the SSDS Mark 2 (Mod 3) combat system, currently in development. LHD 8's SSDS Mark 2 combat system will be similar to the CVN's version (Mod 1). Associated changes are expected to auxiliary systems, such as chilled water, air conditioning, electrical distribution, local area networks, and low-pressure air systems, since these services are platform-specific. Unlike LHD 7, LHD 8 will have an AN/SPQ-9B surface search radar as part of its combat system. The ship's C4I systems will also be updated to reflect the state-of-the-art at the time the ship is outfitted.

TEST & EVALUATION ACTIVITY

Because of these significant differences between LHD 8 and previous ships in the class, DOT&E added the program to OSD's test and evaluation oversight list for OT&E and LFT&E in FY03 with the requirement that a Test and Evaluation Master Plan (TEMP) be submitted for approval.

TEST & EVALUATION ASSESSMENT

DOT&E considered previous test/trial results and operational experience with the seven LHD 1-class ships. OT&E and LFT&E are necessary for LHD 8. The Navy's OT&E and LFT&E responses to DOT&E concerning test and evaluation requirements do not fully address the challenges in integrating the planned changes onto an existing platform. They also do not take into account the important fact that test and evaluation results from

Although labeled as the last of the USS Wasp *(LHD 1-7) class ships, there are important differences in LHD 8. The most significant change is to the propulsion system, in which the previous steam system is replaced with gas turbines, a machinery control system, and auxiliary propulsion motors.*

LHD 8 will likely be applicable to LHA(R). Specifically, the Navy's LHA(R) Test and Evaluation Management Document (approved in May 2003) states that the first LHA(R) will evolve from LHD 8 and therefore, the LHA(R) test and evaluation program will utilize as much of LHD 8's test and evaluation data as possible to reduce the scope and expense of LHA(R) T&E. DOT&E supports that concept; a TEMP for LHD 8 is the appropriate document to describe the test and evaluation strategy and associated resource requirements needed to generate test data that are relevant for LHA(R) program use.

For LFT&E, changes being made to LHD 8 are significant and in some cases pervasive. The integration of these changes potentially create vulnerabilities that must be understood and mitigated. Moreover, since some of these technologies will migrate to the LHA(R), understanding these vulnerabilities through a carefully planned LHD 8 LFT&E program provides the basis for improving the LHA(R) design and/or casualty procedures.

Cobra Judy Replacement (CJR) - Ship Based Radar System

The Cobra Judy Replacement (CJR) is being built to replace Cobra Judy, whose end of service life is predicted to occur in 2012. Although the Air Force is the executive agent, the Navy is building CJR. CJR will transition from the Navy to the Air Force after Initial Operational Capability (IOC), scheduled for 2012.

Cobra Judy is an Air Force-managed program and uses a Military Sealift Command host ship manned by contract seamen. Contractors also operate and maintain the sensors. The host ship, built as a merchant vessel in 1952, is approaching the end of its service life making a host platform replacement necessary. In addition, the S-band radar on the ship is an early generation phased array design and is one of a kind.

Cobra Judy has been operating since 1981 as a one of a kind ship-based radar sensor system. The radars include a phased array S-band radar and a dish X-band radar. The system was designed or evolved to support three missions:

- Treaty monitoring and verification, including proliferation monitoring.
- Ballistic Missile Defense threat assessment and algorithm development.
- Technical data collection of performance assessment, radar signatures, and countermeasures.

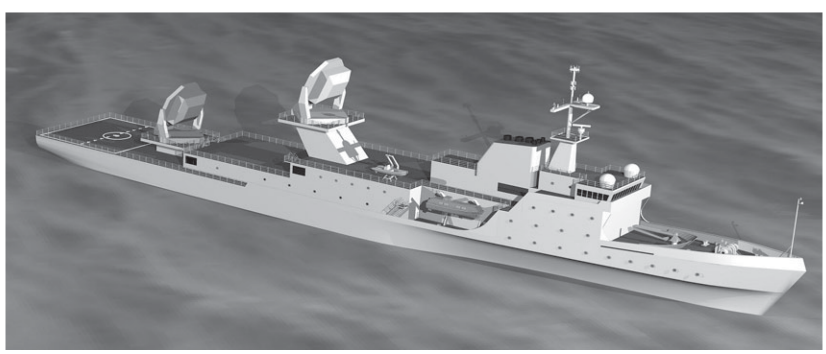
The Services and Central Measurement and Signature Intelligence Organization are working to determine the replacement platform's requirements. Overall, the replacement system should provide at least the same capability as the current platform; in particular, the replacement system's S- and X-band radars must provide data of at least the same quality as that provided by the current system.

TEST & EVALUATION ACTIVITY

- Milestone A Acquisition Decision Memorandum was signed August 6, 2002, and designated the Navy as the acquisition agent.
- Milestone B/C occurred in September 2003. The Under Secretary of Defense, Acquisition, Technology and Logistics approved entry into System Development and Demonstration phase and Production phase with a requirement for a joint independent cost estimate submission in 2005.
- Air Force Operational Test and Evaluation Center (AFOTEC) is the lead operational test agency (OTA), with Operational Test and Evaluation Force (OPTEVFOR) as the supporting OTA.
- DOT&E approved the CJR Test and Evaluation Master Plan (TEMP) in September 2003.

TEST & EVALUATION ASSESSMENT

There are two significant issues with the CJR TEMP, which was co-written and approved by OPTEVFOR and AFOTEC, with final DOT&E approval. The first concerns using ballistic missile targets of opportunity for testing. In the future, the program may feel schedule pressure to conclude testing in a particular time frame, as opposed to when data has been gathered on a sufficient set of targets. A revised TEMP will include a statement that IOT&E is complete only when all testing events have been completed, instead of when a specific period of time has passed, and that IOC will not be declared until IOT&E is complete.



Cobra Judy has been operating since 1981 as a one of a kind ship-based radar sensor system.

Since only one CJR system is planned and operational testing requires a production-representative test article, IOT&E will be done on the sole production article, after production is completed. In order to mitigate this risk, combined developmental test/operational test and operational assessment events should be conducted to evaluate the sensor systems, their sensor integration into the command and control and common operational picture architectures, and, finally, the sensor suite integration into the host ship.

Cooperative Engagement Capability (CEC)

The Cooperative Engagement Capability (CEC) is a system of hardware and software that allows ships to share radar data on air targets. Radar data from individual ships of a Battle Group are transmitted to other ships in the group via a line-of-sight, data distribution system . Each ship uses identical data processing algorithms resident in its cooperative engagement processor so that each ship will have essentially the same display of track information on aircraft and missiles. An Aegis ship can launch an anti-air missile at a threat aircraft, or anti-ship cruise missile (ASCM) within its engagement envelope, based on radar data relayed to it by another ship. SSDS- or ACDS-equipped ships can receive cueing to hostile tracks. Program plans include the addition of E-2C aircraft equipped with the cooperative engagement processor and data distribution system to bring airborne radar coverage plus extended relay capability to CEC. Cooperative engagement processor-equipped units, connected via the data distribution system network, are known as cooperating units.

CEC was demonstrated at sea as early as FY90. Early operational assessments were conducted in FY94, FY95, and FY97. Entry into engineering and manufacturing development was approved at Milestone II in 1995. In accordance with congressional guidance, the Navy certified initial operational capability for CEC (engineering development model equipment upgraded to AN/USG-1 configuration) in late FY96. CEC was designated an Acquisition Category ID program in FY99.

Operational evaluation (OPEVAL) of the surface AN/USG-2 hardware and Baseline 2.0 software was conducted in 3QFY01. DOT&E's test and evaluation report was published on February 1, 2002. The acquisition decision memorandum of April 3, 2002, approved AN/USG-2 for full-rate production and approved low-rate initial production) for the air AN/USG-3 hardware for FY02-03. The AN/USG-2 and AN/USG-3 hardware, with associated software, were designated as CEC Block 1. The acquisition decision memorandum further approved the Navy's plan for the next CEC upgrade, Block 2, which was to be competed for development. During FY03, the Navy reconsidered this approach and elected instead to pursue an upgrade program for CEC, with no further reference to Block 2. The OPEVAL equivalent of the air AN/USG-3 hardware and software was delayed from FY02 to FY04 when deployment of the Battle Group intended for OPEVAL was accelerated.

TEST & EVALUATION ACTIVITY

Test & Evaluation activity consisted of engineering tests, developmental testing, and operational testing of AN/USG-3 equipment in E-2C aircraft in preparation for the FY04 follow-on operational test & evaluation (FOT&E-2) that will support the AN/USG-3 full-rate production decision. An operational assessment was conducted in November 2002 in the Virginia Capes Operating Area. The program is preparing for a two-phase technical evaluation during the first quarter of FY04, followed by FOT&E-2, the USG-3 OPEVAL, in the second quarter of FY04. FOT&E-2 will be conducted with the *USS John F. Kennedy* Strike Group along the east coast and in the Gulf of Mexico.

The Cooperative Engagement Capability is a system of hardware and software that allows ships to share radar data on air targets.

TEST & EVALUATION ASSESSMENT

CEC Surface Equipment AN/USG-2 and Baseline 2.0 Software. Although the surface AN/USG-2, with Baseline 2.0 software, was determined to be operationally effective and suitable, issues were identified in the following areas for further examination during FOT&E: Battle Group integration and interoperability, information assurance, maintainability, joint interoperability, production representative

AN/USG-3 equipment, and new combat system integration. While the CEC Program Manager (PM) is attempting to address these issues, correction of certain issues in the area of Battle Group integration and interoperability require changes to the combat systems integrated with CEC. In spite of acquisition decision memorandum-direction to the Navy to fund expeditious solution of problems associated with integration and interoperability, there is no evidence that correction of most of these problems will be demonstrated soon.

FOT&E-2. The primary objective of this testing is to demonstrate improved operational effectiveness and suitability with production-representative AN/USG-3 equipment and software operating in a Strike Group-level CEC network while executing the air defense mission. At a minimum, FOT&E-2 should demonstrate that the air defense mission can be executed without degradation resulting from integration of the production-representative AN/USG-3 and the E-2C radar. This testing requires a CEC-configured Strike Group detecting, tracking, and engaging threat-representative ASCM surrogates during operationally realistic air defense scenarios with actual and simulated Standard and Seasparrow missiles. Given the current immature air defense T&E infrastructure on the east coast and Gulf of Mexico, and with the closure of the Atlantic Fleet Weapons Training Facility outer range in Puerto Rico, DOT&E is concerned about the adequacy of FOT&E-2. DOT&E is particularly concerned that the OT&E is to be integrated with training of a Strike Group that is also using the immature infrastructure.

FOT&E-3. The primary objective of this testing is to demonstrate operational effectiveness and suitability with a Ship Self Defense System Mark 2 combat system operating in a Strike Group-level CEC network while executing air defense. The Navy plans this testing for early FY05 with the *Reagan* Strike Group on the west coast. DOT&E is concerned that the Strike Group deployment may be accelerated, as was the *Nimitz* Battle Group's in FY02, with the testing delayed until the next Strike Group becomes available. DOT&E is also concerned that the Strike Group composition may not be adequately representative of a CEC Strike Group in terms of numbers of CEC-capable ships and aircraft.

OT&E of Network Centric Warfare Systems. The challenge associated with adequate testing of CEC is an example of the challenges facing this generic category of systems. The Navy has applied substantial effort to development of the Distributed Engineering Plant (DEP), an interconnection of land-based combat system sites for interoperability testing. This has been a useful tool for new system development and for software interoperability certification. Future improvements in the DEP will likely provide significant useful data for the overall warfare system test process, but operational testing under realistic combat conditions will, for the foreseeable future, require an ensemble of platforms – both in quantities and types – that truly represent the size and complexity of at-sea battle forces. The DEP is not a substitute for realistic operational test and evaluation, but it may be used to augment testing.

Adequate OT&E that supports acquisition investment decisions for networking systems such as CEC for the Fleet is important. Effective training of the Fleet in preparation for deployment is also essential. When effectively integrated, mutual contribution and benefit can result with both T&E and training bringing resources that can improve the operational realism of the combined training/T&E environment. With the flexibility and surge capability called for by the Navy's new Fleet Response Plan, effective integration of the two will require collaboration at the highest Fleet and Navy acquisition executive levels.

CVN 21 Next Generation Aircraft Carrier

The Navy accelerated the new Aircraft Carrier program since the last report. The original vision was a three-step evolutionary program advancing from CVN-77, the last of the NIMITZ class, through CVNX1 and culminating in a new aircraft carrier design in CVNX2. In response to the FY04 Defense Planning Guidance, the Navy proposed changes that were approved in a December 12, 2002, Program Decision Memorandum. The restructured program was renamed CVN 21 and will retain the baseline NIMITZ class hull form. CVN 21 will have a smaller island located farther back on the flight deck, three (rather than four) aircraft elevators, two (rather than three) hanger bays, electromagnetic (rather than steam) catapults, and redesigned weapons stowage and weapons elevators. The Navy believes these changes, combined with a slightly larger flight deck, unobstructed catapult configuration, and a pit-stop aircraft servicing and rearming arrangement, will yield the desired/anticipated increase in sortie generation rate.

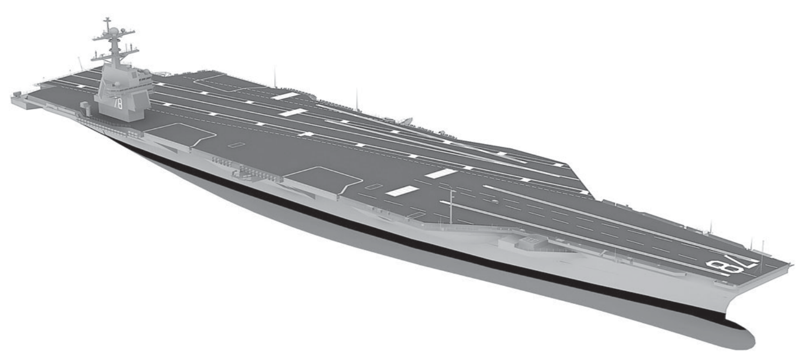
The ship will incorporate a new propulsion plant hoped to be less manpower intensive and have significantly more electric generating capacity than the present NIMITZ class plant. Hull materials and internal design features emphasize enhanced survivability. Additionally, the Navy proposed that CVN 21 be developed in two phases. Phase I will include all the features described above. Phase II will include the ship's Integrated Warfare System (IWS) (e.g., the mission planning, command, control, communications, computers, intelligence, surveillance, and reconnaissance), air traffic control, and ship's self defense systems and aviation intermediate maintenance facilities that are heavily dependent upon evolving commercial technology. The Navy intends this phased approach to provide more robust technology insertions while minimizing disruptive changes during ship construction.

TEST & EVALUATION ACTIVITY

DOT&E and Operational Test and Evaluation Force (OPTEVFOR) witnessed competing contractors' full scale, half-length, testing of Electromagnetic Aircraft Launching Systems (EMALS) at Naval Air Warfare Center, Lakehurst, New Jersey. A down select is scheduled for January 2004. Representatives from DOT&E and OPTEVFOR are witnessing early testing of the Multi-Function Radar Engineering Development Model (EDM) at Wallops Island, Virginia. The early operational assessment, approved by DOT&E in September 2002, was delayed due to program restructuring and is now projected to be complete after the EMALS down select in 2QFY04. The Navy is planning a Test and Evaluation Master Plan (TEMP) to support a 3QFY04 Milestone B decision.

On July 1, 2003, the Future Carrier Program Office completed and approved the first Carrier Vulnerability Assessment Report (VAR). This report details an engineering analysis and assessment based on test and evaluation efforts, including surrogate live fire tests, for the preliminary CVNX ship design. The approval of the CVNX VAR concluded 3 1/2 years of effort involving over 10 organizations and dozens of subject matter experts covering such areas as threats, ship structure, damage control, and fire fighting.

DOT&E and the Navy continue planning activities in support of a robust LFT&E program. During the past year, the Navy performed sixteen shots in a test series for protection system performance against a specific (classified) airborne threat weapon, and conducted one surrogate test of a scaled CVN test article in a simulated underwater explosion. Three test series were conducted on ex-*Shadwell*, the Navy's fire safety research and test facility, examining the fire threat to ordnance stowed in aircraft carrier magazines. The Office of the Director of Naval Nuclear Propulsion has cradle-to-



CVN 21 will have a smaller island located farther back on the flight deck, three (rather than four) aircraft elevators, two (rather than three) hanger bays, electromagnetic (rather than steam) catapults, and redesigned weapons stowage and weapons elevators.

grave responsibility for all aspects of nuclear propulsion plants, and DOT&E does not evaluate the nuclear propulsion plant part of these ships.

TEST & EVALUATION ASSESSMENT

The technical risk for this program is moderate. The Navy is conducting a comprehensive early operational assessment in FY04 intended to identify additional risk factors in ten major areas of the ship. By using the proven *Nimitz* hull form the Navy reduced technical risk in Phase I of the ships development. The Navy plans to use Multi-Function Radar and Volume Search Radar for CVN-21 and these are being developed as part of the new DD(X) destroyer program. The greatest risk will probably be in the IWS, most of which is in Phase II of the CVN 21 program. Safe and adequate operational testing of the IWS providing self-defense against anti-ship cruise missiles will require testing with a self-defense test ship.

The program has a competitive test and evaluation program set up for EMALS. A successful EMALS program should significantly reduce the complexity, space, and manpower consumed by legacy steam and hydraulic systems. It could also help increase the life expectancy of carrier aircraft due to a much smoother launch sequence.

The LFT&E program, as planned by the Navy and DOT&E, will be a comprehensive evaluation based on CVN survivability studies, battle damage lessons learned, flight deck accident lessons learned, relevant weapons effects tests, probability of kill versus probability of hit studies, damage scenario-based engineering analyses of specific hits, vulnerability assessment reports, a total ship survivability trial, a ship shock trial, and extensive surrogate testing.

DDG 51 Destroyer Including AN/SPY-1D Radar and AN/SQQ-89 Integrated Surface Ship Anti-Submarine Warfare Combat System

Initiated in the 1970's, the DDG 51 Destroyer program provides replacements for earlier classes of surface combatants at the end of their service life. The Navy is building the destroyers in flights in order to incorporate technological advancements and other changes during construction. Prior year reports describe Flight I (DDG 51-71) and Flight II (DDG 72-78) configurations. Construction of Flight IIA ships (DDG 79-112) was approved at Milestone IV in FY94. Evolution of the DDG 51 design is continuing, with Flight IIA destroyers being delivered in several baseline configurations to accommodate equipment and computer program changes. All Baseline 5 ships, DDG's 51-78, will eventually receive Baseline 5.3.8. A major effort to replace outdated military computing systems with modern commercial hardware and software began with AEGIS Baseline 6 Phase I (DDG 79-84). Baseline 6 Phase III (DDG 85-90) introduces Cooperative Engagement Capability and the Evolved Seasparrow Missile (ESSM). Baseline 7 Phase I (DDG 91–112) will complete the planned commercialization of the AEGIS Weapon System (AWS) computing plant.

The AWS, which includes the SPY-1D radar and SM-2 surface-to-air missiles, provides the ship's air defense capability. ESSM (and/or the Phalanx close-in weapon system when fitted), SM-2 missiles, countermeasures, and the 5-inch gun provide self-defense against aircraft and anti-ship missiles. The SPY-1D radar system is a multi-function, phased array, three-dimensional (range, altitude, and azimuth) radar that conducts search, automatic detection, and tracking of air and surface targets. AN/SPY-1D(V), a new variant under development for installation in Baseline 7 Phase I ships, is intended to improve performance against targets in clutter and provide an enhanced capability to counter deceptive electronic attack measures.

For undersea warfare (USW), DDG 51 uses the AN/SQQ-89 USW combat system, up to two embarked Light Airborne Multi-Purpose System (LAMPS) Mark III helicopters, torpedoes, and vertically launched USW standoff weapons. Surface warfare weapons include the 5-inch gun and LAMPS Mark III helicopters armed with Penguin or Hellfire missiles. Shore targets are engaged with Tomahawk missiles and the 5-inch gun. Links 4A, 11, and 16 provide connectivity to other Navy, Joint, and Coalition forces.

The AN/SQQ-89(V) series of USW combat systems links acoustic sensors and weapon control systems with advanced data processing and information displays. The AN/SQQ-89(V)6 is the baseline system for ships with a towed array and is installed in Flight I and Flight II ships and other combatants. It integrates the AN/SQS-53 series hull mounted sonar, the AN/SQR-19(V) towed array sonar, and the AN/SQQ-28(V) LAMPS Mark III shipboard electronics with the USW Control System Mark 116 series. In Flight IIA ships, the USW suite does not include the towed array sonar.

DDG 51 is operationally effective in an open ocean, blue-water environment.

TEST & EVALUATION ACTIVITY

DDG mine detection effectiveness, using the AN/SQQ-89 Kingfisher subsystem installed in all DDG's, was tested November 5-6, 2002.

One phase of DDG 51 Operational Test (OT)-IIIF tested the AN/SQQ-89(V)10 USW suite. The operational test pitted *USS Winston S. Churchill* (DDG 81) and supporting aircraft against a *Los Angeles* class nuclear submarine in a series of events at the Atlantic Undersea Test and Evaluation Center (AUTEC) in November 2002.The operational evaluation of the Mark 45, MOD 4 gun mount in December 2002 included the performance of the new 5-inch/62-caliber gun and Mark 160, MOD 8 gun computer system installed in DDG 81 and later ships.

The Navy tested the performance of the Flight IIA ship and the AEGIS Baseline 6.1.5 computer program against cruise missile and small boat threats in February 13-22, 2003.

DOT&E participated in test and evaluation working groups involved in planning the tests completed in FY03 and the tests that will examine the performance of AEGIS Baseline 6 Phase III ships, AN/SPY-1D(V), and AN/SQQ-89(V)14 in FY04.

DOT&E provided testability advice during the sponsor's development of revisions to the operational requirements for the AN/SQQ-89(V)15 and AN/SQQ-89A(V)15 variants of the USW combat system. DOT&E participated in Test and Evaluation Master Plan revisions for DDG 51, AN/SQQ-89(V10), and AN/SPY-1D(V).

TEST & EVALUATION ASSESSMENT

DDG 51 is operationally effective in an open ocean, blue-water environment – it's designed operating environment. However, it is less effective and at greater risk in littoral areas, where it may encounter asymmetric threats. Flight I and II ships are operationally suitable, but maintainability, compatibility, interoperability, and safety deficiencies degrade the operational suitability of Flight IIA variants.

In OT-IIIF Phase I, *USS Cole* (DDG 67), outfitted with Baseline 5.3.8, conducted simulated engagements against 47 manned aircraft presentations and live SM-2 engagements against six aerial targets representing anti-ship cruise missile threats. The ship's air defense performance exceeds the prescribed operational requirements. However, the improved radar performance unmasked issues with command and decision subsystem processing of certain tracks in an electronic attack environment that can result in false tracks and possibly unnecessary missile expenditures. These deficiencies should be addressed in future baseline upgrades. The ship's overall effectiveness against stream raids has not been demonstrated and requires additional testing.

Baseline 5.3.8 software reliability, AWS hardware reliability, and the ship's operational availability for the air defense mission is better than required; however, the time required to restore functionality when a critical computer program fault does occur exceeds the maximum time allowed. These critical faults are infrequent, but when they do occur the combat system is not available during restoration. A review of prior test results shows that computer program restoration times have exceeded the requirement in all but one event and have generally been increasing. The increasing trend in fault identification and restoration times will be monitored closely in future operational tests to determine if it is a by-product of the introduction of commercial hardware and software.

A Flight IIA DDG with the Baseline 6.1.5 hardware and computer program configuration conducted air defense and strike warfare mission operational testing (OT-IIIF Phase II) in FY03. Although not tested against all threats, the Flight IIA ship continues to be effective against the predominant anti-ship cruise missile threats. Analysis of extensive data from tactical engagements shows that DDGs and other surface combatants can effectively complete strike warfare missions using Tomahawk Land Attack Missiles.

DDG 51 does not have an effective mine detection capability. The probability that a moored mine will be detected and correctly classified using the AN/SQQ-89 Kingfisher subsystem is below the prescribed operational requirement. Although bottom mines constitute a very real threat in the littorals, DDG 51 has no equipment designed to detect bottom mines. Part of OT-IIIF evaluated DDG 51 Flight IIA undersea warfare effectiveness. By design, the AN/SQQ-89(V)10 does not provide any improvement in effectiveness and diminishes the ship's organic sensor capability through the removal of the AN/SQR-19 towed sonar array. Overall, DOT&E found the (V)10 to not be effective or suitable for anti-submarine warfare operations. The system failed to meet its threshold requirement for submarine detection and classification, and its software exhibited significant reliability and interoperability problems. Although OT-IIIF did not explicitly test torpedo detection, (V)10 inherits the survivability deficiencies identified in the baseline (V)6.

The anti-submarine warfare testing at AUTEC highlighted the problems created by the recent closing of the Atlantic Fleet Weapons Training Facility. The restricted size, unusual bathymetry, and limited shipping traffic make AUTEC an unrealistic site for operational testing. As the Navy continues to emphasize shallow water operations, the lack of an appropriate littoral test site constitutes a serious limitation.

DDG 51 is not effective in countering the small boat threat. During OT-IIIF Phase II, *USS Bulkeley* (DDG 84) engaged a swarm of five small boats using its helicopter's Hellfire missiles, SM-2 missiles, the 5-inch/62-caliber gun, and the Phalanx Block 1B Close-In Weapon System (CIWS). The ship's sensors and weapons were unable to support situational awareness or to effectively counter the small boat threat.

The Mark 34, Mod 1 Gun Weapon System and 5-inch/62-caliber gun installed in DDG 81 and later ships effectively supported accomplishment of the Naval Shore Fire Support mission. Counter-battery performance continues to be degraded by lack of an effective range-finding capability. An interoperability deficiency that impedes the transmission of sensor information from AWS to the Gun Weapon System degrades the Baseline 6.1.5 ship's gunnery effectiveness against air and sea targets. Poor performance of the ship's laser range finder adversely impacts system performance against sea targets.

The inability to get a stable version of AEGIS baseline 7.1 software delayed the SPY-1D(V) operational assessment from July 2003 to February 2004. The technical evaluation is scheduled for late-August 2004, and operational evaluation is planned for late-November 2004. The compressed schedule allows very little time to correct technical evaluation deficiencies prior to operational evaluation. To adequately evaluate SPY-1D(V)'s improved performance the ship must conduct integrated air defense against a stream raid of threat representative anti-ship cruise missiles in a typical littoral environment with electronic counter measures using SM-2 and ESSM.

The operational suitability of the Flight IIA DDG is not as good as that of Flight I and II ships. Reliability, availability, logistic supportability, training, human factors, documentation, and computer program supportability of the Baseline 6.1.5 ships are satisfactory. Major deficiencies include the safety and compatibility issues related to the limited storage space in the helicopter hangars cited in last year's report; failure of the Operational Readiness Test Set to meet requirements for fault detection, isolation, and identification of applicable technical documentation; continuing problems with excessive AEGIS computer program restoration times; lack of CIWS Block 1B surface mode integration into AWS; and failure of the AWS to pass AN/SPS-67 surface search radar data to the Gun Weapon System.

Since program inception in the 1980's, an extensive LFT&E program has been conducted on the *Arleigh Burke* class of guided missile destroyer. The results of LFT&E indicate that it is highly survivable against the majority of threats it is expected to encounter, but is not invulnerable to all threats. Details are classified and will be forwarded in a separate report to Congress in FY04.

DD(X) Land Attack Destroyer

DD(X) is the replacement for retiring *Spruance* (DD 963) class destroyers and *Oliver Hazard Perry* (FFG 7) class frigates, which are reaching the end of useful service life. The Navy plans the DD(X) to be a multi-mission destroyer featuring a composite deckhouse and a Wave-Piercing Tumblehome Hull displacing about 14,000 tons. Optimized for the land-attack mission, it will have two Advanced Gun Systems (AGSs) with a combined magazine capacity of approximately 750 rounds of long-range land attack and conventional munitions. Each AGS will consist of a single-barrel 155mm gun supplied from an automated magazine. An Advanced Vertical Launch System (AVLS) with 80 cells will host Tomahawk Land Attack Missiles, Standard Missiles (SM2-MR) for local air defense, Evolved Seasparrow Missiles for engagement of both airborne and seaborne threats, and Vertical Launch Anti-Submarine Rockets for engagement of submarine threats. Two 40mm Close-In Gun Systems will enhance self-defense against air and surface threats.

DD(X)'s integrated power system will allow sharing of electrical power between propulsion motors and other electrical requirements such as combat system and auxiliary services. The Navy expects the new Dual Band Radar suite and the Integrated Undersea Warfare System to provide state-of-the-art battle space surveillance and advances in survivability and a total ship computing environment to allow a significant reduction in crew size. Introduction of additional new technology could reduce manning with each successive flight of the DD(X) spiral development.

Designed to operate independently or as an integral part of Naval, Joint, and Combined Expeditionary Strike Forces, DD(X) is intended to be capable of providing strike and firepower support for ground operations and contributing to the protection of friendly naval forces through the establishment and maintenance of surface and undersea superiority and local air defense. The DD(X) design plans to incorporate full-spectrum signature reduction to allow the ship to operate in all threat environments.

On April 29, 2002, the Navy announced that it had selected Northrop Grumman Ship Systems to be the design agent for DD(X). Raytheon is the DD(X) system integrator. Approval to proceed with construction of the lead ship will be sought at Milestone B in FY05.

TEST & EVALUATION ACTIVITY

DOT&E is participating in DD(X) requirements and design reviews for the ship system Engineering Development Models (EDMs) and has been active in development of the draft DD(X) Test and Evaluation Master Plan and LFT&E Management Plan.

DOT&E is participating in Multi-Function Radar test planning.

DOT&E participated in the data analysis of the ex-*Caron* (DD 970) Weapons Effects Test, conducted in December 2002. This test gathered data on fire and smoke spread caused by an internal burst weapon without any attempt to contain or suppress the fire. DOT&E is also participating in the planning for a similar test on ex-*Peterson* (DD 969), which will also demonstrate a Design Agent-developed Automatic Fire Suppression System.

DD(X) will be a multi-mission destroyer featuring a composite deckhouse and a Wave-Piercing Tumblehome Hull displacing about 14,000 tons.

TEST & EVALUATION ASSESSMENT

The Operational Requirements Document for DD(X) has not been approved so design and mission capability requirements are not solidified. Although no operational testing has been done, plans for extensive prototyping of the new technologies to be introduced in DD(X) will provide a rich environment for early operational testing of key DD(X) features. Twelve EDM's are being developed for systems perceived to have the greatest risk. Among them are, AGS, Long Range Land Attack Projectile (LRLAP), AVLS, deckhouse, total ship computing environment, and the Integrated Propulsion System. Preliminary design reviews of almost all the EDM's have been completed and development is progressing. Additionally, the program office is using ex-*Radford* (DD 968) to support early at-sea developmental testing of some of the new technologies.

An early operational assessment is scheduled prior to Milestone B, with four other operational assessments scheduled prior to operational evaluation. The early operational assessment will start 4QFY04. Operational evaluation is scheduled for FY13.

Some operational testing challenges remain to be worked out. There is no shore-based range that will accommodate end-to-end testing of the AGS using the LRLAP. Additionally, safe and operationally realistic self-defense testing with Evolved Seasparrow Missiles against anti-ship cruise missiles can only be accomplished with the Self Defense Test Ship.

Defense Integrated Military Human Resources System (DIMHRS)

The objective of the Defense Integrated Military Human Resources System (DIMHRS) is the automation and integration of personnel and pay entitlement business processes into a standard single point of entry system. DIMHRS will provide a fully integrated military personnel and pay system for all components of the Services. It will replace 17 legacy systems, including all currently operating Service-specific pay and personnel systems. It is being developed based upon commercial-off-the-shelf applications. Extensive reengineering of business practices that capture the best of both private and public sectors is expected.

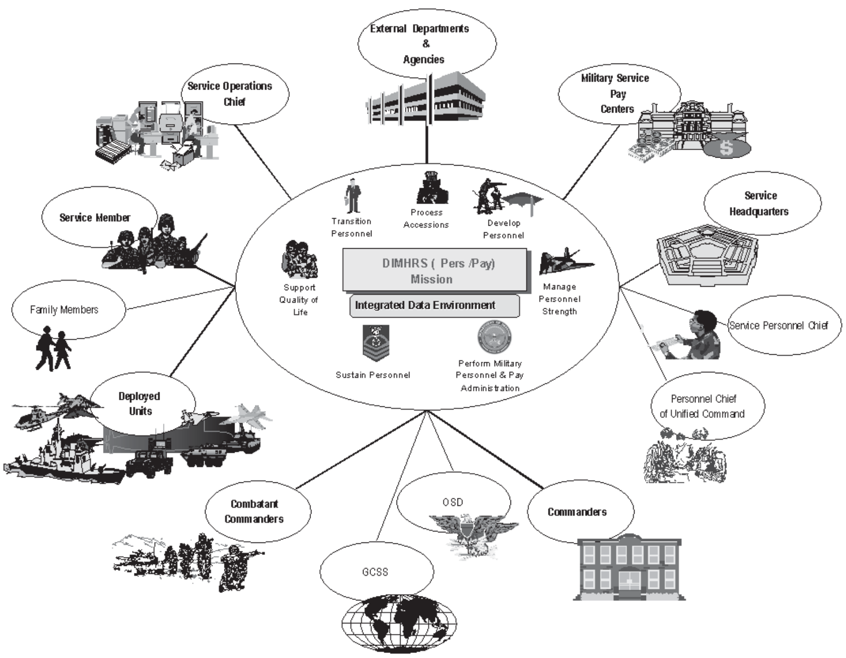
The initial core system of DIMHRS will provide support to processes that are common to all Services. This core system shall collect, store, pass, process, and report personnel and pay data for all DoD active duty, Reserve, Guard, and retired personnel. DIMHRS will support the responsibilities and requirements of the individual Service departments and, in time of war, the Coast Guard. Common software and databases are the foundation of DIMHRS.

The Services will retain their organizational structure management and command and control functions to ensure personnel operational readiness. Personnel and pay organizations will use DIMHRS at all echelons of command to support personnel and pay functions. Managers and analysts in OSD, the Joint Staff, and other federal agencies will also use DIMHRS data for planning and reporting purposes.

DIMHRS addresses the deficiencies in the mission areas of personnel and pay entitlement support. The Joint Requirements Oversight Council-approved Mission Needs Statement identified the following five requirements that DIMHRS must address:

- Provide Combatant Commanders with accurate and timely personnel data needed to assess operational capability.
- Employ standard data definitions across the Services.
- Correctly track mobilized reservists.
- Provide accurate personnel tracking into and within a theater of action.
- Simplify data entry, system maintenance, and resolution of pay discrepancies.

The Navy Reserve Information Systems Office initially managed DIMHRS. In early 1999, the Navy Space and Naval Warfare Command (SPAWAR) took over the management of DIMHRS. The initial acquisition strategy developed by the Program Management Office (PMO) was faulty, and the Joint Requirements and Integration Office under the Office of the Under Secretary of Defense for Personnel and Readiness suspended the strategy. During FY01, the PMO presented a viable acquisition strategy and released an Acquisition Strategy Plan in March 2002. The PMO is moving forward to implement that strategy.



Defense Integrated Military Human Resources System will provide a fully integrated military personnel and pay system for all components of the Services.

TEST & EVALUATION ACTIVITY

The PMO held several Test and Evaluation Integrated Product Team (T&E IPT) meetings over the past three years. There have been no actual test events for this program to date.

DOT&E approved a DIMHRS Test and Evaluation Master Plan (TEMP) in March 2003. Because much of the development strategy and schedule would be determined by the system integrator, DOT&E required that the TEMP be revised and resubmitted within 120 days of the system integrator contract award. In September 2003, Northrop Grumman Information Technology won the contract. Based on the currently projected schedule, the IOT&E of the first increment (Army implementation) is not expected before January 2005.

TEST & EVALUATION ASSESSMENT

The PMO worked hard to develop a viable test strategy and supporting documents. The operational test agency for each of the Services plans to evaluate DIMHRS in their own respective Service environment in accordance with a TEMP jointly developed by the Services. The Navy Operational Test and Evaluation Force will coordinate all operational test activities. The Army is scheduled to be the first Service to receive DIMHRS for operational testing purposes. The coordination of the Service-specific operational test agency efforts has been the focus of several T&E IPT meetings and the planning is becoming more mature.

Deployable Joint Command and Control (DJC2)

The DJC2 is designed to provide the Joint Force Commander with a deployable integrated family of systems with which to plan, control, coordinate, execute, and assess operations across the spectrum of conflict. The DJC2 infrastructure and information technology systems will provide the Joint Force Commander and staff with an environment for collaborative planning, predictive battlespace situational awareness, dynamic asset synchronization and oversight, and executive battle management and control. The Joint Command and Control system will eventually provide the majority of the information technology for garrison and deployed operations. Until then, the DJC2 will use existing command and control systems including the Global Command and Control System-Joint and the Collaborative Information Environment. The material portion of DJC2 consists of shelters, hardware, software applications, databases, and communication support systems. The DJC2 system has three basic configurations: a 10- to 20-position En Route configuration, a 20- to 40-position Early Entry configuration, and a 60-position Core configuration. Multiple Core configurations will be delivered to each regional Combatant Commander to provide the needed agility to meet Joint Task Force needs. The DJC2 will also provide a common deployable command and control platform for all regional Combatant Commanders, service and functional component commanders, and standing and designated Joint Task Force Commanders.

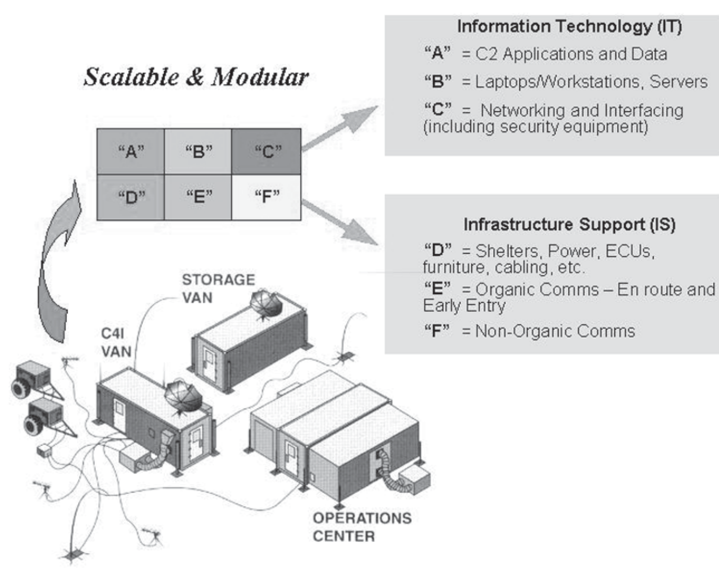
The program is following an evolutionary acquisition strategy. The DJC2 Increment 1 plans a Milestone B review in November 2003 and a Milestone C in 4QFY04. The Program Office will integrate the first increment and transition to a contractor to integrate later increments. A Milestone B for Increment 2 is scheduled for 3QFY06.

TEST & EVALUATION ACTIVITY

The DJC2 initiated activities in February 2003 to accomplish a Milestone B review in September 2003. The Test and Evaluation Integrated Product Team developed a test strategy and draft Test and Evaluation Master Plan. The strategy includes an operational assessment in FY04 and an initial operational test and evaluation of Increment 1 in FY05. The DJC2 Test and Evaluation Integrated Product Team continues working to define the scope of each event consistent with the evolving requirements, system design, and acquisition strategy. The Air Force 46th Test Squadron is the developmental test organization and the Navy Operational Test and Evaluation Force is the lead operational test agency. The test strategy focuses on testing integration and deployment issues since the individual component systems should have completed their own independent testing.

TEST & EVALUATION ASSESSMENT

The DJC2 program is executing an aggressive schedule to deliver the Increment 1capability in FY05. The desire for a Milestone B review in September 2003 resulted in parallel and accelerated Integrated Product Team activities, including development of the Operational Requirements Document. This parallel activity has complicated the ability to finalize a Test and Evaluation Master Plan that reflects the program as defined in the requirements document and acquisition strategy. As a result, the Milestone B review is postponed until December 2003.



The Deployable Joint Command and Control provides a common deployable infrastructure and command and control platform for all regional Combatant Commanders and Joint Task Force commanders.

The DJC2 program plans to integrate existing shelters, computer hardware, and software applications. However, many of the elements of DJC2 are independent acquisition programs with their own development and test schedules or procurements of existing items. The integration of capabilities that have not already completed independent or interoperability testing require additional testing.

The integration of these independent acquisition programs is dependant upon the successful, timely completion of their development and scheduled tests.

E-2C Advanced Hawkeye

There are currently two E-2C configurations in the Hawkeye procurement program: the Hawkeye 2000 (HE2K) and the Advanced Hawkeye (AHE), which includes a Radar Modernization Program (RMP).

HE2K is an umbrella term for multiple improvements to the Group II E-2C, each of which is a separate program. The key objective of this series of modifications is the integration of Cooperative Engagement Capability (CEC). The integration of CEC into the E-2C will increase the air surveillance, detection, and tracking capabilities of the battlegroup. The improvements include the replacement of the current mission computer with a commercial off-the-shelf (COTS) computer (Mission Computer Upgrade (MCU)) and replacement of the control and display consoles with COTS workstations (Advanced Control Indicator Set); the integration of the airborne variant of the CEC system; an upgraded cooling system; UHF Satellite Communications; replacement of the current Passive Detection System with an Electronic Support Measures system; and development of a Mission Information Transfer System. To carry and employ CEC, the E-2C required increased mission computing and display capabilities, as well as an offset in weight and volume. These modifications will be incorporated into new E-2C aircraft production. The Navy also plans to retrofit these improvements into older E-2C aircraft. An upgraded inertial navigation system has also been added.

The AHE program entered System Design and Development in June 2003. This program will replace the E-2C's radar with a UHF Electronically Scanned Array radar via the RMP. This radar is intended to provide significantly increased detection performance over the current radar, particularly in overland and littoral operations. The AHE includes a number of other modifications including an upgraded Identification, Friend or Foe system, a modernized tactical cockpit, a new intercom system, upgraded electrical generators and power distribution system, an upgraded liquid cooling system, and ARC-210 and Multi-function Information Distribution System upgrades. Additionally AHE will incorporate mandated safety improvements including Crash Survivable Flight Incident Recorder, Terrain Approach Warning System/Ground Proximity Warning System, Collision Avoidance System, and Integrated Material Diagnostic System. Finally, CEC software modifications will be required by RMP.

TEST & EVALUATION ACTIVITY

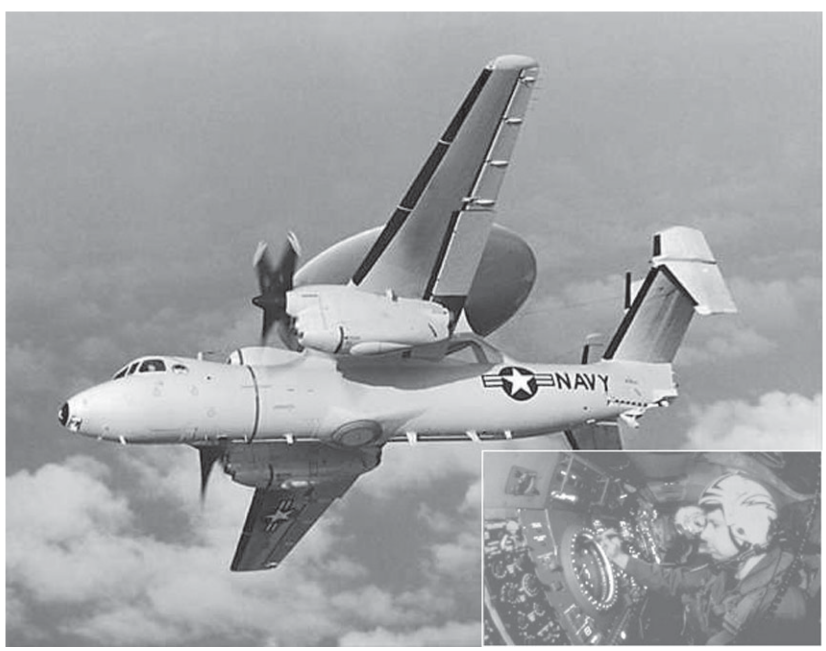
MCU follow-on test and evaluation (FOT&E) will be conducted in parallel with the CEC E-2C operational evaluation now scheduled for 3QFY04.

RMP has completed a series of test flights using the radar technology demonstration system developed for Mountain Top installed on a C-130.

DOT&E approved the AHE Test and Evaluation Master Plan (TEMP) in June 2003.

During FY03, there was no E-2C HE2K operational testing but E-2C HE2K developmental testing continued.

The E-2C upgrades were reviewed and are not covered product improvement programs requiring LFT&E. This determination was based on multiple factors, including the intended role and missions of the aircraft, combat experience to date, and concept of operations.



The integration of Cooperative Engagement Capability into the E-2C will increase the air surveillance, detection, and tracking capabilities of the battlegroup.

Due to its importance to fleet air operations, the survivability of the E-2C will be evaluated for expected combat missions. The Navy has developed a comprehensive survivability evaluation plan to ensure the needed data and information are available.

TEST & EVALUATION ASSESSMENT

The MCU TEMP approval memo, signed July 27, 2000, called for an update to the TEMP within 90 days to define MCU FOT&E, which will include Electronic Support Measures and Satellite Communications. This TEMP has yet to be formally submitted to DOT&E.

The E-2C survivability program is adequate to evaluate the survivability of the aircraft.

Advanced Hawkeye radar risk reduction flight-testing was performed at the Naval Air Warfare Center Aircraft Division, Patuxent River, Maryland, on the NC-130H aircraft from December 2002 - June of 2003. The Advanced Development Model radar system used during the demonstrations at the Pacific Makaha Ridge Facility in 1997 and 1999 was integrated into the NC-130H. Specific risk reduction objectives included evaluation of space time adaptive processing operation in critical operational environments and conditions and radar system performance. The system was operated in overland and littoral environments that included ground traffic, clutter, jamming, and casual electromagnetic interference. Radar system assessment included controlled target detection range performance in clutter and jamming environments and system accuracy. Initial analysis of flight test data indicates the program met all system risk reduction objectives and achieved all predicted performance capabilities.

A critical aspect of E-2C AHE operational testing will be joint interoperability, an area that was unresolved in the MCU operational evaluation. The Joint Air and Missile Defense Organization is coordinating significant resource investment by OSD in a 2010 theater air and missile defense architecture. In addition to AHE, this effort includes other upgrades, such as the Block 40/45 upgrade to the E-3 and new platforms, such as the Joint Land Attack Cruise Missile Defense Elevated Netted Sensor. Additionally, the Single Integrated Air Picture System Engineering Task Force is coordinating an effort to improve the quality of the air picture available to the Joint Forces Air Component Commander and to the forces conducting and fighting the air battle through improvements in the available data links. Joint interoperability will be key to OSD achieving its theater air and missile defense goals. Therefore, testing the joint interoperability of the participating platforms will be a critical part of their OT&Es.

EA-6B Upgrades

The EA-6B is a four-person, carrier capable, twin turbojet tactical aircraft. Its primary mission is the interception, analysis, identification, and jamming of radio frequency transmissions of enemy weapons control and communications. The crew includes one pilot and three electronic countermeasures officers. The EA-6B carries the ALQ-99 Tactical Jamming System, which includes a receiver, processor, and various mission-configured jammer pods carried as external stores. The EA-6B has the USQ-113 Communications Jammer, and may also be armed with the high-speed anti-radiation missile (HARM) for enemy surface-to-air radar destruction and suppression. The EA-6B is a key contributor to the Suppression of Enemy Air Defenses Electronic Attack mission.

Operational since 1972, the EA-6B underwent a number of upgrades: Expanded Capability, Improved Capability (ICAP), ICAP II, and Block 89A. The Navy cancelled another significant upgrade - Advanced Capability - for financial reasons after it reached full-scale development in FY93. The Operational Test and Evaluation Force (OPTEVFOR) conducted IOT&E of Advanced Capability in FY94 which provided the technical basis for much of the current upgrade program. The program scheduled the Initial Operational Capability (IOC) around June 2005.

Improvements to the ALQ-99 jamming pod capability include the Universal Exciter Upgrade (full-rate production in FY96), Band 9/10 transmitter (IOC in FY00), a prototype Band 7/8 jamming capability, and the development phase for a low-band transmitter (LBT) upgrade.

ICAP III, which will be the most significant upgrade, includes a new receiver intended to provide a reactive jamming capability. ICAP III systems integrate many of the above warfighting enhancements with the addition of new controls and displays. It includes provisions for Link 16 connectivity, via the Multi-Functional Information Distribution System. ICAP III builds upon the Block 89A improvements to achieve a reactive jamming/targeting and geolocation capability for active emitters. The Navy's procurement plan is to transition all EA-6B aircraft to the ICAP III configuration by 2010. Addition of the Multi-Mission Advanced Tactical Terminal and the Improved Data Modem capability improves battlefield situational awareness for the crew. The program is also integrating aircrew night vision devices to enhance night capabilities. DOT&E approved the Test and Evaluation Master Plan in January 2003.

TEST AND EVALUATION ACTIVITY

The Navy has been conducting ground and flight system testing on the ICAP III new receiver (the AN/ALQ-218) since February 2002. DOT&E approved the test plan for a two month operational assessment (OA) involving 29 open-air range flight sorties. The test was completed on March 20, 2003. During the first half of 2004, there will be an additional period of ground and flight testing for correction of deficiencies in preparation for full-system operational evaluation (OPEVAL). Specific performance interests prior to fleet deployment are jammer and HARM launch reactive response times, hostile emitter geolocation accuracy, suitability of built-in test, reliability, and aircrew display and control capabilities.

Improved Capability III, which will be the most significant upgrade, includes a new receiver intended to provide a reactive jamming capability.

The Navy is implementing a re-baselined LBT jammer pod program in two phases. The first phase concentrates on completing in-plant tests of the LBT transmitter/amplifier module integrated with a new, vertically polarized antenna and another configuration incorporating an existing horizontally polarized antenna that is currently in fleet use. The second phase will continue the more difficult development and integration of three (or possibly fewer) remaining horizontally polarized antenna types with the transmitter/amplifier module. The Navy projects OA field-testing of the LBT to begin around March 2004, subject to completion of developmental testing. A prototype Band 7/8 jammer pod based on the Band 9/10 architecture is in its early design/fabrication phases.

There was no formal USQ-113 communications jammer test and evaluation activity in FY03. Upgrades and correction of deficiencies are underway in preparation for additional flight testing by OPTEVFOR in early 2004.

TEST AND EVALUATION ASSESSMENT

The ICAP III receiver upgrade program risk centers on its ability to provide accurate emitter geolocation in full azimuth coverage for HARM targeting and the reactive jamming of selected hostile emitters. Twenty-nine OA sorties indicate that with some exceptions, the system is potentially effective and potentially suitable in this role. Prior to entering OPEVAL, deficiencies observed during OA in target emitter display rates, alphanumeric keyboard dysfunction, and mission planner must be corrected. Additionally, the OA revealed a number of operator display and control inefficiencies. Needed correction of deficiencies, almost all by software changes, is predicted to delay the start of OPEVAL from December 2003 to around April 2004. The Navy has scheduled IOC for June 2005. Even after OPEVAL and IOC, there will be a period of tactical concept development and further software refinements to make the best use of the ICAP III selective reactive jamming capability.

The LBT program continues in the development phase. The program office is closely monitoring problems in successful completion of in-plant testing. The Naval Air Warfare Center, Point Mugu, California, has completed aircraft integration testing with one engineering development model. In-plant vibration qualification regression tests resulted in unacceptable damage to a newly designed support bracket. The LBT Reliability Development/Growth Test effort continues to fall behind schedule in both demonstrated mean time between failure measures (71.4 hours vice 277 hours required), and accumulated test time (1,499 hours vice 4,345 hours previously scheduled for this point in the program). The Navy's developmental test began in October 2003.

There were five major deficiencies observed during the January to June 2001 follow-on operational test and evaluation (FOT&E) of the AN/USQ-113(V)3 Radio Countermeasures Set. One was a safety concern and two involved human factor considerations. The FOT&E revealed signal classification and interoperability problems. During the past two years of fleet operation, the Navy initiated an effort to correct selected deficiencies. Two deficiencies are being addressed in a Verification of Correction of Deficiencies that is scheduled to end flight test in December 2003. Testing at required frequencies is denied because of the impact on civilian sector usage of certain frequency bands. Those same frequency bands are the ones that the enemy will plan to use because of readily available, cheap, and effective equipment. This inability to test at all required frequencies in other-than-remote test locations complicates adequate testing. Testing at remote locations is being explored, but such an approach will require transportable, real, or simulated target/victim equipment and associated diagnostic instrumentation. Some of these same testing challenges apply to the LBT.

Evolved Seasparrow Missile (ESSM)

The Evolved Seasparrow Missile (ESSM) is a short-range missile intended to provide self-protection for surface ships. It was developed to balance total system effectiveness against the low-altitude supersonic anti-ship cruise missile (ASCM) threat. On Aegis ships, ESSM will be launched from the Mark 41 Vertical Launch System. Four missiles are stored, with tail fins folded, in each launcher cell. (The number of cells is either 90 or 96 on an Aegis destroyer and either 122 or 128 on an Aegis cruiser.) Vertical launch requires a thrust vector control system on the ESSM rocket motor. Guidance is provided by up-linked commands until the ESSM is near the target, at which time guidance transitions to semi-active homing on reflected radar signals from the target. ESSM may also be launched in a home-all-the-way mode (no up-linked commands). At this time, ESSM installation is funded for Aegis ships only. On non-Aegis ships (aircraft carriers, amphibious assault ships, other surface combatants), ESSM will be fired from other launch systems and guidance will be in homing-all-the-way to intercept. ESSM uses an 8-inch diameter modified guidance section and a new warhead section. A new 10-inch diameter rocket motor provides higher thrust for longer duration than predecessor Seasparrow missiles. ESSM is a cooperative development effort that includes 13 participating governments.

The Milestone II review was conducted in November 1994. During 1998, the program was restructured to add an operational assessment (Operational Test-IIA) based on missile flights at White Sands Missile Range (WSMR), New Mexico, to support the first low-rate initial production (LRIP) decision. A second low-rate initial production decision was added and was supported by results of operational testing (Operational Test-IIC) with the Self Defense Test Ship (SDTS). The full-rate production decision will be supported by the operational evaluation (OPEVAL). LFT&E component/section-level ground testing, conducted in FY96-FY98, included arena warhead tests against fragmentation mats and components of United States and foreign targets. In addition, LFT&E used results of flight testing during OT-IIC, technical evaluation, and OPEVAL.

TEST & EVALUATION ACTIVITY

OT-IIC missile firings with the SDTS were completed in early FY03. Technical evaluation and OPEVAL were conducted on *USS Shoup*, an Aegis destroyer, in March and April 2003, respectively. All of the testing was conducted at the Naval Air Warfare Center Weapons Division sea range at Point Mugu, California. DOT&E staff or their representatives observed portions of the testing.

On Aegis ships, the Evolved Seasparrow Missile will be launched from the Mark 41 Vertical Launch System.

TEST & EVALUATION ASSESSMENT

Although DOT&E approved the OT-IIC and OPEVAL Test and Evaluation Master Plans and operational test plans, the OPEVAL was not conducted in accordance with those plans as a result of unsatisfactory aerial target performance. This is the first OPEVAL of a Navy system for which the testing was not adequate to determine operational effectiveness. The Navy must give development and sustainment of threat-representative targets higher priority.

Self Defense Test Ship Phase (Operational Test-IIC). The combat system installed on the SDTS was intended to approximate the system on non-Aegis ships that use the Mark 29 rail launcher. However, the combat system on the SDTS had limitations that constrained ESSM capability against some operationally realistic threats. As a result of better understanding the impact of these limitations, two missile firing scenarios planned for the SDTS phase were modified and moved to the OPEVAL.

Fifteen ESSMs were launched at various targets in FY02/FY03. Included were maneuvering and non-maneuvering, subsonic and supersonic, low-altitude targets, as well as a supersonic high diving target. Some of the critical scenarios were scripted to be unrealistic or used targets that were not adequately threat-representative. ESSM problems were discovered during flight tests, solutions were implemented, and corrections were demonstrated.

OPEVAL. As a result of unsatisfactory aerial target performance, the testing was not adequate for determining ESSM operational effectiveness. ESSM capability against the supersonic, maneuvering ASCM threat was not demonstrated. Capability against the high-altitude, supersonic, terminal diving missile threat was not demonstrated. ESSM demonstrated capability against the non-maneuvering, low-altitude, subsonic ASCM threat. ESSM is operationally suitable. As demonstrated during OPEVAL and live fire test and evaluation events, the ESSM warhead is lethal against the ASCM threat.

Although capability against a supersonic low-G maneuvering sea-skimming ASCM target was demonstrated in technical evaluation and during OT-IIC, the scenarios were scripted to be unrealistic. Although capability against a high-altitude, supersonic, terminal diving missile target was demonstrated during OT-IIC, it was not adequately threat-representative.

The supersonic, maneuvering sea-skimmer targets and supersonic, high-altitude, terminal diving target scenarios moved from the SDTS phase became more difficult to execute as a result of the significant challenge in balancing range safety requirements against operationally realistic scenarios involving a manned ship. The scenarios were not conducted as planned due to the unsatisfactory target performance. Fourteen scenario attempts resulted in six scenarios that produced useable test results. The other attempts involved target problems.

Follow-on OT&E (FOT&E). FOT&E requires flight testing against the threat ASCM categories that were not adequately examined during the OPEVAL, primarily as a result of the unsatisfactory aerial target performance. Flight testing is also required in the presence of electronic jamming and with ESSMs that have undergone fleet representative shipboard storage time. In addition, a new ASCM threat has appeared for which there is no credible surrogate target. The Navy needs to acquire adequate surrogates and conduct ESSM testing against them.

The OPEVAL was conducted with an Aegis Weapon System Baseline 6.3 with Mark 41 vertical launch system. Other combat systems are sufficiently different that ESSM flight testing is required when it is integrated with them.

ESSMs are intended to provide close-in defense of Aegis ships against ASCMs, with standard missiles providing interceptor capability at longer ranges (both self defense and defense for other ships.). There are circumstances in which the Aegis Weapon System could be controlling ESSMs and SM-2s simultaneously. This is primarily an Aegis Weapon System (Baseline 6.3) issue that requires operational testing under the DDG-51 program's FOT&E.

Although it is not a requirement, non-Aegis combat systems with predecessor Seasparrows provide a useful capability against surface targets. Limitations in the Aegis Weapon System Baseline 6.3 computer program and shipboard illuminator radars precluded testing ESSM's capability against surface targets. Consideration should be given to providing this surface target engagement capability with this and follow-on Aegis baselines.

Expeditionary Fighting Vehicle (EFV)

The Expeditionary Fighting Vehicle (EFV) is an armored amphibious assault personnel carrier that will replace the current Marine Corps amphibious assault vehicle (AAV). Two platform variants are under development: the personnel variant (EFV(P)), which will be armed with a 30 mm cannon and a 7.62 mm machinegun and is intended to transport 17 combat-equipped Marines and a three-man crew; and a command and control variant (EFV(C)) which will transport a commander and staff. An operationally configured EFV is expected to weigh about 38 tons; travel in excess of 20 knots in 3-foot significant wave-height sea conditions; and travel at 43 miles per hour on a level, hard-surface road.

The EFV is designed to provide an over-the-horizon amphibious assault capability for Marine Air-Ground Task Force elements embarked aboard amphibious ships. Once ashore, the EFV(P) will provide transportation, protection, and direct fire support. The EFV(C) will serve as a tactical echelon command post.

The EFV entered its System Development and Demonstration (SDD) phase in December 2000. Delays in completing developmental and operational testing resulted in a program restructuring, necessitating a Test and Evaluation Master Plan (TEMP) update. DOT&E approved this update in July 2003. To allow sufficient time for developmental and operational testing before Milestone C, the Marine Corps requested postponing Milestone C by 12 months, which the Under Secretary of Defense (Acquisition, Technology, and Logistics) approved in March 2003. Formerly called the Advanced Amphibious Assault Vehicle (AAAV), the U.S. Marine Corps renamed the vehicle EFV in September 2003.

TEST & EVALUATION ACTIVITY

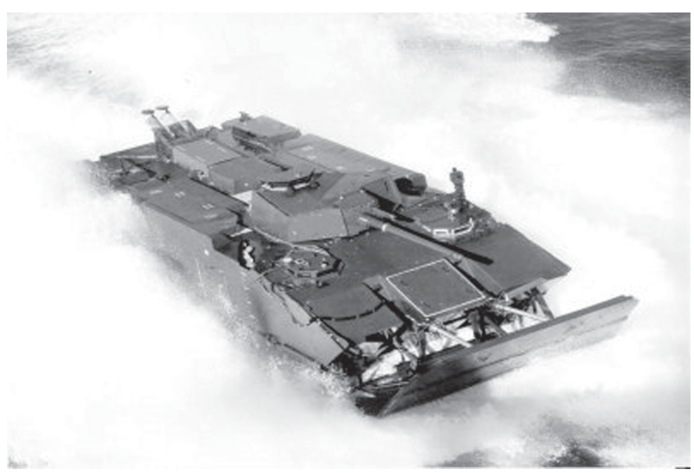
FY03 activities included continued developmental testing using the three Program Definition and Risk Reduction (PDRR)-phase EFV(P)s. This effort involves land mobility (vibration and track durability), water mobility (surf crossing, high/low water speed, and maneuverability), firepower testing (accuracy and ammunition characterization), and initial contractor shakedown testing of the first several of the SDD-phase vehicles. No OT&E events were conducted, but the Marine Corps Operational Test and Evaluation Activity (MCOTEA) observed and reported on a developmental test event that examined EFV compatibility with *Maersk* class Maritime Pre-positioning Force shipping and DoD-used railcars. DOT&E representatives observed a contractor developmental test event that employed the first SDD-phase EFV(P) to re-examine troop-carrying capacity and the amount of time it takes for Marines to egress from the vehicle.

LFT&E activities in FY03 included technical and validation testing of redesigned armors, some component technical testing, and revisions of the LFT&E Strategy in the TEMP. Technical and validation testing of the new armors will continue into FY04.

TEST & EVALUATION ASSESSMENT

The following corrective fixes have been identified, but not demonstrated, for SDD-phase vehicles:

- The PDRR EFV(P)'s weapon system is more capable than the weapon system aboard the AAV. However, shortfalls included a probability of hit less than required despite unchallenging conditions, limited fire-on-the-move capability, and problems with the gun's feed system that reduced the number of rounds that could be loaded.
- The PDRR EFV(P)'s land mobility capabilities effectively equaled the main battle tank's on primary and secondary roads. The PDRR EFV(P) could not keep up with tanks in moderate cross-country conditions and broke down when traversing more challenging cross-country terrain that was passable to both tanks and AAVs.



The Expeditionary Fighting Vehicle is an armored amphibious assault personnel carrier that will replace the current Marine Corps amphibious assault vehicle.

- The PDRR EFV(P)'s demonstrated reliability (a Key Performance Parameter (KPP)) was roughly half the level that had been predicted at that stage of development.
- Safety-related concerns included high interior noise levels, carbon monoxide accumulation during 30 mm cannon firing, and elevated interior temperatures when operating in hot ambient conditions.

Although the Program Manager identified corrective fixes for the SDD-phase vehicles, they have mostly not been demonstrated. However, data from recently completed contractor developmental tests showed that the interior design changes implemented in the SDD EFV(P)s significantly increased troop carrying capacity and reduced the amount of time it takes for Marines to egress the vehicle. Therefore, it appears more likely that SDD EFV(P)s will meet the troop carrying KPP and Operational Requirements Document-specified egress time during the upcoming OT&Es.

The Maritime Pre-positioning Force shipping event showed that the vehicle was compatible with *Maersk* class ships in most respects; however, an EFV cannot move from its stowage area to the stern ramp in order to offload in-stream. The EFV's footprint is approximately 25 percent larger than an AAV's; thus, deck-space needed to embark EFV units will be correspondingly greater.

Assuming reliability improvement initiatives are adequately funded and weight-reducing design trades do not adversely affect reliability, the risk is still high that the vehicle's 70-hour mean time between operational mission failures (MTBOMF) requirement (a KPP) will not be met during IOT&E. Poor reliability jeopardizes mission accomplishment: If the EFV's MTBOMF falls short of the required 70 hours, fewer than 70 percent of a unit's EFVs would be predicted to complete the specified 24-hour mission without experiencing significant failures.

Operationally relevant questions will remain unanswered until OT&E resumes in FY05. The EFV(P) has not demonstrated that it can accomplish its primary mission, that is, transport combat-equipped Marines from an amphibious ship located 20 to 25 nautical miles offshore to objectives located inland without degrading their physical condition. The performance of an integrated EFV(C) will also not be demonstrated during OT&E until conducted by MCOTEA in FY05. Finally, concerns remain about the use of the less corrosion resistant aluminum alloy, Al 2519, and the potential impact on life cycle cost.

The test program described in the revised LFT&E Strategy, including thorough characterization of new armors, ballistic testing of new and unique EFV components, comprehensive controlled damage testing and full-up system-level testing of refurbished EFV(P) and EFV(C) SDD prototypes should be adequate to support the required vulnerability evaluation of the EFV. DOT&E and MCOTEA will continue to seek better insight into technical and developmental testing so as to best leverage data gathered in these tests and help refine the scope of full-up system level tests outlined in the LFT&E Strategy.

F/A-18 E/F/G Super Hornet

The FA-18E/F Super Hornet is a multi-mission, day/night strike fighter aircraft that provides precision strike capabilities to Joint Task Force and Carrier Strike Group Commanders. The aircraft features improvements in range, endurance, carrier bring-back, weapon payload, and survivability over earlier models of the Hornet. It also provides in-flight refueling for other tactical aircraft and additional room for growth and upgrades. The F/A-18E is a single-seat aircraft while the F/A-18F is a two-seater. The EA-18G is the planned electronic attack variant and will closely resemble the two-seat F/A-18F model.

F/A-18 E/F aircraft through Lot 25 are all Block 1 aircraft. Beginning with Lot 26 (FY03), production transitioned to Block 2 with a re-designed forward fuselage and provisions to incorporate Block 2 equipment including Active Electronically Scanned Array (AESA) radar, Advanced Crew Station (ACS), 8x10 Display, Fiber Channel Network Switch, and Digital Video Map Computer. Advanced Mission Computers and Displays (AMC&D) upgrades the mission computers from an assembly language based system to an open architecture higher order language and were introduced beginning with Lot 25.

With AESA, the APG-79 radar, the Navy intends to enhance E/F capabilities in all warfare areas: aircraft lethality, survivability, and signature characteristics. Because of the potential significance of AESA, DOT&E placed it on oversight for both OT&E and LFT&E. AESA Milestone B occurred in February 2001. Milestone C is planned for December 2003 with operational evaluation (OPEVAL) beginning in February 2006 and an initial operating capability in FY07.

The ACS provides a completely re-designed aft cockpit in Block 2 F model aircraft. The intent of ACS is to provide a work station for the Weapon System Officer that will enhance aircrew coordination and situational awareness for increased combat capability in heavy threat and high cockpit task loading environments. ACS was designed to allow for spiral capability upgrades, potentially including completely de-coupled cockpits in which one crewmember can be in air-air mode and the other in air-ground mode. ACS began with Lot 26 (FY03).

Advanced Targeting and Designation Forward-Looking Infrared System (ATFLIR) represents the latest generation of technology in infrared targeting capabilities, including Navigation Forward-Looking Infrared (NAVFLIR), laser spot tracker (LST), air-to-air laser ranging, electronic zoom, geographic-point targeting, and Electro-optics. It will combine the functions of three legacy pod systems (TFLIR, NAVFLIR, and LST) into one pod. This next-generation technology is designed to provide three fields of view, incorporate a larger detector array, and allow flight operations up to 50,000 feet altitude.

The EA-18G aircraft, chosen to augment electronic attack capabilities across the services and replace the Navy's EA-6B, will be a missionized F/A-18F airframe to provide capabilities to detect, identify, and locate hostile radio frequency emitters in order to direct jamming against radar and communications threats, and to fire suppression weapons such as High-speed Anti-Radiation Missiles (HARMs). The EA-18G incorporates a version of the airborne electronic attack (AEA) suite developed for the Improved Capability (ICAP) III EA-6B upgrade. The Navy plans to include a newly configured Communications Countermeasure Set as a replacement for the USQ-113. The Navy expects approval of the Operational Requirements Document for the EA-18G in October 2003. The Milestone B decision review is expected in

The FA-18E/F Super Hornet is a multi-mission, day/night strike fighter aircraft that provides precision strike capabilities to Joint Task Force and Carrier Strike Group Commanders. The F/A-18E is a single-seat aircraft while the F/A-18F is a two-seater. The EA-18G is the planned electronic attack variant and will closely resemble the two-seat F/A-18F model.

November 2003; Milestone C is planned for April 2007. A spiral acquisition strategy leads to a planned Core Block I capability (described below) at the initial operating capability in FY09.

TEST & EVALUATION ACTIVITY

In April 2000, DOT&E's beyond low-rate initial production (BLRIP) report to Congress stated that the F/A-18E/F was operationally effective and operationally suitable. The Operational Test and Evaluation Force conducted follow-on test and evaluation (FOT&E) 1 of the F/A-18E/F with new tactical software (Software Configuration Set (SCS)-18E) from September 2001 to May 2002 in accordance with a DOT&E-approved Test and Evaluation Master Plan (TEMP) and Test Plan.

The Operational Test and Evaluation Force conducted the second FOT&E period with Lot 25 aircraft from May 12, 2003 - November 2003. This period tested the new higher order language SCS known as H-1 and the first version of AMC&D. It also tested several component upgrades, such as the Signal Data Computer Replacement, Digital Expandable Color Display, and others. OPEVAL of the ATFLIR Block 1 was conducted from March 21 - June 23, 2003.

FOT&E 3 is scheduled to begin in March 2004 and will test SCS H-2 (the first higher order language software that will deploy in late FY04 or early FY05), the Shared Advanced Reconnaissance Pod (SHARP) reconnaissance pod, ATFLIR Block 2, AIM-9X (for the E/F), and other F/A-18 roadmap improvements.

FY03 test and evaluation activities focused on preparation of the TEMP for the AEA suite's integration into the F/A-18E/F. Risk reduction testing continued during FY03 in preparation for a System Development and Demonstration contract award in February 2004. The TEMP correlates with the EA-18G Acquisition Strategy and current plans and funding for a Core Block I configuration. Core Block I will consist of a repackaged ICAP III receiver/antenna system (the ALQ-218), an existing Multi-Mission Advanced Tactical Terminal, a newly configured Communications Countermeasure Set, and existing ALQ-99 jammer pods. It will be able to deliver HARM and Advanced Medium Range Air-to-Air Missile weapons. The electronic attack system will not be interoperable with AESA, nor will the aircraft have Integrated Defensive Electronic Countermeasures or ALR-67.

Initial test efforts included wind tunnel aeromechanical testing, antenna measurements, limited initial flight tests that did not include functional avionics, and preliminary electromagnetic interference/compatibility measurements. These initial tests supported feasibility studies and early design activity, and revealed potential antenna problems. The early tests were conducted in a limited flight envelope and provided initial flying qualities, loads, noise, and vibration data that were used to define EA-18G design criteria.

TEST & EVALUATION ASSESSMENT

DOT&E based its assessment on operational testing activities conducted during the past year, as well as operational experience gained in Operation Iraqi Freedom. The Navy certified several new systems for early operational capability in conjunction with accelerated wartime deployments: ATLFIR, Multi-functional Information Distribution system (MIDS), joint helmet mounted cueing system (JHMCS), and SHARP were all deployed aboard *USS NIMITZ*. All these systems received either a preliminary report or an operational assessment prior to the early operational capability. OPEVAL of MIDS, JHMCS, and ATFLIR are complete. The Navy will conduct OPEVAL for SHARP as part of FOT&E 3 beginning in March 2004.

For the F/A-18E/F OPEVAL the Navy approved 50 waivers to the testing of required capabilities. FOT&E 1 resolved 30 of those waivers with nine additional waivers to be resolved during FOT&E 2. ATFLIR OPEVAL resolved four more waivers (one ATFLIR test waiver is to be resolved during FOT&E 3). The Navy expects that incorporation of the testing of the Advanced Crew Station will resolve two more test waivers and AESA will resolve the final four waivers to required capabilities.

The DOT&E beyond low-rate production report to Congress found that the ATFLIR was operationally effective for air-to-surface operations, its primary mission area, and operationally suitable. DOT&E found that Block 1 is not operationally effective for air-to-air operations.

Even though the EA-18G has a high degree of commonality with the F/A-18F airframe and is integrating existing jammer pods, the new antennae and receiver will be a significant challenge and represent high risk with the given schedule. Three key areas will need to be demonstrated: Does it meet the EA-6B ICAP III baseline performance? Does it meet reliability, availability, and maintainability requirements? Will a two person aircrew be able to accomplish the required Electronic Attack and Electronic Support functions? At present, a comprehensive definition of the EA-18G AEA system will not be available until a Preliminary Design Review has been reached in late 2004.

The Navy plans to review the first TEMP submitted for Milestone B decision review shortly after the Preliminary Design Review. The limited number of operational assessment flights prior to a Milestone C decision date is a concern and is associated with the timeliness and adequacy of modeling and simulation facilities needed to supplement flight testing. The capability of the wingtip receiver pod design to support interferometric-based geolocation requirements warrants special consideration in early T&E planning and assessments, along with aircrew display and control interfaces. Because the aircrew is reduced from four to two, there will be an impact on operator workload and consequent modifications to existing EA-6B operational concepts and tactics.

F-35 Joint Strike Fighter (JSF)

The F-35 Joint Strike Fighter (JSF) is a joint, multi-national program for the Air Force, Navy, Marine Corps, and eight cooperative international partners: the United Kingdom, Italy, the Netherlands, Turkey, Canada, Australia, Denmark, and Norway. The JSF Program's objective is to develop and deploy an affordable air system that satisfies the warfighter's requirements.

The air system consists of a family of highly common and affordable strike fighter aircraft designed to meet an advanced threat (year 2010 and beyond) and a logistics system to enable the F-35 to be a self-sufficient unit or an integrated part of a multi-system and multi-Service operation. This family of strike aircraft will consist of three variants: conventional takeoff and landing; aircraft carrier suitable; and short takeoff and vertical landing (STOVL). The System Development and Demonstration (SDD) phase is a 126-month block development program to develop, acquire, and test the F-35 JSF in a series of block upgrades. To accommodate the phased integration of capabilities and functionality, the Integrated Test Force and the operational test agencies will test interim blocks. Block 3 aircraft will be Joint Operational Requirements Document threshold-compliant. As SDD progresses, the users are expected to develop requirements for additional capabilities for future block upgrades to respond to new threats.

Biennial operational assessments will determine potential operational effectiveness and suitability with a focus on programmatic voids, areas of risk, testability of requirements, significant trends in development efforts, and the ultimate ability of the program to support an adequate period of evaluation during the dedicated OT&E. Operational assessments will not replace the independent period of dedicated operational testing necessary to support decisions on full-rate production.

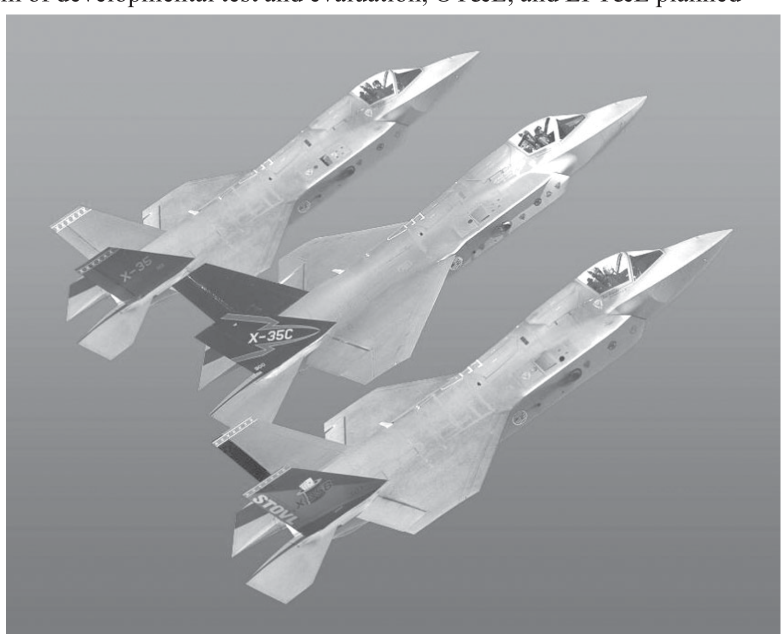
The F-35 JSF requires both lethality and vulnerability LFT&E. The F-35 JSF program will conduct full-up, system-level live fire testing of the STOVL variant using one of the flight-test aircraft from the SDD phase that has reached the end of its operational flight lifetime.

TEST & EVALUATION ACTIVITY

DOT&E participated in F-35 JSF OT&E and LFT&E planning activities since June 1995. The Integrated Product Team held meetings to coordinate the integrated program of developmental test and evaluation, OT&E, and LFT&E planned during SDD phase. The Combined Test Working Group provides a single forum for the member services, OSD, and the weapon systems contractors for all test and evaluation related matters.

The Air Force Operational Test and Evaluation Center and the Navy's Operational Test and Evaluation Force conducted an early operational assessment (EOA) of the JSF in support of the air system Preliminary Design Review. The EOA report found that the JSF program is making satisfactory progress toward being an effective and suitable system.

DOT&E approved the Test and Evaluation Master Plan update to reflect the impact of contractor selection in July 2003. The revised Test and Evaluation Master Plan reflects the additional fidelity of requirements and resources now available following the selection the SDD contractor.



The F-35 Joint Strike Fighter is a joint, multi-national program for the Air Force, Navy, Marine Corps, and eight cooperative international partners: the United Kingdom, Italy, the Netherlands, Turkey, Canada, Australia, Denmark, and Norway.

The F-35 JSF Air System Preliminary Design Review was closed in June 2003 and the F-135 Engine and F-136 Engine critical design reviews were closed in October 2003.

The following LFT&E test series were conducted during fiscal year 2003:

- Replica fuselage tank/inlet duct damage control tests (December 2002).
- Canopy spall ballistic tests (December 2002).
- Man-portable air defense system characterization tests (February 2003).
- STOVL lift fan shaft & coupling ballistic tests (May 2003).
- Fuel tank hydrodynamic ram mitigation ballistic tests (June 2003).
- STOVL three-bearing swivel duct nozzle ballistic tests (July 2003).
- Aft Boom man portable air defense system test (September 2003).

TEST & EVALUATION ASSESSMENT

The findings from the EOA were beneficial to the JPO in identifying areas of risk that could impact potential operational effectiveness and suitability, program documentation and testability of user requirements, programmatic voids, and the ability of the program to support operational test and evaluation. The F-35 JSF Integrated Product Teams worked the areas of risk identified by the EOA report and resolved, mitigated, or refined the issues in support of the air system Preliminary Design Review.

Weight growth is a significant risk for all three variants of the F-35 JSF. Aircraft weight is not a key performance parameter, but weight does impact the aircraft's ability to satisfy key performance requirements. No variant of the F- 35 JSF design exceeds the weight at which key performance parameters predictions are breached; however, the STOVL design remained consistently above target weight projections. The JPO has been aggressively pursuing weight reduction initiatives. Additional aircraft weight reductions are required, particularly in the case of the STOVL variant, to satisfy all key performance parameters and preserve sufficient weight reserve for post SDD block upgrades.

The F-35 JSF Program SDD schedule is aggressive and aircraft weight reduction efforts have eroded a significant portion of available development time. The first flight of the U.S. Air Force conventional takeoff and landing variant will be in 2005, followed by the STOVL variant. This schedule is very challenging. The F-35 JSF Program should remain event driven with continued weight reduction efforts and design optimization before producing SDD test aircraft. The decisions the JPO face at this point in the program are significant drivers to cost and performance limitations through the life cycle of an aircraft.

Planning for dedicated OT&E includes 14 low-rate initial production flight-test aircraft in Block 2 configuration plus several ground test articles. While this large number of aircraft is adequate for the conduct of a thorough operational test, it is not excessive since three different aircraft configurations must be tested in the accomplishment of a variety of missions. In Block 3, six additional jets - two of each variant - will be added to allow for additional operational test requirements.

Live fire tests of candidate fuel tank liner concepts were conducted using expected threats against test panels. Based on the test results, a successful liner concept was identified that produced fuel leakage rates substantially lower than engine fuel ingestion tolerances, thus increasing aircraft survivability.

Global Command and Control System-Maritime (GCCS-M)

The Global Command and Control System- Maritime (GCCS-M) provides Maritime Commanders at all echelons of command with a single, integrated, scalable command, control, communication, computers, and intelligence (C4I) system that processes, correlates, and displays geographic track information on friendly, hostile, and neutral land, sea and air forces, integrated with available intelligence and environmental information, to support command decision making. GCCS-M is implemented afloat, at ashore fixed command centers, and as the command and control (C2) portion of mobile command centers. GCCS-M fields a baseline system consisting of core functionalities and a set of mission specific subsystems. Additional subsystems, as well as core upgrades and new functionality, will be fielded in future releases allowing GCCS-M to evolve as warfighter requirements change.

GCCS-M expands existing C4I baseline capabilities through the evolutionary, incremental implementation of hardware and software releases. This approach provides the user with state-of-the-art C4I capabilities that keep pace with both continually evolving operational requirements and technological advances. Central to the success of this approach is adherence to an open-system commercial and government standards-based architecture that maximizes use of non-developmental items. GCCS-M must also be in compliance with the Global Information Grid- Enterprise Services to ensure interoperability with U.S. Joint and other naval C4I systems. A key goal of GCCS-M is to serve as the host for other independently built applications using the Global Information Grid. GCCS-M can be used as a building block for C4I systems that range in size from a single server and client workstation, through a large multi-server, multi-client architecture.

GCCS-M Version 3.1.2.1 was evaluated as effective and suitable in 2002 and is executing well in the fleet. Several critical interfaces have not been formally tested and certified for interoperability by the Joint Interoperability Test Command (JITC).

TEST & EVALUATION ACTIVITY

The Software Qualification Test for Version 3.1.2.1 Patch 1 (P1) was a limited operational test conducted aboard the *USS Theodore Roosevelt* in February 2003 during a battle group exercise during the transit from the Puerto Rican operating areas to operations in the Sixth Fleet. Additional testing was performed in a laboratory at Space and Naval Warfare Systems Center, San Diego.

TEST & EVALUATION ASSESSMENT

During operational testing, the system was operated on a continuous basis by fleet personnel in the intended operating environment, and was employed to perform all routine C4I functions normally associated with battle group operations and underway training exercises. The system met or exceeded all threshold values except maintainability, which could not be measured since no failures occurred. Two interfaces (multiple tactical digital information link capability (MTC) and Navy Joint Surveillance Target Attack Radar System interface (NJI)) were not tested due to test limitations, and these deficiencies will be addressed in future test events. A Common Operational Picture synchronization tool (CST) deficiency involved documentation and will be addressed in late 2003. The

The Global Command and Control System- Maritime provides Maritime Commanders at all echelons of command with a single, integrated, scalable command, control, communication, computers, and intelligence system.

Software Qualification Test report declared GCCS-M 3.1.2.1P1 operationally effective (excluding MTC and NJI) and operationally suitable (excluding MTC, NJI, and CST), and recommended approval for fleet release.

The GCCS-M Management Office needs to submit a proposed Interoperability key performance parameter for approval. Together with associated information exchange requirements, this will be required before JITC interoperability certification can be achieved. The GCCS-M program and JITC are making progress in this area, and DOT&E expects the work to be accomplished in time to support testing and interface certifying for GCCS-M 4.0, which is the next major release scheduled for testing by August 2004.

Integrated Defensive Electronic Countermeasure (IDECM)

The Navy intends for the Integrated Defensive Electronic Countermeasures (IDECM) suite to provide self-protection and increased survivability for tactical aircraft against radio frequency and infrared surface-to-air and air-to-air threats. The current IDECM Block II and Block III program is to counter radio frequency-guided surface-to-air missiles. The major hardware components for the IDECM program to develop are the IDECM Radio Frequency Countermeasures (RFCM) system and the ALE-55 Fiber Optic Towed Decoy (FOTD), which is towed behind the aircraft. The Navy intends for the ALE-55 FOTD to be compatible with existing launcher and controllers used with the currently fielded ALE-50 Advanced Airborne Expendable Decoy. The on-board capability will provide some protection even if operational maneuvers or engagements deplete the limited number of FOTDs available on the any given mission.

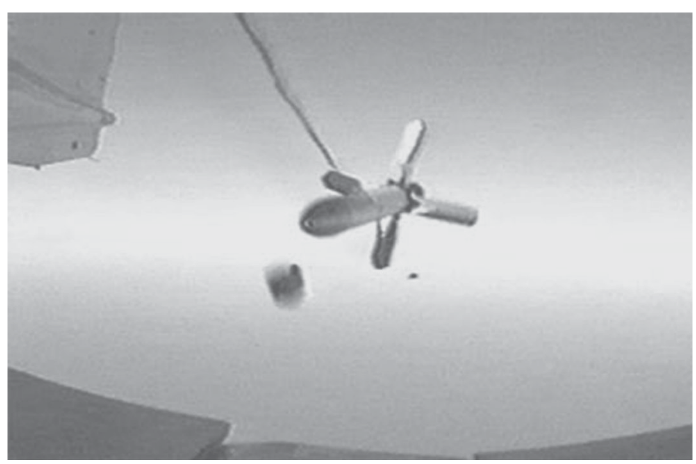
The Navy has re-baselined the program several times and the resultant IDECM development strategy is a three-phased (Blocks I, II, and III) approach. IDECM Block I is deployed as an interim system consisting of the ALQ-165 Advanced Self-Protection Jammer (ASPJ) and the ALE-50 towed decoy. IDECM Block II, a second interim configuration, replaces the ASPJ with the ALQ-214 (V)2 RFCM (providing on-board jamming capability) and was tested in 2003. IDECM Block III will be the final configuration and will consist of the ALQ-214 (V)2 RFCM and the addition of the ALE-55 FOTD. The IDECM RFCM engineering and manufacturing development contract included the Air Force requirements for a common FOTD and techniques generator. The Air Force selected components of IDECM RFCM for the B-1B Defensive System Upgrade Program (DSUP) and the F-15. In 2002, the Air Force cancelled B-1 DSUP while IDECM was experiencing delays and cost overruns. The Air Force still intends to use portions of the IDECM suite as part of the F-15 electronic warfare suite.

Prior to the Phase block approach, the ALQ-214 and ALE-55 completed a limited Operational Assessment in 2000 and was assessed to be potentially operationally effective and potentially suitable. In FY01, the Navy decided to focus testing on the Block II and wait for Block III, instead of doing them concurrently. The Operational Test and Evaluation Force (OPTEVFOR) will conduct the majority of Block III operational testing in FY05 and FY06. DOTE approved the IDECM Block II Test and Evaluation Master Plan in October 2002.

TEST & EVALUATION ACTIVITY

OPTEVFOR completed a combined developmental test/operational test flight in October 2002. The Navy used data from these tests to supplement the operational evaluation (OPEVAL), which the Navy began in November 2002 and completed in May 2003. The Navy resolved all priority A (highest priority) system anomaly reports prior to the OPEVAL, and waived five priority B system anomaly reports involving RWR-RFCM integration for the Block II OPEVAL. The rack for mounting the RFCM was determined to be insufficient to tolerate the full life cycle loads. The redesigned rack will be tested when it becomes available. The DOT&E beyond low-rate initial production report is being finalized in preparation for a full-rate production decision in 1QFY04. ASN/RD&A is the decision authority.

A verification and correction of deficiencies test is scheduled to begin in CY04. ALE-55 FOTD developmental testing continued at a low level in preparation for IDECM Block III testing. Separation and final towline evaluation flight tests are scheduled in FY04 to resolve separation and towline risks of the ALE-55. F-15 developmental testing is underway and includes side-by-side testing of a Raytheon fiber optic ALE-50 variant with the ALE-55 FOTD.



The Integrated Defensive Electronic Countermeasures Block II, consisting of both an onboard jammer and a towed decoy, enhances aircraft survivability against radio frequency-guided missiles.

TEST & EVALUATION ASSESSMENT

The Navy fielded Block I on initial F-18E/F deployments and, by virtue of being an interim solution, has limited logistics supportability. Follow-on IDECM Blocks II or III need to produce an effective and suitable replacement for the Block I suite before its available logistics support expires. Block II performance results in developmental test and OPEVAL indicate the system was tested adequately and is operationally effective and operationally suitable, but needs suitability improvement.

The IDECM Block II showed a substantial contribution to aircraft survivability, both in the absolute and as compared to the current on-board F/A-18C ECM system, the ALQ-126B. OPTEVFOR should have more thoroughly tested joint interoperability, reprogramming capability, and system response. Although most available test assets were used, the diversity of threats tested was very small. This is due to a shortfall in electronic warfare test capabilities. A substantial and sustained investment in both the number of different threat systems and the quality of data available from them is needed so that future electric countermeasure systems can be more completely tested. A common family of missile fly-out models should be supported (several exist) to maximize commonality across test facilities.

Test results showed suitability concerns. The cockpit interface and controls made it very difficult for the pilot to set-up and determine the state of the system. This led to two safety issues involving inadvertent or partial decoy deployment. Control of chaff and flare dispense was also difficult. Updates to both the ALQ-214 and Mission Computer are being worked and are scheduled to be tested 2QFY04. Reliability was acceptable, but far from the desired mature system levels, and two lots of bad squibs (explosive charges to launch the decoys) were undetected until late in the test and drastically reduced measures of ALE-50 reliability. Built-in test (BIT) performance was marginal. Use of the pilot-initiated BIT allowed an acceptable number of missions to be completed, though without relieving the burden on maintenance of the high BIT false alarm rate.

In the lab environment, the Block III RFCM and FOTD proved to be highly effective and very close to predicted performance. For Block III, the deployment of the FOTD and the durability of the towline under operational conditions are still high risk.

Joint Standoff Weapon (JSOW)

The Joint Standoff Weapon (JSOW), produced by Raytheon, is a family of kinematically efficient (~12:1 glide ratio) 1,000-pound class, air-to-surface glide weapons intended to provide low-observable, standoff precision engagement and launch-and-leave capability against a wide range of targets during day/night, all weather conditions. All three JSOW variants employ a tightly coupled Global Positioning System/Inertial Navigation System (GPS/INS). JSOW is employed for interdiction of soft/medium fixed, re-locatable and mobile light and heavy armored targets; massed mobile armored targets; anti-personnel; and air-to-surface threats. JSOW primarily functions in a preplanned mission mode. The system will allow pilot manual inputs of up to eight targets as well as third party targeting as long as the targeting system can meet JSOW's targeting requirements. The weapon is intended to be used by land- and carrier-based forces.

The air crew accomplishes mission planning using the Navy's Tactical Automated Mission Planning System and the Air Force Mission Support System. Integration of operations with the Joint Mission Planning System is planned. JSOW will be employed on the following aircraft: F/A-18C/D and E/F; F-16C/D; F-15E; F-35; B-1B; B-2A; and B-52H. The weapon comes in three operational variants:

- AGM-154A (JSOW Baseline) – Air Force and Navy: The payload of the AGM-154A consists of 145 BLU-97/B sub-munitions. The BLU-97/B is a combined effects munition. The bomblets consist of a shaped charge for light armor defeat capability, a fragmenting case for material destruction, and a zirconium ring for incendiary effects. The JSOW Baseline is designed to conduct pre-planned attacks on stationary soft targets such as air defense sites, parked aircraft, components of airfields and port facilities, command and control antennas, stationary light vehicles, trucks and artillery, and refinery components.
- AGM-154B – (JSOW BLU-108) – Navy only (the Air Force withdrew support in FY02): The payload for the AGM-154B is the BLU-108 sub-munition from the Air Force Sensor Fuzed Weapon. JSOW carries six BLU-108s, each of which dispenses four warheads, or skeets. Each skeet carries an infrared or dual-mode sensor, and upon detecting a target, detonates to create an explosively formed penetrator that impacts the target. This system is an interdiction weapon. The target set consists of tanks, infantry fighting vehicles/armored personnel carriers, and trucks in a tactical road-march formation. The President's budget did not include funding for the BLU-108 variant. The Navy no longer intends to continue development of this variant.
- AGM-154C – (Unitary Variant) – Navy only: The AGM-154C, in addition to the common GPS/INS guidance, will use an autonomous imaging infrared seeker for target acquisition and terminal guidance. The AGM-154C will carry the British Aerospace multiple warhead system (Broach). The Broach warhead, consisting of an augmenting charge and a follow-through bomb, can be set to explode both warheads simultaneously or sequentially. The AGM-154C is designed to attack point targets vulnerable to blast and fragmentation effects and point targets vulnerable to penetration, such as industrial facilities, logistical systems, and hardened facilities.

AGM-154A, Baseline Variant
Initial operational testing of the AGM-154A concluded in FY98. DOT&E submitted a combined AGM-154A OT&E and LFT&E report to Congress to support a Milestone III decision in October 1998. The AGM-154A, incorporating a new low cost control section and guidance unit, entered full-rate production in FY99. A deficiency in AGM-154A software's ability to accurately estimate wind effects was later suspected as a result of combat employment of AGM-154A weapons in FY00. The Air Force

AGM-154A follow-on operational tests confirmed the effectiveness and suitability of new hardware and software.

and Navy later confirmed the deficiency during developmental testing in FY01. Operational tests of both new hardware and updated software began in FY02.

AGM-154B, BLU-108 Variant
The Navy approved the low-rate initial production of the AGM-154B in FY99. Continued developmental tests ceased in FY00 during production verification due to numerous system performance shortfalls.

AGM-154C, Unitary Variant
In September 2000, the Under Secretary of Defense (Acquisition, Technology and Logistics) approved incorporation of the developmental Broach warhead. Due to incorporation of the new warhead, LFT&E is required.

TEST & EVALUATION ACTIVITY

AGM-154A, Baseline Variant
Adequate operational test of both new hardware and updated software began in FY02, but was not complete prior to deployment in the Navy in November 2002. Adequate operational testing of this AGM-154A hardware and software configuration was not complete until December 2002. Operational testing in FY03 also included evaluation of the effectiveness and suitability of a further re-design of the AGM-154A control section intended to enable the F-16 to employ the weapon throughout the entire F-16 operational envelope.

AGM-154B, BLU-108 Variant
Although the Navy conducted test planning for operational evaluation (OPEVAL) through mid-FY03, testing is no longer planned.

AGM-154C, Unitary Variant
An operational assessment to support an AGM-154C low-rate initial production decision began in January 2003. Testing concluded in June 2003 and consisted, primarily, of captive carry missions to evaluate seeker performance and concluded with the free flight of an inert AGM-154C. Developmental flight-testing is slated to conclude in FY04. The Navy has initial operational testing planned for FY04.

LFT&E of static warhead arena testing to characterize the Broach warhead's blast and fragmentation performance began in September 2002. Dynamic warhead integration sled testing began in October 2002. Live warhead developmental flight-testing began in August 2003.

TEST & EVALUATION ASSESSMENT

AGM-154A, Baseline Variant
DOT&E's evaluation of the results of Navy operational evaluation and Air Force IOT&E confirmed that the AGM-154A, in the low-rate initial production configuration, is operationally effective and suitable.

Follow-on operational tests concluded in December 2002 and July 2003, were adequate to evaluate the effectiveness and suitability of new software and hardware. Results confirm the hardware deployed to the fleet, the redesigned control section to support F-16 full envelope employment, and updated Baseline software are effective and suitable for combat. Operational testing to evaluate F-16 capability to employ weapons from the BRU-57 smart rack was delayed, awaiting certification of an expanded employment envelope, and will be accomplished under additional follow-on operational testing.

AGM-154C, Unitary Variant
An operational assessment of the unitary variant, concluded in June 2003, was adequate. Initial performance of the system resulted in the seeker tracking well outside requirements. Mission planning was slow and was evaluated as not

suitable. Regression testing with updated seeker software later demonstrated that guidance to the intended point of impact has the potential to meet requirements. However, improvements to mission planning remain undemonstrated.

Sled tests against concrete slabs have not demonstrated follow-through bomb lethality. The results from one of three developmental flight-tests using live warheads against similar targets has resulted in no follow-through bomb detonation. Additional risk-reduction efforts performed by the contractor occurred prior to the last developmental free-flight test event. Although risk reduction efforts and an additional weapon drop have delayed entry into operational testing, additional developmental testing and further risk reduction should increase the probability of weapon system success during OPEVAL.

Four static arena tests occurred in FY03 to characterize the blast and fragmentation performance of the Broach warhead in both simultaneous and sequential detonation modes. Analysis of these results will be available in FY04. Warhead lethality and the intended level of damage against realistic targets will be assessed during the combined OT&E and LFT&E.

To proceed forward with OPEVAL, target materials and construction where lethal warhead effects occur must be realistic for all targets. OPEVAL will test the weapon in a realistic GPS-jamming and camouflaged, concealment, and deception environment, but will simulate surface-to-air threat systems. The Navy will complete an evaluation of weapon survivability against realistic surface-to-air threat systems during follow-on operational testing.

KC-130J Aircraft

The KC-130J, a variant of the C-130J, is a medium sized, four-engine turboprop aircraft modified to perform a primary mission of aerial refueling of fixed and rotary wing aircraft for the United States Marine Corps (USMC). Secondary missions include rapid ground refueling, assault transport, logistics support, and special warfare, while preserving personnel and cargo transport capabilities. The KC-130J will perform the same missions as the aircraft it will replace, the KC-130F and KC-130R. Procurement of the KC-130J is proceeding under a commercial off-the-shelf acquisition strategy, instituting catalog pricing and commercial payments through the United States Air Force's C-130 System Program Office.

The KC-130J Navy/USMC test program is specifically designed to address differences in aircraft configuration and mission employment from the baseline U.S. Air Force (USAF) C-130J. The KC-130J program intends to build upon the contractor, Federal Aviation Administration, and USAF test efforts and data collection rather than duplicate efforts. The USAF effort has been ongoing since 1995.

TEST & EVALUATION ACTIVITY

The Navy/USMC developmental test and evaluation program has completed approximately 1,200 flight test hours. Operational testing (OT-IIIA/B) began in October 2003 to determine the operational effectiveness and suitability for air/land, air delivery, and aerial refueling capability, and to support a recommendation for fleet introduction.

As part of the LFT&E program, measurements of oxygen concentrations inside the removable center fuselage fuel tank ullage were made from July to August 2003. The data collected will be used to assist in selecting shotlines for ballistic testing, currently scheduled for FY04.

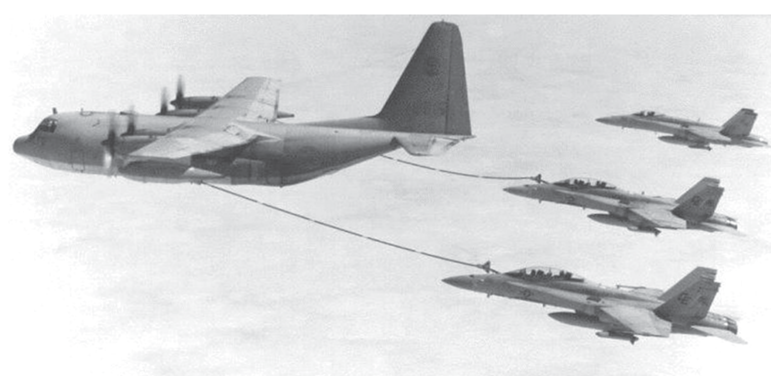
DOT&E approved the Test and Evaluation Master Plan and the Operational Test Plan in October 2003.

TEST & EVALUATION ASSESSMENT

The new KC-130J aerial refueling system was not qualified because of flight safety and operational performance problems. There were incidents of pull-offs where the refueling hose disengaged from the aircraft being refueled. This problem caused a one-year slip in testing from the original schedule. The new refueling system was replaced by the existing (legacy) system used on the KC-130T. Legacy pods will be installed in the near-term. However, the legacy pods will be upgraded and installed after developmental and operational testing is completed. The upgraded pods will contain a Rapid Ground Refueling port and reliability enhancements. They will be integrated into the aircraft mission computer, which will be produced and retrofitted onto existing KC-130J and incorporated into production aircraft starting in October 2004.

The excessive false alarm rate to identify failures increases the maintenance burden to an unacceptable level. Deficiency corrections are not budgeted to be incorporated until FY08-FY09 timeframe.

Assessment of the LFT&E ullage measurement data awaits completion of the 46th Test Wing ullage test report.



The KC-130J's primary mission is aerial refueling of fixed and rotary wing Marine Corps aircraft.

Littoral Combatant Ship (LCS)

Envisioned as a networked, agile, stealthy surface combatant capable of defeating asymmetric threats in the littorals and ensuring U.S. forces access to those regions of the world, the Littoral Combat Ship (LCS) will be a relatively small, high-speed, and maneuverable combatant. The Navy expects it to complement the Aegis Fleet, DD(X), and CG(X) by operating in environments where it is less desirable to employ larger, multi-mission ships. It is expected to be able to deploy independently, remain on station for long periods of time, operate with a strike group or through a forward-basing arrangement, and conduct underway replenishment.

The LCS will likely be an advanced hull form employing open software architecture to integrate different combat systems, or mission packages, depending on its assigned mission. It is expected to be rapidly reconfigurable in response to changes in mission, threat, and technology. Each mission package will rely heavily on manned and unmanned vehicles to execute assigned missions.

The LCS will have three primary or focused missions: surface warfare against small hostile boats; mine countermeasures; and littoral anti-submarine warfare. It will only be capable of conducting one focused mission at a time. Likely secondary missions include: intelligence; surveillance and reconnaissance; Special Operations Forces support; logistic support for movement of personnel and materials; Maritime Intercept Operations; and Homeland Defense. A spiral development approach is planned to meet accelerated production and deployment goals. The first ship is scheduled for delivery in FY07. The initial two ships, comprising Flight 0, will deliver a set of core warfighting capabilities that must include self-defense and core command and control capabilities. Flight 0 will also produce a limited set of mission modules based on current or near-term systems. While Flight 0 ships and mission packages are being built, the Flight 1 ship and mission package designs will be developed.

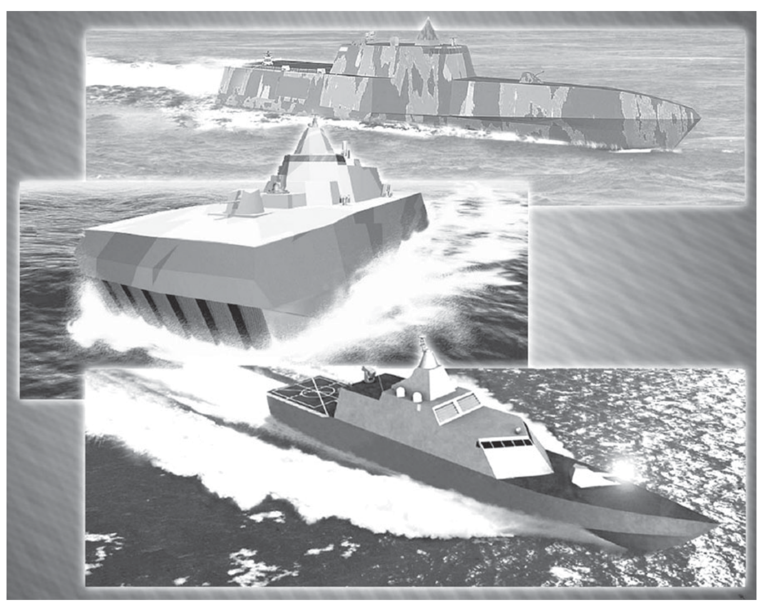
TEST & EVALUATION ACTIVITY

Although still very early in the LCS program, the Program Office developed a Flight 0 Interim Requirements Document and promulgated it with the Preliminary Design Request for Proposal. Additionally, DOT&E has been active in the development of both the Acquisition Strategy and Test and Evaluation Strategy documents, which are due at Milestone A.

TEST & EVALUATION ASSESSMENT

The accelerated acquisition timeline for LCS leaves very little time to apply any lessons learned from the construction/operational testing of Flight 0 ships to Flight 1 hull and mission package designs. The two Flight 0 hulls will likely be different designs and their construction schedules will overlap. Hull #1 will be delivered approximately nine months prior to hull #2. The final design of hull #3, the first Flight 1 ship, will start a few months after delivery of hull #1 and prior to the delivery of hull #2.

The Program Office, the operational test agency, and DOT&E have reduced program risk through early planning and good liaison. Several early operational assessments on each of the different hulls and mission packages are planned. A LFT&E program is planned, although many details remain to be worked out before the LFT&E Management Plan can be approved.



The Littoral Combatant Ship will have three primary or focused missions: surface warfare against small hostile boats; mine countermeasures; and littoral anti-submarine warfare.

Operational effectiveness determination of LCS self-defense in the littoral environment against the anti-ship cruise missile threat will be required. The program should plan on using a self-defense test ship, as that is the only way to conduct safe and adequately realistic operational testing. An instrumented shallow water range will be required to fully evaluate LCS's anti-surface warfare capability and would be very beneficial to evaluate it's mine warfare capability. Threat representative targets will also be critical to evaluate LCS's effectiveness against the diesel submarine threat in shallow water.

LPD 17 Amphibious Transport Ship - Dock

The LPD 17 Amphibious Transport Ship - Dock, the *USS San Antonio*, is a diesel-powered amphibious assault ship that will transport and deploy the combat and support elements of Marine Expeditionary Units/Brigades as a key component of amphibious task forces. LPD 17 will be capable of debarking forces by surface assault craft, including current and new Expeditionary Fighting Vehicles (formerly Advanced Amphibious Assault Vehicles), air-cushioned landing craft, conventional landing craft, as well as helicopters and MV-22s. A flight deck should enable the aerial transport of troops and equipment, and a floodable well deck will permit operation of air-cushioned landing crafts, conventional landing craft, and amphibious assault vehicles. The LPD 17 is expected to have command, control, communications, computer, and intelligence (C4I) capabilities sufficient to support operational maneuver from the sea/ship-to-objective maneuver. These C4I systems should interoperate through a modern ship-wide area network (SWAN). The planned self-defense capabilities of the LPD 17 include the ship self-defense system (SSDS) Mark 2 (Mod 2 variant) with cooperative engagement capability, SPQ-9B and SPS-48E radars, Rolling Airframe Missile (RAM), and the Nulka decoy to provide own-ship defense against anti-ship cruise missiles (ASCMs). Defense against surface threats will be provided by two Mark 46 30mm gun systems.

TEST & EVALUATION ACTIVITY

Activity focused on the most significant T&E challenge: planning a separate Self Defense Test Ship (SDTS) phase within the FY06/FY07 LPD 17 operational evaluation window with an LPD 17-representative combat system engaging threat-representative ASCM targets with RAM.

The last operational assessment (Operational Test (OT)-IIB) began in FY02 and will be completed in FY04. An assessment team, composed mostly of fleet experts in areas associated with amphibious warfare and organized under the leadership of the Navy's and Marine Corps' respective operational test agencies, is reviewing ship specifications and design drawings. To perform this, the team is examining results from modeling and simulation conducted as part of the ship design process in order to make an assessment of the ship's capability to conduct its primary and secondary missions.

Significant progress has been made on the detail design vulnerability assessment this year, with completion expected early in FY04. In this assessment, the ship designers will exercise a variety of ship vulnerability models to determine the vulnerability of the *USS San Antonio* class ships to eight threat engagements including a *USS Cole*-like scenario, followed by probability of kill given a hit analyses and crew recoverability scenarios. The Navy continues to perform component shock qualification tests.

TEST & EVALUATION ASSESSMENT

Preliminary OT-IIB findings suggest that the LPD 17 will provide considerable amphibious lift as well as advances in shipboard application of information technology, reduced radar cross-section, and improved habitability for the crew and embarked Marines. The Program Manager, however, has not corrected some of the design deficiencies identified as early as 1996.

The LPD 17 combat system's effectiveness depends on the complex integration of separate sensor, weapon, and control element programs. The only hard-kill defensive system (RAM), along with soft-kill systems (such as Nulka and chaff), must achieve the threshold requirement for ASCM defense - the primary threat in the challenging littoral environment. Defense against fighter/attack-type aircraft is a

LPD 17 will be capable of debarking forces by surface assault craft, including current and new Expeditionary Fighting Vehicles (formerly Advanced Amphibious Assault Vehicles), air-cushioned landing craft, conventional landing craft, as well as helicopters and MV-22s.

vulnerable area because LPD 17 does not have any demonstrated capability against these threats. A RAM upgrade program will enable RAM to engage helicopters, some aircraft ("low/slow flyers," not jet aircraft), and surface craft, but the new missile will not be fielded in time for LPD 17 nor is SSDS Mark 2 expected to be modified to accommodate the missile's improved capabilities. Real-time tracks provided by SSDS Mark 2 are not fused with near real-time friendly unit positions and control measures provided by nonintegrated systems such as the ship's Amphibious Assault Direction System. System operators and supervisory personnel must manually deconflict the tracks, increasing their workloads and the risk of misclassifying a threat as a friendly or friendly as a threat. Finally, concerns remain about the ship's susceptibility to torpedoes.

The ship was designed to carry a substantial amount of cargo; however, there are currently no backup systems for the elevators that service two of the ship's three cargo and ammunition magazines. Combined, these two hold approximately 85 percent of the supplies carried aboard the ship. DOT&E is especially concerned because the Marine Corps' Sea-Based Logistics concept states that most supplies and ammunition remain aboard ship and are brought ashore only when needed. An emergency ordnance handling system has been proposed, but has not been tested and evaluated.

Five systems that are not part of the ship's baseline were identified as necessary during the OT-IIB. These include Joint Operations Planning and Execution System; Joint Service Imagery Processing System – Navy; Theater Battle Management Core System; High Frequency, Automatic Link Establishment Radio; and Global Broadcast Service terminal. Discussions are ongoing among various Navy and Marine Corps staffs to determine whether these systems are required for LPD 17-class ships and, if so, how they can be funded.

Three other systems that are also not part of the ship's baseline are necessary. These are Advanced Field Artillery Tactical Data System; Naval Aviation Logistics Command Management Information System; and Digital Terrain Analysis Mapping System. Although the Navy stated that the landing force can bring the needed hardware and software aboard the ship before deploying, this approach potentially introduces integration and Information Assurance concerns.

Finally, although corrective actions for several significant C4I shortfalls have been identified, it is unclear that these fixes will be applied before the ship's IOT&E. If they are not, there is a risk that the ship, as tested, will not be operationally effective.

Like the 1970s-era amphibious ships it will replace, the LPD 17 will not fully support concurrent, nighttime, flight-deck and well-deck operations because of lighting that is not compatible with night vision devices. The Program Office is working with other Navy organizations to define and support a solution, and promising approaches have been identified and tested at sea. Nevertheless, progress to date makes it questionable that a solution will be found and implemented on LPD 17.

The ship's sophisticated SWAN is crucial to mission accomplishment. The SWAN is expected to facilitate improved information technology capabilities, but it potentially introduces information assurance-related vulnerabilities, due to internal security shortfalls in areas such as firewalls, intrusion/virus detection software, and network load management.

DOT&E approval of Test and Evaluation Master Plans and operational test plans for LPD 17 and SSDS will hinge on an adequate OT&E strategy. An adequate strategy includes a separate SDTS phase within the FY06/FY07 LPD 17 operational evaluation window with an LPD 17-representative combat system engaging threat-representative ASCM targets with RAM.

Mark 48 Mods

The fleet baseline Advanced Capability (ADCAP) Torpedo is the Mark 48 Mod 5. A 1995 upgrade, the Mark 48 Mod 6, features an improved guidance and control section and a torpedo propulsion upgrade. A follow-on version of the Mark 48 Mod 6 guidance and control hardware, called the Advanced Common Torpedo Guidance and Control Box (ACOT-GCB), will be introduced in FY05 in order to replace obsolete components. ACOT-GCB parts will be incorporated into the next-generation torpedo, the Mark 48 Mod 7 Common Broadband Advanced Sonar System (CBASS), planned to start testing in FY05. The CBASS torpedo is being developed as part of a cooperative program between the United States and Australia.

Several software builds are currently under oversight. Block III upgrade is the final tactical software upgrade to the Mark 48 Mod 5. Block IV extends Block III capabilities and applies them to the Mark 48 Mod 6 weapon. The more sophisticated CBASS software follows the Block IV. In lieu of future Block upgrades, the program plans to employ a series of advanced processor builds (APBs) to both the Mod 6 and CBASS weapons as a more flexible means of introducing software changes. APB testing will begin in FY04. For future software development, DOT&E supports the flexibility of the APB approach, but insists upon complete and rigorous testing of all upgrades.

The Mod 6 ADCAP testing addressed open issues from previous OT&E in FY95. DOT&E assessed the Mod 6 ADCAP to be both operationally effective and suitable in the FY96 report. Although reliability was below the threshold, DOT&E identified the Mod 6 ADCAP as producing much better total performance against the expected threat than the Mod 5 ADCAP.

Follow-on test and evaluation (FOT&E) on the Block IV software was completed in FY00. DOT&E determined that Block IV was not operationally effective because it did not provide the shallow water performance improvements originally promised.

TEST & EVALUATION ACTIVITY

There was no dedicated operational testing in FY03, but the Navy did conduct numerous ADCAP torpedo exercises. These included four Prospective Commanding Officer exercises, one of which was conducted jointly with the Royal Australian Navy.

The Navy conducted an under-ice exercise (ICEX) for developmental testing of ice-related torpedo software improvements in the Arctic in April 2003. *USS Connecticut* (SSN-22) fired Mark 48 exercise torpedoes using suspended targets and itself as the target.

The Navy conducted a double ship sinking exercise (SINKEX) in the Pacific against two retired U.S. destroyers in August 2003. The SINKEX consisted of firing two Mark 48 exercise torpedoes (one Mod 5 and one Mod 6) and two Mark 48 warshot torpedoes (one Mod 5 and one Mod 6).

DOT&E participated in the drafting and review of the Test and Evaluation Master Plan revisions for the ACOT-GCB, CBASS, and APB programs. The Navy plans an operational test for APB in FY04 and CBASS in FY05. For ACOT-GCB, which is designed to deliver the same

An Advanced CapabilityTorpedo being loaded on a Los Angeles *class submarine.*

performance as the legacy Mod 6 hardware, DOT&E supports plans to test the two guidance and control sections side-by-side in the Navy's Weapons Analysis Facility hardware-in-the-loop simulator. The simulated data will be supplemented with a limited set of in-water confidence tests. The verification, validation, and accreditation of the Weapons Analysis Facility will be a significant project in FY04.

TEST & EVALUATION ASSESSMENT

The Block IV Verification of Correction of Deficiencies (VCD) testing, conducted in 2002, consisted of a small number of exercise torpedo firings at shallow water sites near Maui, Hawaii, and Southern California. The VCD focused on technical issues affecting torpedo performance, rather than overall operational effectiveness. In February 2003, Navy testers issued a VCD report stating that neither the technical nor operational level performance provided conclusive evidence that the original deficiency had been corrected. The fact that the test was not conducted at the same site as the FY00 operational test, raised concerns regarding the impact of acoustic conditions on the validity of the VCD results. Despite the shortcomings, Navy testers recommended fleet release based on the improved deep-water performance of the Block IV.

The 2003 ICEX did not feature operationally realistic firings against a valid target, but did provide a demonstration of the Mark 48 Mod 6 ADCAP's ability to perform reliably in the Arctic environment.

During the 2003 SINKEX, the two exercise weapons ran as planned, but the two warshots did not; the Navy is investigating whether this was due to reliability problems or other causes. In the last few years, the Navy has experienced some unsuccessful, incomplete, or otherwise ambiguous results in its SINKEX program, raising concerns regarding the warshot inventory performance and reliability. Torpedo reliability, as described in previous Annual Reports, remains an ongoing concern. These failures highlight the overall problem of ADCAP reliability, which continues to run in cycles and identifies a need for more Navy investment in its torpedo SINKEX program. Work force reductions at the weapon's depots may also threaten the fleet's ability to process weapons quickly and accurately.

The new level of cooperation between the U.S. Navy and the Royal Australian Navy provided valuable opportunities for training and testing, particularly against diesel-electric submarines. However, some torpedo performance questions remain unresolved due to inadequate T&E resources and funding provided by the Navy. For open-ocean shallow water exercises, the tested torpedo's internal monitoring equipment is the only source of data, resulting in post-run analysis biases and errors. Development of a mobile test range, or other independent instrumentation, is necessary to alleviate shallow water testing shortfalls. As a more permanent solution, given the high priority of the diesel submarine threat, an instrumented shallow water test range in a threat representative environment would help hasten maturation of littoral Submarine Warfare tactics and torpedo performance improvement in shallow water. The cumbersome nature of open ocean torpedo firings, coupled with seasonal marine mammal habitat restrictions at many locations, has significantly lengthened development cycle times. Navy funding support for a viable instrumented shallow water test range is needed.

MH-60R Multi-Mission Helicopter Upgrade

Originally conceived as an aircraft remanufacture and avionics upgrade program, cost considerations redefined the MH-60R Multi-Mission Helicopter program to procure new production vice remanufactured aircraft. The Assistant Secretary of the Navy, Research, Development and Acquisition (ASN(RDA)), approved the current Acquisition Program Baseline schedule on March 14, 2002. The program combines the missions of the legacy SH-60B and SH-60F aircraft into a single airframe. The Navy expects the aircraft's improved avionics to enhance undersea and surface warfare, surveillance, identification, and power projection objectives. The program entered engineering development at Milestone II in FY93.

The initial variant (Block 0) of the multi-phase evolutionary acquisition program develops the AN/AQS-22 Airborne Low-Frequency Sonar with increased sonobuoy acoustic signal processing capability. The program also develops the AN/APS-147 Multi-Mode Radar that includes Inverse Synthetic Aperture Radar imaging and periscope detection modes of operation. Other improvements include the AN/ALQ-210 electronic support system, a fully integrated self defense system; and the AN/AAS-44 Forward-Looking Infrared sensor with laser designator. The MH-60R will have the Common Cockpit design, also used in the MH-60S, which has multi-functional displays and a complex tactical data processing system.

DOT&E designated the MH-60R as a covered system for LFT&E in 1998. ASN(RDA) granted a waiver from full-up system level LFT&E of the MH-60R under an extension of a July 1996 memorandum. The Army and Navy established a joint LFT&E test program for the UH-60M, MH-60S, and MH-60R development programs to address data voids and reduce costs. The joint effort recognized the high degree of commonality among the H-60 variants' structural and dynamic components. Both Services provided airframe components and the prototype YCH-60S aircraft to be used as test articles for static and dynamic ballistic testing that began in 2001. The joint LFT&E program will continue into FY05.

TEST & EVALUATION ACTIVITY

The Navy conducted developmental tests (DT-IID) from November 2002 – July 2003 using a test-fix-test methodology of the fully integrated radar, electronic support measures, acoustics, weapons system, and Common Cockpit systems. Test results supported conduct of the operational assessment (OA) begun in June.

The Joint Requirements Oversight Council approved an Operational Requirements Document revision and DOT&E approved changes to the Test and Evaluation Master Plan in May 2003.

On September 3, 2003, the Program Executive Office decertified the MH-60R for test due to poor performance and stopped the OA begun in June. The OA focused on the performance of radar, electronic support measures, acoustic, and Common Cockpit systems.

Technical evaluation of the fully integrated Block 0-configured MH-60R may be delayed up to ten months.

The Army and Navy joint LFT&E test program conducted static and dynamic ballistic tests on aircraft components and on the YCH-60S test aircraft while operating at hover. Testing continued throughout the year at the Army's Aberdeen Proving Ground, Maryland, and at the Naval Air Warfare Center, Weapons Division, China Lake, California. DOT&E observed these tests.

The MH-60R combines the missions of the legacy SH-60B and SH-60F aircraft into a single airframe.

TEST & EVALUATION ASSESSMENT

Common Cockpit and mission systems integration for the MH-60R has resulted in numerous software instability problems. System integration was not complete prior to the start of the June 2003 OA, thereby precluding test of the weapon system and Integrated Self Defense System. The Program Executive Office de-certified the MH-60R for further operational test and evaluation in early September 2003 because the aircraft mission systems failed to demonstrate adequate performance during the OA. Deficiencies were recorded for the Electronic Support Measures, acoustic, and multi-mode radar systems. Failure analyses and fault isolation efforts are ongoing to fix and verify correction of the deficiencies prior to the start of the rescheduled technical evaluation (TECHEVAL) and operational evaluation. To provide additional risk reduction, the program office plans to run an additional OA concurrently with TECHEVAL.

The joint LFT&E program is adequately resourced and is expected to provide the required information to evaluate the survivability of the MH-60R. Testing, beginning with the program's full-scale development tests and the available combat data on earlier versions of this aircraft, indicates that the MH-60R will be more survivable than previous models of this airframe.

MH-60S Fleet Combat Support Helicopter

The MH-60S Fleet Combat Support Helicopter is replacing the CH-46D, most of which have exceeded their original service life. The primary mission of the baseline (Block I) MH-60S configuration is to provide the Navy's Combat Logistic Force with responsive vertical replenishment, vertical onboard delivery, ship-to-shore airhead support, and Amphibious Task Force search and rescue. Secondary missions include Special Warfare Support, aero-medical evacuation, and noncombatant evacuation. A Block II MH-60S configuration will support the organic Airborne Mine Countermeasures mission. A Block III MH-60S configuration, the Armed Helicopter, will support combat search and rescue, anti-surface warfare, and aircraft carrier plane guard missions. A Milestone III decision in late FY02 led to full-rate production of Block I aircraft in FY02. DOT&E submitted a Beyond Low-Rate Initial Production (BLRIP) report to Congress in August 2002. Fleet introduction of the Block II configuration is scheduled early in FY06 and the Block III late in FY06.

The MH-60S is an Army UH-60L Black Hawk airframe incorporating Navy Seahawk GE T700-401C engines, transmission/drive train, stabilator, flight controls, and a folding rotor head and tail pylon. It uses the digital Common Cockpit design, also used in the MH-60R, which has multi-functional displays and a complex tactical data processing system. MH-60S avionics include dual UHF/VHF transceivers, dual embedded Global Positioning System/inertial navigation systems, and night vision device-compatible heads-up displays. The Airborne Mine Countermeasures configuration will incorporate a Sensor Data Link, a sensor workstation, a winch and tether/towing system, and one of two mine detection sensors or one of three mine destructor systems currently under development. The Armed Helicopter configuration will include tactical moving maps, a forward-looking infrared sensor with a laser range finder/target designator, crew-served side suppression weapons, Hellfire missiles, forward firing guns/rockets, and an integrated self-defense system.

DOT&E placed the MH-60R on oversight for LFT&E in 1998. The Assistant Secretary of the Navy, Research, Development, and Acquisition (ASN(RDA)) granted a waiver from full-up system level live fire test of the MH-60R under an extension of a July 1996 memorandum. The Army and Navy established a joint LFT&E test program for the UH-60M, MH-60S, and MH-60R development programs to address data voids at reduced costs. The joint effort recognized the high degree of commonality among the H-60 variants' structural and dynamic components. Both Services provided airframe components and the prototype YCH-60S aircraft to be used as test articles for static and dynamic testing that began in 2001. The joint LFT&E program will continue into FY05.

TEST & EVALUATION ACTIVITY

The Navy revised the Operational Requirements Document (including Appendix A- Armed Helicopter, and Appendix B-Airborne Mine Countermeasures) in August 2002 for Milestone III. The Test and Evaluation Master Plan is being revised to support development and testing of the Armed Helicopter and Airborne Mine Countermeasures-configured aircraft.

Verification testing for correction of some of the deficiencies identified during operational evaluation (OPEVAL) of the baseline configuration occurred in July 2003.

The Army and Navy joint LFT&E test program conducted both static and dynamic tests on aircraft components and on the YCH-60S test aircraft while operating at hover. Testing continued throughout the year at the Army's Aberdeen Proving Grounds, Maryland, and at the Naval Air Warfare Center, Weapons Division, China Lake, California.

The baseline-configured MH-60S successfully accomplished its primary and secondary missions.

TEST & EVALUATION ASSESSMENT

OPEVAL results showed that the MH-60S is operationally effective and survivable, but not operationally suitable. The baseline-configured MH-60S successfully accomplished its primary and secondary missions, constrained only by a 350 gallon fuel capacity. DOT&E recommended in the August 2002 BLRIP report to Congress that sufficient quantities of 200 gallon internal auxiliary fuel tanks be procured by the Navy to accomplish current missions requiring extra fuel, as directed by Task Force Commanders.

The MH-60S was not operationally suitable due to excessive delay time in obtaining spare parts. The aircraft was reliable during OPEVAL. However, when failures occurred, needed parts were not readily available. DOT&E recommended in the BLRIP report that the Navy act to correct the deficiency and ensure adequate logistics were available to support the planned rapid introduction of the MH-60S to the Fleet.

Verification of Correction of Deficiency testing in July 2003 confirmed that operator-systems software interface defects identified during OPEVAL have been corrected. Deliveries of MH-60S-unique spare parts began in April 2003 and should resolve interim inventory shortages. Over 50 baseline MH-60S aircraft were in Fleet service by the end of FY03 and have exceeded the Chief of Naval Operations' Fleet readiness goals. The Navy's Operational Test Agency found the MH-60S to be operationally suitable after completing several follow-on test and deficiency correction periods. Additional follow-on testing, in conjunction with the Airborne Mine Countermeasures Mission, will continue to monitor and verify deficiency correction.

The retrofit of 35-pound centrifugal vibration dampers on the rotor mast to bring the MH-60S aircraft within vibration specifications has not yet occurred. Testing of the vibration dampers is complete and production installation is planned to start in 1QFY04. Crews will experience increased fatigue and potentially decreased mission effectiveness until this repair is made.

The LFT&E results and legacy H-60 databases indicate that the MH-60S is operationally survivable in its intended operational environment for the baseline configuration missions. The MH-60S is a damage-tolerant aircraft that can withstand multiple small caliber projectile hits, continue to fly, and often complete its mission in spite of incurred damage. The data from the joint LFT&E program was adequate to evaluate the survivability of the Block I MH-60S configuration while conducting its wartime missions. The joint LFT&E program will extend into FY05 and consider Block II and Block III configurations of the aircraft.

Mobile User Objective System (MUOS)

The Mobile User Objective System (MUOS) is a satellite communications network designed to provide a worldwide, multi-service population of mobile and fixed-site terminal users with narrowband beyond line-of-sight communications services. Capabilities will include a considerable increase from current narrowband satellite command (SATCOM) capacity, as well as significant improvement in availability for small, disadvantaged terminals. The MUOS will provide graceful transition from the current ultra-high frequency follow-on narrowband SATCOM system. The MUOS will consist of the space transport segment, the ground transport segment, the user entry segment, the network management segment, the satellite control segment, and the ground infrastructure segment.

The Navy is acquiring MUOS under new DoD National Security Space Policy directives tailored for space programs. Three acquisition phases are planned, each utilizing full and open competition. The first phase or study phase was broken into two sequential contracted events. The first study event, a 21-month effort for concept exploration, is done. Six industry teams, consisting of commercial and DoD contractors, studied and recommended system concepts and architectures to meet MUOS Operational Requirements Document needs. The second study event, currently underway, is a planned 14-month task using two contractor teams selected to refine the architecture and develop technology. The second phase, Risk Reduction and Design Development, will develop and launch the first satellite along with associated ground infrastructure. The third phase, Acquisition and Operations Support, will procure and support the remainder of the satellites and associated segments. Initial Operational Capability is projected for 2008.

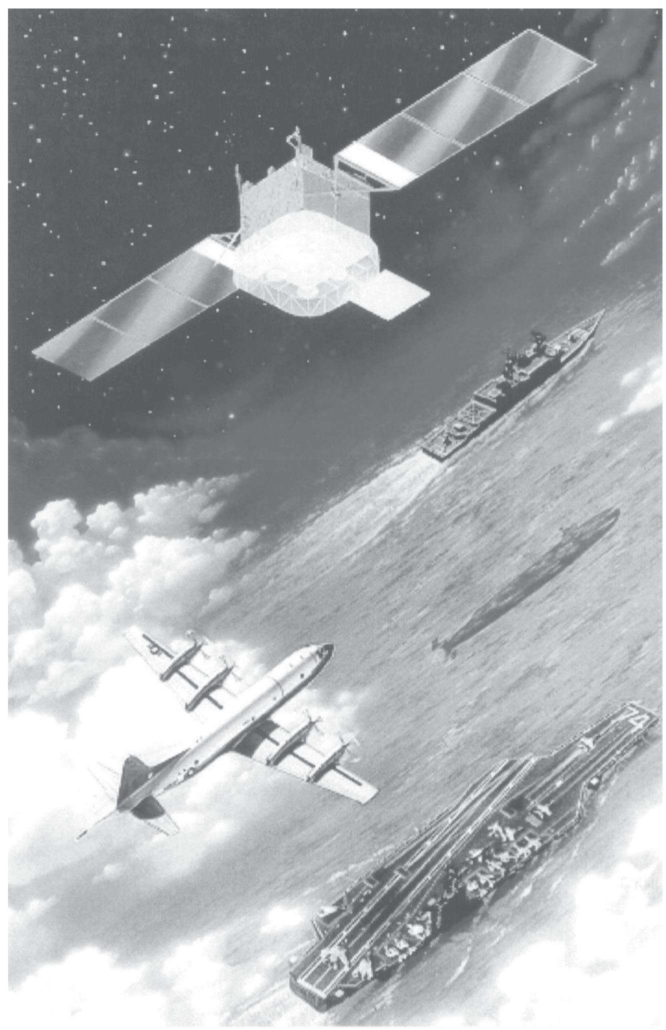
TEST & EVALUATION ACTIVITY

The evaluation strategy was written by a combined Test Force and is in coordination, prior to approval by DOT&E.

The combined Test Force will conduct government insight of the commercial developmental testing following commercial practices and will conduct combined developmental test/operational test as appropriate.

The operational test agencies, led by the Operational Test and Evaluation Force, are in the process of performing an early operational assessment, based on design review documentation submitted by the two contractors and early technology demonstrations.

Dedicated operational test and evaluation will take place after the launch of the first satellite in FY08.



Dedicated operational test and evaluation will take place after the launch of the first satellite in FY08.

Multifunction Information Distribution System - Low Volume Terminal (MIDS-LVT)

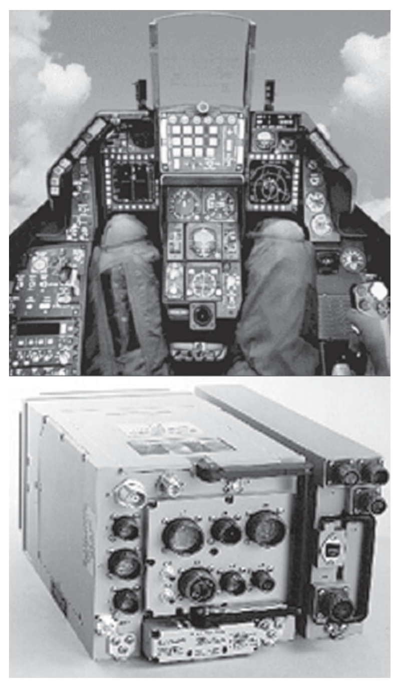
The Multifunctional Information Distribution System-Low Volume Terminal (MIDS-LVT) is a communications terminal that provides Link 16 digital data link, digital voice and, for fighter aircraft, Tactical Air Navigation (TACAN) capabilities when integrated into the host platform. Link 16 is a Joint and allied digital data link that operates on an anti-jam waveform and uses standardized message sets to exchange theater tactical information such as air tracks, engagement orders, targeting information, and platform status. MIDS-LVT provides host platform interoperability with legacy Class 2 Joint Tactical Information Distribution System equipped host platforms.

There are three MIDS-LVT variants: MIDS-LVT 1 for aircraft and shipboard integration, the MIDS-LVT 2 for Army land-based host platform integration, and the MIDS-LVT 3 (also known as Fighter Data Link) for the Air Force F-15 fleet. MIDS-LVT 1 has two competing production contractors: Data Link Solutions, Inc. (DLS) and Via Sat, Inc. The Army has designated Via Sat, Inc. as the sole manufacturer of MIDS-LVT 2. The MIDS-LVT 3 program will complete deliveries in January 2004.

The MIDS-LVT 1 and MIDS-LVT 2 are planned for integration into 13 separate host platform types. The F/A-18 is the lead host platform for MIDS-LVT 1 integration and requires 53 percent of the total planned MIDS-LVT 1 acquisition of 1,880 terminals. The integration of the MIDS-LVT 1 into the F/A-18 served as the primary basis for the MIDS-LVT 1 IOT&E. The F-16 (Blocks 40 and 50) requires 35 percent of planned MIDS-LVT 1 terminals and is approximately one year behind the F/A-18 in terms of integration and test schedule.

The MIDS-LVT 1 replaces the analog AN/ARN-118 TACAN to provide a digital TACAN function for the F/A-18 and F-16 fighter aircraft. This installation is reversible in the F/A-18 allowing reinstallation of the AN/ARN-118 TACAN should the need arise. The installation of MIDS in the F-16 is permanent. The TACAN function provides air-to-ground and air-to-air modes of navigation information.

The Patriot Information Coordination Central (ICC) is the lead host platform for integration of the MIDS-LVT 2; however, the Patriot Battery Command Post (BCP) will require the majority of MIDS-LVT 2 terminals. Since Link 16 integration into the BCP is phased, the integration of MIDS-LVT 2 into the Patriot ICC and BCP Phase 1 (Link 16 not integrated into host sensors and Link 16 receive only) served as the basis for the MIDS-LVT 2 IOT&E.



The Multifunctional Information Distribution System-Low Volume Terminal provides a digital data link, digital voice - and for fighter aircraft - Tactical Air Navigation capabilities.

TEST & EVALUATION ACTIVITIES

DOT&E monitored developmental test activities and prepared pre-test predictions for the F/A-18 MIDS-LVT integration operational evaluation (OPEVAL).

DOT&E conducted an independent analysis and evaluation of the results of the Army-conducted MIDS-LVT 2 IOT&E.

The Operational Test and Evaluation Force (OPTEVFOR) conducted the first portion of the F/A-18 MIDS-LVT 1 integration OPEVAL (IOT&E) from October 2002 to March 2003. Data from over 3,900 MIDS-LVT 1 flight hours were used to complete the evaluation.

OPTEVFOR conducted the final portion (Verification of Correction of Deficiencies) of the F/A-18 MIDS-LVT 1 integration OPEVAL from July 21 to August 15, 2003.

DOT&E completed a MIDS-LVT beyond low-rate initial production report to Congress during September 2003.

TEST & EVALUATION ASSESSMENT
DOT&E concluded that F/A-18 MIDS-LVT testing was adequate to evaluate operational effectiveness and operational suitability.

DOT&E, OPTEVFOR, and the Navy's operational test squadron, Air Test and Evaluation Squadron Nine (VX-9) agree that the F/A-18 MIDS-LVT 1 integration was operationally effective but not operationally suitable.

- Principally, the air-to-ground TACAN function performance was not stable and was unacceptable for aircraft carrier approach operations. TACAN deficiencies included frequent loss of magnetic bearing and range information while in marshal and approach patterns for those TACAN stations operating in a set of notched radio frequencies, and overall reliability regarding the availability of TACAN air-to-air and air-to-ground functions.
- Built-in test (BIT) exhibited excessive false alarms, and the intermediate maintenance capability was not ready for evaluation.
- Integration testing indicated longer than required time to initialize the MIDS-LVT terminal and enter the Link 16 network while preparing the aircraft for flight.
- The F/A-18 MIDS-LVT integration does not include reliable transmission and receipt of emergency messages such as "Bailout" or "Aircraft Down."
- The F/A-18 and F-15E cannot exchange precision ground target coordinates on Link 16.

DOT&E continues to monitor F-16 MIDS-LVT 1 integration and emerging results indicate integration issues with the MIDS-LVT 1 TACAN function, terminal initialization and initial network entry, BIT false alarms, and human factors.

The Army IOT&E and preceding developmental tests indicated MIDS-LVT 2 and Patriot ICC host platform integration issues leading to loss of Link 16 data exchange.

- The testing also indicated that the MIDS-LVT 2 did not meet reliability requirements. A follow-on laboratory test conducted by the Army Test and Evaluation Command indicated that terminal modifications resulted in meeting the laboratory reliability requirement of 1,000 hours mean time between failures.
- The Army Research Laboratory conducted a very comprehensive information assurance (IA) vulnerability analysis of the MIDS-LVT 2 terminal and the data indicated some potential vulnerability with moderate to low risk of occurrence.

DOT&E makes the following conclusions with respect to MIDS systems:

- A Follow-on test and evaluation is needed to verify that the Navy has corrected the 22 major – and numerous minor – deficiencies identified in the IOT&E test reports for the F/A-18 MIDS integration.
- The F-16 MIDS-LVT 1 integration should not proceed to IOT&E until the TACAN and other emerging integration issues have been addressed.
- The Army should employ the Patriot ICC MIDS-LVT 2 in a dense Link 16 environment or large Force exercise to determine if the data exchange halts have been resolved during periods of high data throughput.
- The MIDS-LVT Program Manager should coordinate for an in-depth IA vulnerability assessment for the MIDS-LVT 1; establish a program to mitigate the vulnerabilities; and conduct a follow-on and periodic testing of MIDS-LVT 1 and MIDS-LVT 2 IA vulnerability.

Navy Extremely High Frequency Satellite Communications Program (NESP)

The Navy Extremely High Frequency (EHF) Satellite Communications Program (NESP) terminal connects ship, shore, and submarine platforms to the Military Strategic, Tactical, and Relay (MILSTAR) satellite constellation. The NESP terminal supports survivable, endurable, and flexible worldwide command and control communications to strategic and tactical Naval forces through all levels of conflict. The NESP terminal provides minimum essential secure communications in stressed environments that require anti-jam and low probability of intercept capabilities.

There are three different configurations of the NESP terminal corresponding to surface ship, shore, and submarine platforms. Although each terminal has the same basic capabilities, their antennas and other peripheral equipment vary by platform. The NESP terminal upgrades added a tactical medium data rate (MDR) capability to the existing strategic low data rate (LDR) capability. A limited number (64) of the existing NESP ship and shore terminals were upgraded with an MDR appliqué to achieve the combined low/medium data rate MILSTAR capability. All existing NESP terminals will be replaced with the follow-on terminal (FOT), which provides the same functionality as the MDR appliqué, but offers technology upgrades in terminal hardware and software. The submarine LDR terminals are also undergoing MDR upgrades, including installation of a new mast with a 16 inch antenna, as well as addition of super high frequency and Global Broadcast Service capabilities.

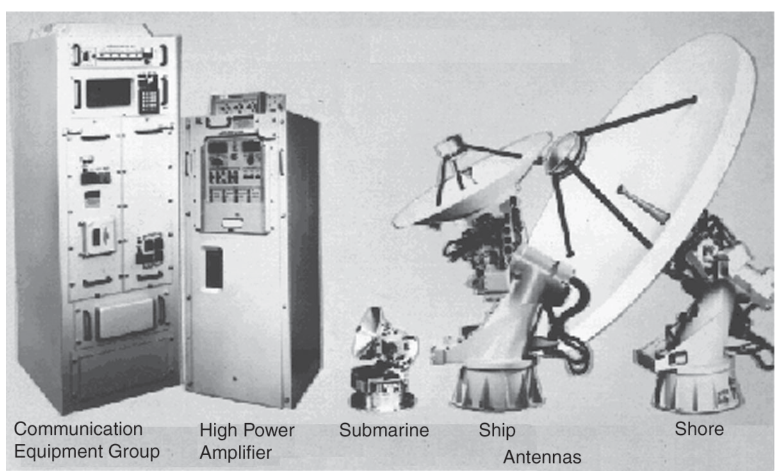
The Navy is developing two new communications controllers, the Navy EHF Communications Controller (NECC) and the Time Division Multiple Access Interface Processor (TIP). The NECC and TIP are baseband interface units that allow more efficient use of MILSTAR satellite resources. The NECC supports LDR data networks, while the TIP supports MDR data networks.

TEST & EVALUATION ACTIVITY

An approved Test and Evaluation Master Plan provides the bases for testing LDR, MDR, FOT, and the NECC and TIP controllers. DOT&E also approved the Operational Test IIIC (OT IIIC) test plan in March 2003. Testing of the NESP MDR terminal began with developmental test/operational test (DT/OT) events associated with on-orbit testing of MILSTAR Flights 4 and 5, occurring from March-July 2001 and January-March 2002, respectively. More recently, NESP participated in Flight 6 on-orbit testing, taking place from April-June 2003. These tests demonstrated compatibility and interoperability with the LDR and MDR payloads in orbit. Tests included satellite acquisition; simultaneous network operations; interoperable network and point-to-point calls with Army, Navy, and Air Force terminals; and antenna and network control functions.

Anti-jam and a low probability of intercept (LPI) are two important characteristics of the NESP MDR terminal. MDR OT&E is employing modeling and simulation rather than at-sea testing to evaluate the terminal's ability to meet requirements. The Navy conducted model validation testing of both the anti-jam and LPI models in 2001with additional validation testing in 2002. The models may be accredited pending an on-going review by the Operational Test and Evaluation Force (OPTEVFOR).

The Navy conducted OT&E for the NESP terminal with the MDR appliqué from April 22 to May 10, 2002, in ships and shore stations in San Diego, California, and Pearl Harbor, Hawaii. This test was conducted to support a fielding decision on the MDR appliqué.



The Navy Extremely High Frequency Satellite Communications Program terminal supports survivable, endurable, and flexible worldwide command and control communications to strategic and tactical Naval forces through all levels of conflict.

OT&E for the NESP terminal with the NECC was conducted in May, 2003, on ships based in San Diego, California. This test was conducted to support a fielding decision on the NECC.

OT of the FOT was scheduled to begin in October 2002, but was delayed due to poor reliability performance during DT. The Program Manager has issued a software change and is now conducting additional DT. The Program Manager is tentatively planning for a late November OT readiness review. The purpose is to certify both FOT and TIP for OT, OT-IIIF, and OT-IIIE respectively. OPTEVFOR has initiated planning to test both FOT and TIP early in 2004. The submarine MDR terminal operational test schedule will be integrated into the overall MILSTAR and NESP terminal test schedules to the greatest extent possible, consistent with submarine terminal progress.

TEST & EVALUATION ASSESSMENT

At the completion of the LDR IOT&E, DOT&E concluded that the ship and shore NESP terminals were operationally effective, suitable, and supported full fleet introduction. Although the MILSTAR LDR submarine terminal does meet the technical and operational requirements for LPI, operational tests showed that the submarine had a substantially higher probability of signal intercept than DTs had indicated. These LPI results reinforce the role of operational testing in providing the warfighter with the most accurate operational performance information possible.

OPTEVFOR determined that the MDR appliqué is operationally effective and operationally suitable, and recommended fleet introduction. However, no assessments can be made regarding joint interoperability, anti-jamming, and LPI until further testing and modeling and simulation are conducted. The modeling and simulation accreditation is not expected to be complete until mid to late FY04. DOT&E originally recommended additional at-sea testing of MDR LPI performance of the submarine terminal to mitigate risk associated with the model to be used for OT. Additional at-sea testing was completed with inconclusive results. Consequently, DOT&E supports the use of both the anti-jam and LPI models for verifying requirements, but only for a limited range of scenarios where the performance margins predicted by the models are large enough to compensate for the uncertainties in the model results. Predictions of specific vulnerability and standoff distances cannot be relied upon with any certainty.

DOT&E concurred with the September 2003 OPTEVFOR final report stating that the NECC was operationally effective and suitable.

Navy Marine Corps Intranet (NMCI)

The Navy Marine Corps Intranet (NMCI) is an information technology (IT) service contract intended to provide reliable, secure, and seamless information services to the shore-based components of the Navy and Marine Corps. NMCI infrastructure and services will not extend to afloat or deployed units. However, NMCI will provide deployable workstations to deployed forces to be used with the Navy's Integrated Shipboard Network System and the Marine Corps Tactical Network. NMCI supports new processes and enables new initiatives such as knowledge management, distance learning, and tele-medicine to improve the quality of life for Department of the Navy employees and support personnel. NMCI will provide IT services using a seat management contract that delivers comprehensive information services through a common computing and communications environment. Seat management is a method of coordinating all the workstations in an enterprise network by overseeing the installation, operation, and maintenance of hardware and software at each workstation. Upgrades, modernization, and technology refreshment will occur over the NMCI contract life cycle.

The NMCI contract is for the procurement of IT services (not systems) based upon a commercial model of service-level agreements. Under this model, emphasis is placed on the verification, validation, and monitoring of the end-user services and not on the underlying infrastructure or systems. The architecture will support Navy and Marine Corps bases, camps, stations, and activities in the Continental U.S., Alaska, Hawaii, Puerto Rico, and Guantanamo Bay, Cuba, for an estimated 360,000 seats. It is anticipated that a total of 72 server farms, six network operations centers, and two help desk centers will be required.

The Navy Operational Test and Evaluation Force (OPTEVFOR) conducted a baseline system assessment (BSA) in FY01 on the pre-NMCI IT configuration, including hardware, software, security, and current performance levels at four Naval aviation sites. DOT&E evaluated the results of the BSA and will reference those results against the future system (which will be evaluated during operational evaluation (OPEVAL)) to measure improvements provided by NMCI. Due to the large scale and complexity of the NMCI initiative, implementation will take several years to reach full operating capability.

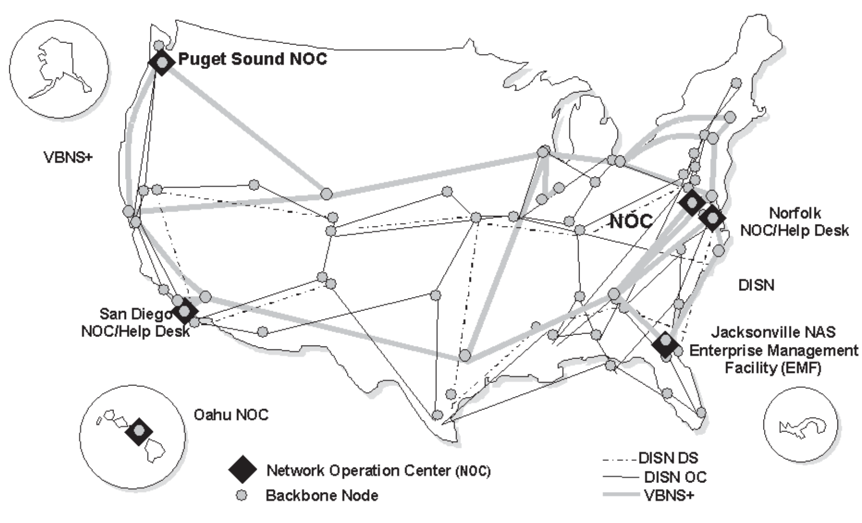
TEST & EVALUATION ACTIVITY

DOT&E approved an updated Test and Evaluation Strategy for NMCI on September 4, 2002.

OPTEVFOR conducted an operational assessment (OA) during September-October 2002 to assess NMCI readiness for OPEVAL and to support further initial deployment. This OA was conducted at five operational sites, including four Naval aviation sites and Fleet Forces Command, under a DOT&E-approved test plan.

The United States Marine Corps (USMC) conducted an OA for the NMCI deployable solutions at a Marine Corps base in Hawaii during February-March 2003.

OPTEVFOR conducted an OPEVAL during October-November 2003.



The Navy Marine Corps Intranet is an information technology service contract intended to provide reliable, secure, and seamless information services to the shore-based components of the Navy and Marine Corps.

TEST & EVALUATION ASSESSMENT

The September-October 2002 OA was unable to provide a comprehensive review of NMCI operations because many of the target capabilities were either not yet available or the data collection process was not sufficiently mature to produce the required data for evaluation. Working with the partial data obtained during the OA, OPTEVFOR found only 6 of the 16 critical operational issues (COIs) were met. Five COIs (customer service and support, network support, interoperability, mission support, and logistic supportability) of the remaining ten posed high risk for failure to meet requirements during the OPEVAL, four COIs posed a moderate risk, and one COI was not tested. Overall, 72 major deficiencies were identified across nine COIs. The Program Director initiated a corrective action plan, and in April 2003, OPTEVFOR began a VCD to confirm the fixes. The VCD completed in October 2003. DOT&E assessment is ongoing.

The USMC OA of the NMCI deployable solutions identified several deficiencies. Field operators could not conduct effective reachback from deployed positions, nor could they access the NMCI help desk.

OPTEVFOR conducted an OPEVAL during October-November 2003 to assess the operational effectiveness and operational suitability of NMCI at five test sites: Naval Air Facility Washington, DC; Naval Air Systems Command Headquarters, Patuxent River, Maryland; Naval Air Station Lemoore, California; Naval Reserve Center Lemoore, California; and Fleet Forces Command, Virginia. An aircraft carrier was to be part of the OPEVAL to evaluate the deployable solutions, but none were available during the OPEVAL period. OPTEVFOR plans to evaluate the deployable solutions on a carrier in a follow-on operational test. DOT&E's assessment of the OPEVAL is ongoing.

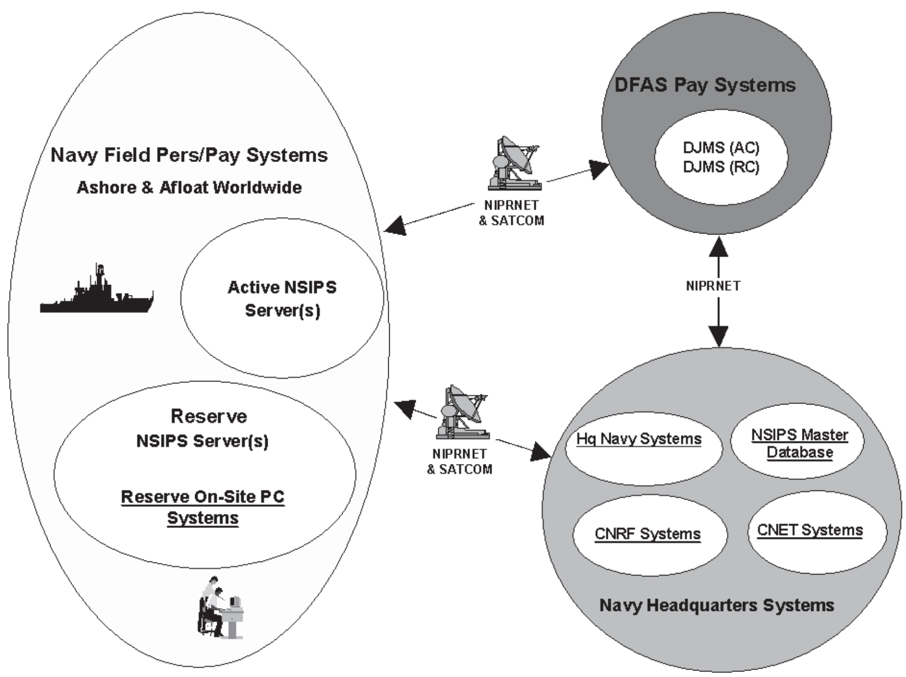
Navy Standard Integrated Personnel System (NSIPS)

The Navy Standard Integrated Personnel System (NSIPS) will consolidate the Navy active and reserve field source personnel data collection systems, both ashore and afloat. The objective is to produce a standard, single point-of-entry system for all personnel and pay information. The primary interfaces for NSIPS will be with systems of the Defense Finance and Accounting Service. NSIPS was to provide pay and personnel functionality for the Navy Reserve force in Release 0, and for the Navy active force in Release 1. The client-server architecture will have information stored at the local level and at the regional level. A corporate-level database will be used for planning and analysis purposes.

In 1997, the program manager developed a prototype system to prove the planned architecture and user friendliness of the graphical user interface and selected *PeopleSoft*® as the basic human resource software package. The Program Management Office customized this Release 0 package to address the Navy reserve requirements. The Release 0 operational evaluation (OPEVAL) began in mid-September 1999. DOT&E noted many deficiencies, including inaccurate transmittal logs, missing e-mail functionality, corrupted reports, and inadequate training. The program manager immediately developed a plan to address these shortcomings. Beginning in October 1999, the Navy installed three separate software builds to fix the problems and OPEVAL resumed in November 1999. In January 2000, DOT&E concurred with the Operational Test and Evaluation Force's (OPTEVFOR) conclusion that NSIPS Release 0 is operationally effective and operationally suitable, and recommended approval for fleet introduction. NSIPS Release 0, which replaced the Reserve Standard Training, Administration, and Readiness Support (Manpower and Personnel) System, is operational at 260 reserve sites.

In June 2000, the program manager announced a four-month schedule slip in software development and proposed that Release 1 be delivered in two separate increments. The first increment (Release 0.2) would address personnel actions and the second increment (Release 1) would address pay actions for the Navy active force. OPTEVFOR conducted the OPEVAL of Release 0.2 from April 23 to May 4, 2001. The results indicated that two effectiveness and eight (of ten) suitability critical operational issues were resolved satisfactorily. Interoperability and documentation were unsatisfactory. The PMO made the corrections and the Navy conducted a follow-on Verification of Corrected Deficiencies (VCD) test in July 2001. Test results indicated that previously identified deficiencies had been corrected. The Assistant Secretary of Defense (Command, Control, Communications, and Intelligence) approved the NSIPS Release 0.2 for fleet introduction in September 2001.

OPTEVFOR conducted the OPEVAL of NSIPS Release 1 from June 10 through July 12, 2002, at seven operational test sites. OPEVAL results revealed that while NSIPS Release 1 was able to meet many of its required performance thresholds, it did not meet the key performance



The Navy Standard Integrated Personnel System will consolidate the Navy active and reserve field source personnel data collection systems, both ashore and afloat.

parameter of 98 percent accuracy in processing personnel or pay transactions (only 89 percent accuracy was achieved). Of the 13 external system interfaces, JITC certified only six as interoperable. Because of these and other deficiencies, OPTEVFOR considered NSIPS Release 1 operationally ineffective and operationally unsuitable for fleet introduction. DOT&E concurred and required a follow-on test to confirm corrections to the identified deficiencies.

TEST & EVALUATION ACTIVITY

- DOT&E approved the NSIPS TEMP in May 2001.
- On March 10-19, 2003, OPTEVFOR conducted a VCD at Personnel Support Detachment (PSD) Newport, Rhode Island; PSD Recruit Training Command Great Lakes, Illinois; PSD Guam; and PSD Point Loma, California, to verify the corrections.

TEST & EVALUATION ASSESSMENT

The VCD results revealed that most previously identified deficiencies were rectified, with some human factors deficiencies remaining. Several of these human factors deficiencies are associated with Navy policies. For example, NSIPS Release 1 does not allow for assisting customers who are not assigned to the command and does not provide flexibility when assisting Reservists and officer accessions (for security and information integrity reasons). NSIPS halts order processing if errors are encountered and it does not allow PSD to correct erroneous data without intervention from the Navy Bureau of Personnel. Other human-factor deficiencies are related to report formatting and dependent data entry. DOT&E recommended that the program manager work with the functional proponent to review existing Navy policies with regard to assisting customers not assigned to the command and providing more flexible support to reservists and officer accessions. If the Navy policies can be modified to allow additional accessibility and flexibility without sacrificing security and information integrity, then the program manager should modify the NSIPS software accordingly. Any major revisions to the system must be evaluated by OPTEVFOR and DOT&E.

Rolling Airframe Missile (RAM) Weapon System

The Rolling Airframe Missile (RAM) program provides surface ships with a low-cost, lightweight, self-defense system to defeat anti-ship cruise missiles (ASCMs). RAM Block 0 uses dual mode, passive radio frequency (RF)/infrared guidance. RAM Block 0 enhances ship self defense against several RF-radiating ASCMs while RAM Block I extends that defense against non-RF radiating missiles. The launching system and missiles comprise the weapon system.

Most current RAM weapon system installations are integrated with the AN/SWY-2 or -3 combat systems. RAM is integrated with the Ship Self Defense System (SSDS) Mark 1 on the LSD 41/49-class of amphibious ships. AN/SWY-2 installations use RAM as the only hard-kill weapon. AN/SWY-3 installations use both RAM and NATO Seasparrow systems as hard-kill weapons. RAM will be integrated with the SSDS Mark 2 on LPD 17-class, LHD 1-class, and CVN 68-class ships (the NATO Seasparrow is also on the latter two ship classes).

The United States and the Federal Republic of Germany jointly developed RAM. Commander, Operational Test and Evaluation Force (COMOPTEVFOR) completed RAM Block 0 IOT&E in FY90. COMOPTEVFOR conducted the RAM Block 1 operational evaluation on the Self Defense Test Ship (SDTS) and on a fleet ship in 1999. In 1997, the resource sponsor requested that the program manager determine what RAM capability existed against helicopters, slow aircraft, and surface targets (HAS). This request stipulated that Block 1 anti-ASCM capability was to be retained, but was not accompanied by operational requirements for the additional target set.

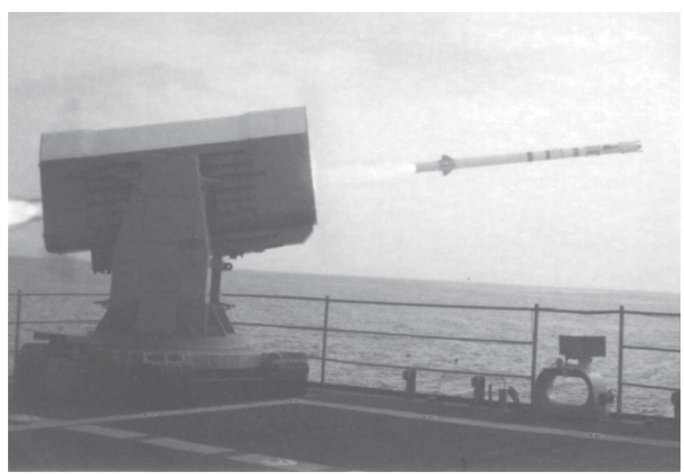
TEST & EVALUATION ACTIVITY

DOT&E approved the RAM Block 1A (RAM Block 1 with HAS software) Test and Evaluation Master Plan and Operational Test Plan. Combined Developmental Test/Operational Test (DT/OT) started in June 2003 and extended into FY04, using the existing SDTS to ensure operationally realistic tests for determining that RAM with the new HAS software retained capability against ASCMs and to carry out deferred testing from the FY99 operational evaluation.

TEST & EVALUATION ASSESSMENT

RAM Block 1. RAM Block 1, as supported by an LSD 41-class combat system, is operationally effective against most current ASCMs . RAM Block 1 is operationally suitable and is lethal against most current ASCMs. Follow-on test & evaluation for Block 1 (or Block 1A) still needs to address missile capability against the threat category that was not tested during the operational evaluation, against ASCMs under conditions of electronic jamming of the combat system sensors, in low visibility (high aerosol) environments, and in the presence of other infrared sources.

For the threat category not tested during the operational evaluation, the Navy's subsonic target upgrade program may deliver targets by FY06 that may be adequately representative of the threat for some acquisition programs. Unfortunately, the Navy's target developers did not accord high priority to providing the characteristics required to make the target adequately threat representative for RAM program testing. The program manager considers examining missile capability against ASCMs under conditions of electronic countermeasures against the combat system sensors to be an area beyond his control and his sponsor does not wish to fund such T&E. Overall testing of RAM will not be adequate without such testing, and the fleet users of the system will not be informed about their self-defense capability in that environment.



The Rolling Airframe Missile program provides surface ships with a low-cost, lightweight, self-defense system to defeat anti-ship cruise missiles.

RAM HAS Mode. The program sponsor has not issued detailed performance goals for RAM HAS. From an OT&E perspective, the absence of operational requirements undermines objective assessment of operational test results and hampers the program manager's ability to understand the impact of performance trades on mission accomplishment and operational effectiveness against HAS targets. In addition to the combined DT/OT against ASCMs in FY03/FY04 on the SDTS, developmental testing is planned in FY04 with the same Block 1A rounds against a small number of representative HAS targets from an upgraded RAM launcher operated in a standalone mode. The Navy will conduct DT/OT from a manned ship against an aerial target drone in FY05/FY06, accompanied by a maintenance demonstration and evaluation of the Mod 3 launcher.

During the initial flight tests of the combined DT/OT of Block 1A, a defect in microcircuitry of the guidance system was discovered. Isolating the problem and locating missiles containing the defective components delayed completion of DT/OT until FY04. However, the value of operationally realistic operational testing conducted with the SDTS was reaffirmed during later tests in September 2003. Problems with SSDS Mark 1 and with the RAM HAS software were discovered during a realistic test against ASCMs that could not have been conducted with a manned ship.

In November 2002, the Navy discovered that the seeker-focus shifts over time which could reduce missile performance after extended storage. The problem is understood and a fix is being implemented.

RAM Block 0 and Block 1 LFT&E evaluated lethality against various ASCMs. RAM HAS was designated for lethality LFT&E oversight based on its new target set. There is little data on RAM warhead lethality against those targets. Additional tests are needed for information on the lethality of the weapon and for the development of simulations that can be used to predict lethality/effectiveness against threats under a variety of scenarios. The LFT&E strategy for RAM HAS includes ground testing of the warhead against whole targets and/or components, flight testing, and simulation-based analyses.

As with any shipboard combat system required to provide self defense with short range weapons such as RAM and the Evolved Sea Sparrow Missile, safe and effective OT&E requires the use of an SDTS. The current SDTS, Ex-*Decatur*, is nearly 50 years old and evidences severe deterioration. The current combined DT/OT is probably the last testing that will be conducted with this ship. The first was in 1994 and several important weapons and combat system elements have been realistically tested over the years. The replacement SDTS, a decommissioned *Spruance*-class destroyer, is at Port Hueneme, California, awaiting conversion for the next testing. As DOT&E has noted in the discussion of the LPD 17 and the SSDS, the adequacy of the OT&E for both programs (and approval of the test plans) hinges on having an LPD 17-representative combat system on the new SDTS, along with funded resources, including RAMs and targets, for the testing. This should be funded in time to support the LPD 17 FY06/FY07 operational evaluation before the ships are ready for deployment.

Seawolf SSN 21 Class Attack Submarine and AN/BSY-2 Combat System

The *Seawolf* (SSN 21) Nuclear Attack Submarine is designed to rapidly deploy to hostile ocean areas and deny use to the enemy, clear the way for strikes by other friendly forces, and engage and destroy enemy submarines, surface forces, and land targets. Secondary missions are mine and special warfare. *Seawolf* is designed to be a quiet, fast, heavily armed and survivable submarine.

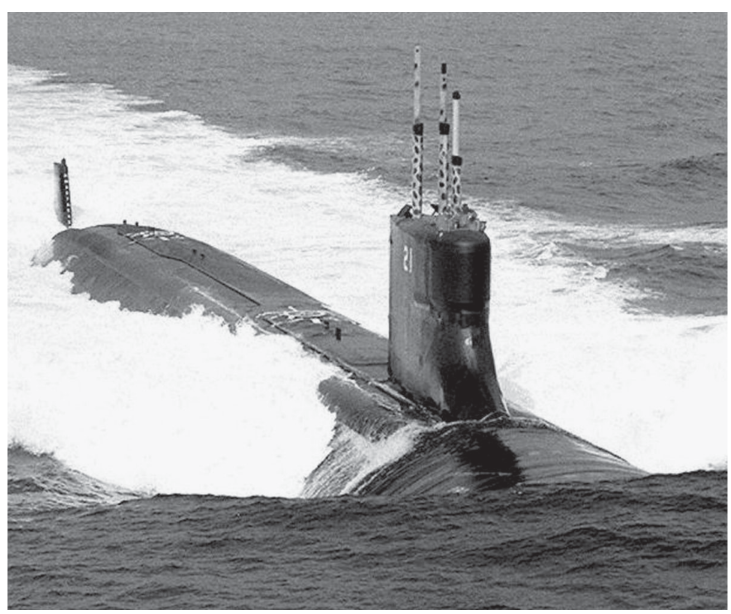
The AN/BSY-2 Submarine Combat System is designed to support SSN 21 in all mission areas. It detects, classifies, localizes and tracks targets, platforms, and weapons by means of onboard active and passive sensors and with augmented target information from other platforms and external detection systems. The combat control subsystem provides setting and control of weapons, over-the-horizon targeting, combat systems management, improved target motion analysis, piloting and navigation functions, and automatic contact correlation. It includes the weapon launch equipment for the Mark 48 Advanced Capability Torpedo and the Tomahawk Missile. Acoustic hardware includes a truncated 24 ft diameter spherical receive array, a 15 ft diameter hemisphere active transmit array, a wide aperture array, a low frequency bow array, two towed arrays, and a mine detection and avoidance high frequency array.

The *USS Seawolf* began initial sea trials in July 1996 and completed acoustic trials in November 1997. The *USS Connecticut* (SSN 22) went to sea in 1998. The third and final *Seawolf* class submarine, *Jimmy Carter* (SSN 23), is under construction with delivery scheduled in FY04. *USS Jimmy Carter* will be uniquely outfitted with an additional hull section lengthening the ship for special missions and research and development projects.

The *USS Seawolf* LFT&E plan included a 1/4 scale Shock Model Test Vehicle that underwent underwater shock and hull whipping. The Navy conducted extensive shock qualification testing of vital *USS Seawolf* internal components using Floating Shock Platforms (test barges) and standard Navy shock test machines. The original LFT&E Plan for *Seawolf* featured a full-ship shock trial of the completed ship. However, Congressional legislation that prohibited the Navy from funding *Seawolf's* shock trials prevented a full ship shock trial.

The *Seawolf* OPEVAL was completed in FY01. Warm water and cold water testing was performed by *USS Seawolf*. Minefield testing was conducted by *USS Connecticut*, which then deployed for five weeks to the Arctic and surfaced at the North Pole in June 2001. In September 2001, it completed a test of the missile strike capability while performing as a launch platform for a Cruise Missile Program Operational Test Launch.

The Office of the Director, Naval Nuclear Propulsion has cradle to grave responsibility and reporting for all aspects of nuclear propulsion plants. DOT&E has been briefed on the Naval Nuclear Propulsion processes for design and qualification of nuclear propulsion plants that power certain classes of U.S. Navy ships and was impressed with the thoroughness and complete understanding of the rational behind operational requirements and specification. All other DoD programs would benefit from implementing similar processes to ensure the rational behind the operational requirements and specifications is understood.



The Seawolf *is designed to be a quiet, fast, heavily armed, and survivable submarine.*

TEST & EVALUATION ACTIVITY

Test and evaluation activity in 2003 consisted of a short trip to the Arctic by *USS Connecticut* to confirm retest fixes for deficiencies and to conduct developmental testing of under-ice software for Mark 48 torpedoes.

DOT&E issued a classified combined OT&E/LFT&E Report on the *USS Seawolf* and the BSY-2 Submarine Combat Control System on July 15, 2003.

TEST & EVALUATION ASSESSMENT

Although several requirement thresholds were not met, DOT&E evaluated the *Seawolf* Class Nuclear Attack Submarine and the BSY-2 Submarine Combat Control System as operationally effective and operationally suitable. Details of *USS Seawolf's* performance during OPEVAL are available in the classified OT&E/LFT&E Report. The *Seawolf* and the BSY-2 Combat Control System were adequately tested to assess operational effectiveness and suitability, but the lack of a full ship shock trial prevented full assessment of *Seawolf's* survivability. However, the *Seawolf* design incorporates numerous features that improve survivability over previous classes. These features make Seawolf less susceptible and vulnerable and thus, considered more survivable than the *Los Angeles* class submarine.

Ship Self Defense System (SSDS)

The Ship Self Defense System (SSDS) is designed to expedite the detect-through-engage process on amphibious ships and aircraft carriers against anti-ship cruise missiles (ASCMs). SSDS consists of software and commercial off-the-shelf hardware and is intended to integrate sensor systems with engagement systems. SSDS is not designed to improve capability of individual sensors but enhances target tracking by integrating the inputs from several different sensors to form a composite track. Similarly, SSDS is not designed to improve capability of individual weapons, but expedites the assignment of weapons for threat engagement and provides a "recommend engage" display for operators, or if in automatic mode, initiates weapons firing, electronic jamming, and chaff or decoy deployment.

The SSDS variant in development is the Mark 2 system. The original Mark 1 system was designed to provide an automated and integrated detect-to-engage capability against ASCMs. The SSDS Mark 2 system expands upon this capability by subsuming the command and decision functionality of the Advanced Combat Direction System Block 1. Thus, SSDS Mark 2 facilitates command and control and combat direction encompassing the multi-warfare missions of air, surface, undersea, strike, and command, control, and communications warfare. Since SSDS Mark 2 is being installed with the Cooperative Engagement Capability (CEC), the tracking functionality of CEC is being used to leverage the sensor integration capabilities of this new system.

The SSDS Mark 2 system will be the combat direction system for CV/CVN class aircraft carriers and LPD 17 and LHD 1 amphibious ships. The Mark 1 system has been introduced into the Fleet in dock landing ships (LSD 41/49); full-rate production of SSDS Mark 1 was authorized in March 1998. SSDS Mark 2 has four planned variants. Mod 0 is installed in *USS Nimitz* for one deployment. Mod 1 will be installed in all carriers, including *USS Nimitz*, beginning with *USS Reagan* in 2003. Mod 2 will be installed in all LPD 17 class ships, beginning with *USS San Antonio*. Mod 3 will be installed in LHD 8. The major differences in the Mods are in the sensors and weapons for the ship classes. Beyond Mark 2, SSDS is planned to migrate to an open architecture system.

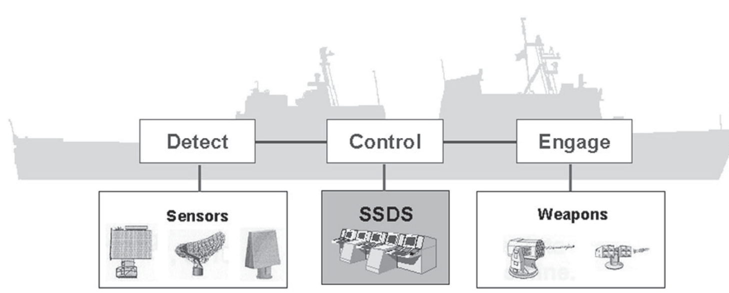
TEST & EVALUATION ACTIVITY

Activity during FY03 focused on further definition of the overall Mark 2 test and evaluation program, work on a Test and Evaluation Master Plan (TEMP) for Mark 2, and engineering and developmental testing of the Mod 1 version at the Ship Combat Systems Center, Wallops Island, Virginia, and on board *USS Reagan.*

TEST & EVALUATION ASSESSMENT

As was the case with the *USS Nimitz* in FY02, the Navy conducted SSDS Mark 2 engineering and developmental testing for *USS Reagan* FY03 without an approved TEMP. There has been no operational testing.

Because it incorporates Advanced Combat Direction System Block 1 functionality, SSDS Mark 2 will require an assessment of performance in several warfare areas, depending on the ship class. These warfare areas include air, surface, strike, amphibious, and others. Further, the air warfare test and evaluation requires an additional phase to assess ship self defense against ASCMs. This requires Mark 2 integrating the sensor and engagement subsystems of the applicable ship class combat systems while engaging ASCMs or adequate surrogate targets. Since the systems on these ships use short-range weapons, safe and effective OT&E can only be accomplished with a Self Defense Test Ship (SDTS) capable of being remotely operated during operationally realistic ship air defense scenarios. Given that the LPD 17-class ship is the first forward-fit installation using SSDS Mark 2, this OT&E of



The Ship Self Defense System is designed to expedite the detect-through-engage process on amphibious ships and aircraft carriers against anti-ship cruise missiles.

Mark 2 must be combined with the SDTS phase of the LPD 17 operational evaluation, projected for FY06-FY07. Delaying the testing will result in several ships being deployed with combat systems that have not been adequately tested.

DOT&E's concerns on this issue are clear. DOT&E approval of TEMPs and operational test plans for LPD 17 and SSDS will hinge on an adequate OT&E strategy. An adequate strategy includes a separate SDTS phase within the FY06-FY07 LPD 17 OPEVAL window with an LPD 17-representative combat system engaging threat-representative ASCM targets with Rolling Airframe Missiles.

SSGN-26 *Ohio* Class Conversion

The Navy is reconfiguring four *Ohio* class nuclear ballistic missile submarines (SSBNs) as tactical platforms and retiring them from their strategic role. The *Ohio* class cruise missile submarine (SSGN) program entails the refueling and conversion of the four SSBNs to dedicated cruise missile launch submarines to support the Land-Attack/Strike mission. Each new Multiple All-Up-Round (AUR) Canister (MAC) launchers contain seven Tomahawk land-attack missiles (TLAMs) and fit within the existing Submarine Launched Ballistic Missile (SLBM) vertical launch tubes. Each SSGN will accommodate up to 22 MACs, for a total of 154 TLAMs.

The SSGN will also support Special Operations Forces (SOF) missions. Two of the large vertical launch tubes will be converted to SOF lockout chambers and the ship will feature dedicated accommodations for SOF personnel and their equipment. The SSGN is capable of hosting the Advanced SEAL Delivery System (ASDS) and Dry Deck Shelter on its upper deck.

In the future, the extensive payload capacity of the SSGN may be used to support other offboard systems, including large unmanned and autonomous underwater vehicles, as well as alternate weapons systems.

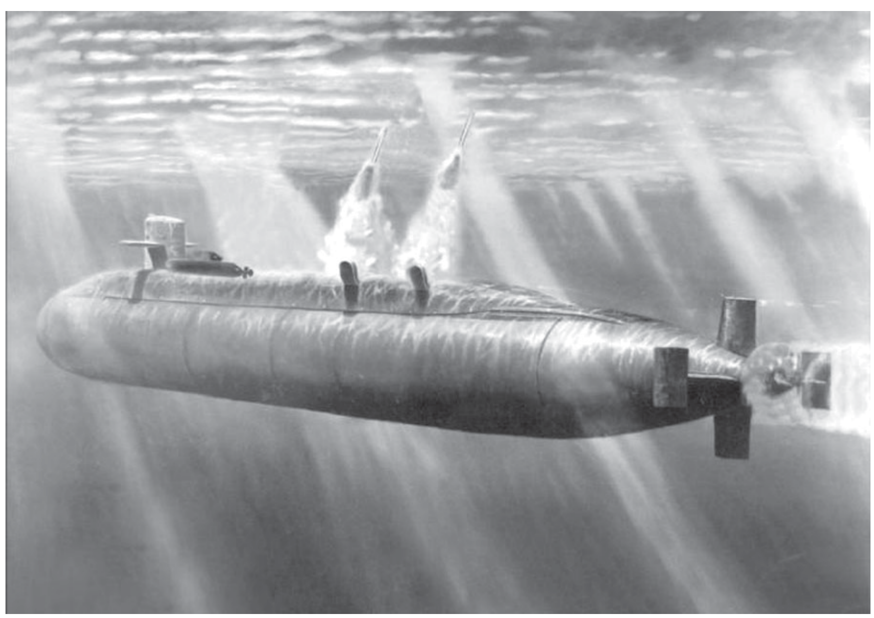
The Navy plans to conduct operational evaluation (OPEVAL) of the SSGN's Strike and SOF missions in FY07.

TEST & EVALUATION ACTIVITY

The Navy approved the SSGN Operational Requirements Document in September 2002. DOT&E approved the Test and Evaluation Master Plan (TEMP) in November 2002; however, the TEMP requires a revision to reflect new developmental test plans.

The Navy conducted Demonstration and Validation (DEMVAL) testing of the MAC design in the Atlantic in January 2003. Two TLAMs were fired from *USS Florida* using a non-production mock-up of the MAC. In addition, land-based tests were performed on MAC subsystems.

Two LFT&E Program Reviews were held during FY03. Emphasis of the reviews were on defining the LFT&E program in detail and the content of the Vulnerability Assessment Reports. Since the Navy's goal is to maintain the level of survivability in the converted SSGN and not introduce any deficiencies into the platform survivability, these meetings addressed how to limit the survivability concerns to the changed areas. DOT&E emphasized this concern in light of the revised operating concepts and scenarios for the SSGN. To initiate efforts on damage scenarios, a Total Ship Survivability Test Management Plan was developed and working groups were established. In May 2003, the SSGN Project Manager signed a Vulnerability Assessment Report. As part of the vulnerability assessment an SSGN component shock database was initiated to demonstrate SSGN's capability to withstand required shock levels.



The SSGN program entails the refueling and conversion of four Ohio *class SSBNs to dedicated cruise missile submarines.*

TEST & EVALUATION ASSESSMENT

During the DEMVAL firings*, USS Florida* successfully launched two TLAMS that reached their targets. The launcher system employed a demonstration article (DEMVAL MAC) which replicated the AUR spacing in a tactical production MAC, featuring two AUR missiles and an Inert Instrumented Test Vehicle (IITV). Due to the use of a Trident C4 diameter missile tube, the DEMVAL MAC could accommodate only three (vice seven) AURs. While two TLAMs were designated as launch articles, the IITV was intended to be a witness round to measure the survivability of adjacent enclosures. The program reported the witness round experienced some damage, and there were indications of post-launch debris and launch pressure transient problems. The program initiated a redesign effort of the AUR Capsule Closure Assembly (CCA) to enhance survivability during launch events.

The Program Office believes land-based testing of the CCA redesign will replicate all aspects of the SSGN environment and provide capability for repeatability testing, lifecycle testing, and testing at environmental extremes. DOT&E believes that additional at-sea TLAM developmental test firings should be scheduled as developmental tests using the production MAC in order to adequately test the launch system prior to starting OPEVAL. The Navy could leverage previously scheduled TLAM test firings by using the SSGN as the launch platform. While the Navy has extensive experience with vertical launch of TLAMs from Improved *Los Angeles* class SSNs and SLBMs from SSBNs, the MAC represents an entirely new launch system. Specifically, the MAC includes up to seven separate AUR TLAM canisters placed within a vertical tube with a single hatch. There are several risks associated with the launch concept, including the effects of launch debris on the ship and associated systems, launch damage to adjacent AURs, and the effects of the SSGN's hydrodynamic flow field on the missiles. DOT&E supports the program's DEMVAL plan as an important technical test and risk mitigation effort, but will require a full end-to-end test of the production-representative system at sea to satisfy operational test requirements. Ideally, a full salvo of TLAMs would be fired, but cost and range safety restrictions limit the launch rate of real cruise missiles. Firing of inert TLAM-surrogates would demonstrate the launch and booster firing without transitioning to flight, but no such test articles exist. The current Strike operational test plans include the launch of five TLAMs from a single MAC, spaced as closely as possible over the course of several days. While the consecutive firings may provide some indication of the cumulative stress on the system, the firing rate will be too slow to replicate a true salvo.

The SSGN program is developing an AUR Simulator that incorporates TLAM electronic simulation, pressure/vent volume and control capability, and power demand. The simulators will be loaded into SSGN MACs to replicate a 32-missile salvo. In addition, a full set of 32 AURs will be loaded and spun up as part of the at-sea testing of the weapons control system.

For both the Strike and SOF mission operational tests, the conduct of realistic operations against a capable opposing force is essential. DOT&E emphasizes that the SSGN missions will involve new concepts of operations and take it into new environments, including the littorals. The SSGN must demonstrate the ability to execute its missions effectively while maintaining survivability. DOT&E is particularly interested in the shallow water, slow speed ship control and the ability of the sonar and combat systems to support the situational awareness to accomplish these new missions.

Progress has been made on the direction and scope of the LFT&E program. However, the Navy allocated limited resources for LFT&E while maintaining an aggressive program schedule. The LFT&E program scope is the minimum acceptable, considering the upgraded weapon system and its new operating environments.

SSN 774 *Virginia* Class

The *Virginia* class submarines will replace the aging fleet of *Los Angeles* (SSN 688) class submarines. *Virginia* is intended to be a submarine comparable in most respects to its immediate predecessor - the *Seawolf* - but in a more affordable configuration. The missions of *Virginia* include Covert Strike Warfare, Anti-Submarine Warfare, Covert Intelligence Collection/Surveillance, Covert Indication and Warning and Electronic Warfare, Anti-Surface Ship Warfare, Special Warfare, Covert Mine Warfare, and Battle Group Support. The SSN 774 was christened on August 16, 2003, and is undergoing dockside outfitting and testing. *Virginia* will start builder's trials in 2004.

Virginia will be capable of targeting, controlling and launching Mark 48 Advanced Capability torpedoes, mines, and Tomahawk missiles. Its sonar capability is expected to be similar to *Seawolf*'s, and its electronic support suite and combat control system represent improvements over legacy systems. The external communications system will be an improvement over legacy systems, providing full, high data rate interoperability with U.S. and allied forces. These characteristics support intelligence and strike capabilities.

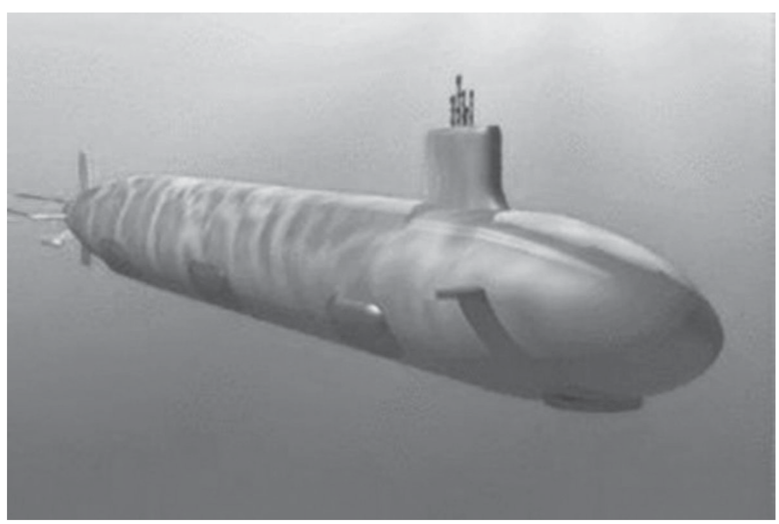
The *Virginia* Class (SSN 774) submarine Non-Propulsion Electronics System was integrated outside of the ship's hull. Sonar displays and processors; Navigation and Combat Control Architecture; Data Distribution and Display, Electronic Support Measures, Onboard Team Trainer; Total Ship Monitoring; and Submarine Regional Warfare systems were all electronically integrated on a rafted system and inserted into the *Virginia* hull.

DOT&E recommended, and the Secretary of Defense approved, a waiver from full-up, system-level live fire testing of *Virginia* in accordance with Title 10, Section 2366. DOT&E approved the alternative LFT&E plan in June 1995. This plan includes shock qualification tests and analysis of components, surrogate underwater shock tests, a Total Ship Survivability Trial, a Full-Ship Shock Trial, as well as a series of vulnerability assessments.

The Office of the Director, Naval Nuclear Propulsion has cradle to grave responsibility for all aspects of nuclear propulsion plants. DOT&E has been briefed on the Naval Nuclear Propulsion processes for design and qualification of nuclear propulsion plants that power certain classes of U.S. Navy ships and was impressed with the thoroughness and complete understanding of the rational behind operational requirements and specification. All other DOD programs would benefit from implementing similar processes to ensure the rationale behind the operational requirements and specifications are understood.

TEST & EVALUATION ACTIVITY

Developmental testing was conducted on the Light Weight Wide Aperture Array (LWWAA), a key *Virginia* class sensor for target localization. Technical problems required an investment to complete developmental testing to support shipboard installation. Hardware delivery problems limited LWWAA testing on the factory floor integration stimulator; however, shipboard testing is expected to begin during 1QFY04.



Virginia *will replace the aging fleet of* Los Angeles *class submarines.*

The Navy indicated intent to cancel the full-scale target acoustic strength trials for the *Virginia* class in favor of modeling and simulation (M&S). The *Seawolf* trials validated the acoustic M&S for the *Seawolf* class. Although M&S can supplement many aspects of full-scale acoustic target strength trials, DOT&E feels the model must be validated for the *Virginia* and that M&S cannot replace all full-scale tests.

The Navy's LFT&E program includes three separate Vulnerability Assessment Reports, a modified Total Ship Survivability Trial, component shock qualification testing for new/changed components, a variety of component and surrogate tests, and M&S. DOT&E witnessed component shock qualification tests and reviewed the results of completed component and surrogate testing.

TEST & EVALUATION ASSESSMENT

Indications are that the propulsor will not meet all performance design objectives for the *Virginia* class. The Navy has not indicated its plan to address this shortfall.

Developmental testing identified several LWWAA performance issues. The two most severe are channel-to-channel phase variations in the fiber optic signals and failure of the system to meet system cold-start time requirements. The phase variations erode the system signal processing gain, and the excessive start time will impact system suitability. Failure to meet system cold-start time requirements is a continuing problem often seen in commercial off-the-shelf systems. Correction of these problems will be verified during dockside testing to ensure the LWWAA will be reliable for the builder's trials and follow-on testing.

The Operation Test and Evaluation Force reported concerns regarding the linked issues of habitability, access, and damage control in the last two operational assessments. The most detrimental impact of poor habitability is on the damage control response to a major casualty, such as fire or flooding. Access to spaces outboard the berthing areas is extremely limited. These outboard spaces contain many high-pressure air and hydraulic lines, as well as electrical cables and water piping. Additionally, small passageways and lack of space in berthing areas limit the ability of the crew to evacuate from, and respond to, casualties from these crowded spaces.

The Navy chose the Voyage Manager System (VMS) as the new program of record to provide paperless navigation capability to VIRGINIA. The initiative to integrate VMS in *Virginia* does not support installation and testing of a paperless charting system until 2006. Consequently, *Virginia* will conduct all initial at-sea operations using paper charts and temporary plotting tables - an arrangement which the ship is not configured for that adversely affects habitability and navigation.

Strategic Sealift Program (SSP)

The Strategic Sealift Program (SSP) acquired nineteen large, medium-speed roll-on/roll-off (RO/RO) (LMSR) vessels in the following four classes: the National Steel Shipbuilding Company (NASSCO) conversions ships (2), Newport News Shipyard conversion ships (2), Avondale Industries new construction (7), and NASSCO new-construction ships (8). These ships provide surge transport or support afloat pre-positioned combat equipment for a projected military force. The notional cargo per ship is equipment for one-third of a heavy Army brigade task force and its supporting supplies.

The LMSRs are about 950 feet long and 106 feet wide (to enable transit through the Panama Canal), and have a displacement of about 55,000 long tons. The NASSCO new-construction ships are gas turbine powered and the other three classes are diesel-powered. All of the ships can operate at 24 knots. The sealift ships are capable of self-sustained RO/RO and lift-on/lift-off (LO/LO) operations at a pier and at anchorage. In addition, they must provide an in-the-stream (ITS) capability using their stern and side port ramps for delivery of RO/RO cargo to lighterage via a floating Discharge Facility in a sea state 3 environment. The LMSR ships are not armed and do not have a combat system. They do have a command, control, communication, and intelligence suite sufficient to perform their intended mission in conjunction with other naval vessels.

As authorized in the acquisition strategy, developmental testing has been limited, focusing on production assurance testing by government agents in conjunction with the builders. Navy, U.S. Coast Guard, and American Bureau of Shipping representatives witnessed systems and integration testing.

The Operational Test and Evaluation Force (OPTEVFOR) conducted the operational evaluation (OPEVAL) (Operational Test (OT)-IIA) for the NASSCO-conversion LMSR ships during September 1996 aboard *USNS Shugart* in Savannah, Georgia, at sea, and at anchorage in Hampton Roads, Virginia. A joint OPTEVFOR and Army Test and Evaluation Command test team conducted this test in conjunction with a planned Army sealift deployment exercise and the test involved over 1,000 pieces of Army equipment including tanks, trucks, and various helicopters. They also conducted limited ITS operations.

TEST & EVALUATION ACTIVITY

OPTEVFOR conducted OT-IIB on the Avondale Industries-new construction LMSRs (*USNS Bob Hope* class) from October 2001 through January 2003. Because of deficiencies in the reliability of the main engine exhaust piping system of these ships, the testing occurred in several phases over a 16-month period. The joint test team conducted testing in the ports of Savannah, Georgia, and Beaumont, Texas; at anchor in the Southern California operating areas; and at sea off the east and west coasts of the United States. These events required approximately 1,500 pieces of equipment loaded and unloaded pierside, and over 1,000 pieces of equipment offloaded at anchor in the stream in sea conditions far less than the required sea state 3.

The Military Sealift Command deployed LMSR ships extensively for transport of Army equipment to support operations against Iraq in 2003. The performance of the ships in these actual operations provides additional support for the conclusions as to their effectiveness and suitability.

The sealift ships are capable of self-sustained roll-on/roll-off and lift-on/lift-off operations at a pier and at anchorage.

TEST & EVALUATION ASSESSMENT

The LMSRs are operationally effective and operationally suitable (in conventional environments that do not contain chemical, biological, and radiological (CBR) agents) based on their performance in operational testing conducted in the two OPEVAL events. The propulsion reliability of the seven *USNS Bob Hope* class ships is not yet fully determined because of the brief period of testing the improved main propulsion exhaust system. The intended capability to handle cargo in the stream in sea state 3 has not yet been demonstrated because the required supporting equipment (the RO/RO discharge facility) does not exist. Testers identified some additional deficiencies and the Program Office and the Military Sealift Command have instituted actions to correct them.

The 1996 OT-IIA found the NASSCO-conversion LMSR to be operationally effective and potentially operationally suitable. The joint test team observed no significant deficiencies from the operational testing. However, they conducted only limited ITS operations during this test. Its findings identified deficiencies in compatibility, interoperability, and training. The results of OT-IIB indicate that training deficiencies persist. The crews of the ships designated for surge transportation duties are not routinely trained in CBR procedures and developing a system to provide this training before exposing the crews to CBR threat conditions must be done. OPTEVFOR completed assessment of the performance of the remaining two ship classes not subjected to actual operational testing, and reported that those ships have no class-unique deficiencies. The OPEVALs are adequate to describe the demonstrated performance of all of the LMSRs.

After an improved exhaust system was installed in the *USNS Bob Hope* class ship *USNS Brittin*, a 28-hour high-speed trial (including 4 hours at full power) was conducted as the final phase of the test. OPTEVFOR, the lead operational test agency for the multi-Service test team, reported a satisfactory rating for all critical operational issues except reliability, interoperability, and training. Reliability was only partially resolved because of the short duration of the operational test of the improved main propulsion exhaust system. The Army operational test agency rated interoperability as unsatisfactory because no RO/RO discharge facility exists that can support operations in sea state 3. Training was rated as unsatisfactory because of deficiencies in training the ship's crew to fight fires correctly and to operate in CBR environments.

It is likely that existing deficiencies in the overall SSP will hinder LMSR ship mission performance. The existing lighterage system is not safe for cargo loading in sea states higher than two, and the RO/RO discharge facility equipment shares this limitation. This can adversely affect our ability to project power in a timely manner in situations where adequate port facilities are not available. Only a few ports in areas of expected deployment have sufficient depth of water and length of berth to allow pierside offload of an LMSR. Deployment through less-capable ports will require ITS operations. DOT&E is concerned that other aspects of ITS RO/RO operations in any sea state (training, expected offload flow rate, and stern ramp operations) and ITS LO/LO capabilities, including control of load pendulation, will present additional deficiencies that could not be tested operationally. Additional testing of LMSR ITS offload capability in sea state 3 must be performed when sea state 3-capable lighterage connectivity with RO/RO Discharge Facility equipment is developed. This testing should be performed during the operational test of the improved lighterage.

Submarine Exterior Communications System (SubECS)

The Submarine Exterior Communications System (SubECS) is an umbrella program, which integrates 15 smaller acquisition programs and commercial off-the-shelf components into a system that supports network centric warfare. The goal of this effort is to provide a communications system that is common across all submarine classes, is interoperable with the planned DoD Command, Control, Communications, Computers and Intelligence (C4I) infrastructure, and will support the Navy's Copernicus Information System Architecture, the Joint Technical Architecture, the Global Command and Control System Maritime, and the Joint Maritime Communications System. SubECS will support the steady infusion of new technology and the modernization and replacement of obsolete equipment to allow prompt, sustained, and synchronized operations with joint U.S. and multinational forces.

SubECS will be fielded as Common Submarine Radio Room (CSRR) variants upgrading the communications systems of all *Los Angeles* class, *Seawolf* class, *Trident* class, SSGNclass, and *Virginia* class submarines. In order to arrive at the goal of a CSRR on all ships, the *Los Angeles* class is being provided with a backfit Submarine Communications Support System (SCSS) that will eliminate many legacy components in favor of CSRR components. The *Virginia* class CSRR is being developed and integrated as part of new construction using the construction shipyard as the integrator. The goal for the out-years is that all in-service submarines will be upgraded to the technology of the *Virginia* CSRR plus any necessary technology insertions, maintaining a common state-of-the-art radio room on all submarine classes.

TEST & EVALUATION ACTIVITY

The test concept for SubECS involves operational testing for each CSRR variant and end-to-end system testing for each major phase. Each CSRR variant undergoes operational testing before it is introduced into the fleet. CSRR class variants may undergo a land-based operational assessment (OA) and land-based technical evaluation (TECHEVAL) to mitigate risk for submarine installation. Subsequent to on-board installation, each CSRR class variant will undergo an at-sea TECHEVAL (for those tests not completed in the land-based radio room) and an OPEVAL. The *Virginia* class land-based testing occurs in the Combat Control System Module Off-hull Assembly and Test site during *Virginia* class submarine construction at the Electric Boat Company in Groton, Connecticut. At-sea operational testing of the *Virginia* CSRR will occur concurrently with the overall OPEVAL of the *USS Virginia*.

Testing activity focused on the SCSS Phase I being prepared for backfit into the *Los Angeles* class. The land-based portion of the TECHEVAL was completed in May 2001. The at-sea TECHEVAL was completed in December 2002. The Operational Test and Evaluation Force (OPTEVFOR) conducted an OA in 2001.

The test plan for the SCSS Phase I OPEVAL has been approved. The SCSS has been installed on a submarine and was ready for testing; however the submarine was deployed to support Operation Iraqi Freedom before the test was completed.

The Submarine Exterior Communications System provides a communications system that is common across all submarine classes.

TEST & EVALUATION ASSESSMENT

The results of the early OA and at-sea TECHEVAL were positive, with OPTEVFOR concluding that the system was potentially operationally effective and potentially suitable. Operators from the deployed ship provided positive feedback.

The software for the Digital Modular Radio portion of CSRR is behind schedule and the current configuration supports satellite communications only. As a result, legacy radio room equipment may have to be added to the racks in early ships of the *Virginia* class. This is proving to be a space and operability problem that requires resolution.

Tactical Tomahawk Missile

Tomahawk is a long-range cruise missile designed to be launched from submarines and surface ships against land targets. Engagement planning, missile initialization, and launch control functions are performed aboard the launch platform by a Combat Control System (submarines) or Tomahawk Weapon Control System (TWCS) (surface ships). Targeting, mission planning, and distribution of Tomahawk tactical data are supported by the Tomahawk Command and Control System (TC2S). There are two versions of Tomahawk: Tomahawk Baseline III, and Tactical Tomahawk Baseline IV.

Tomahawk Baseline III

Three primary variants of Tomahawk Baseline III are currently operational: RGM-109A Tomahawk Land Attack Nuclear (TLAM-N) (not deployed); RGM-109C Tomahawk Land Attack Missile-conventional (TLAM-C); and RGM-109D Tomahawk Land Attack Missile-conventional submunition (TLAM-D). The fielded Baseline III Tomahawk Weapon System continues to receive incremental upgrades. The principal improvements are in the Advanced Tomahawk Weapon Control System (ATWCS) fire-control system, and the TC2S software. Test and Evaluation Master Plan (TEMP) 251 Revision A governs test and evaluation of the Baseline III missile and ATWCS. TEMP 1007-1 Revision B, Change 1, approved by DOT&E in 2001, governs the Tomahawk TC2S testing.

Tactical Tomahawk Baseline IV

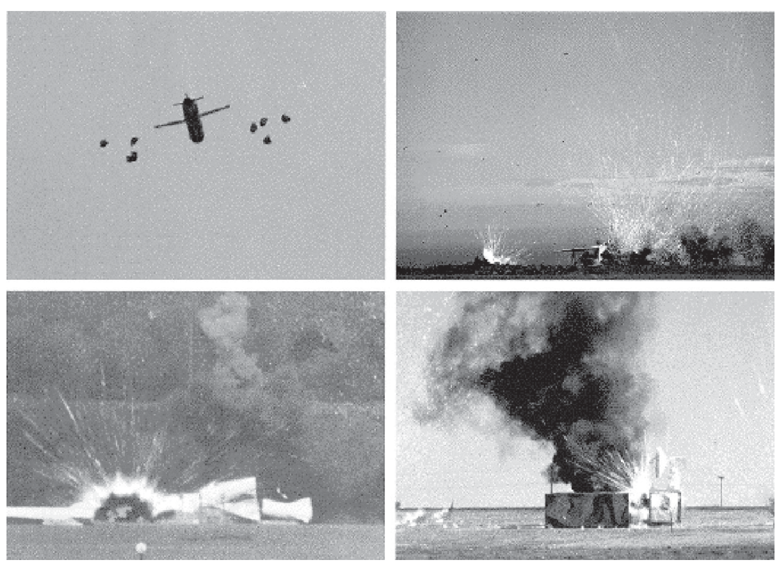
The RGM-109E Tactical Tomahawk (Tomahawk Baseline IV) program began in FY98 as a restructure of the earlier (FY94-FY98) Tomahawk Baseline Improvement Program. Tactical Tomahawk represents a considerable leap forward in technology. Designated C3 nodes will be able to communicate with the missile in-flight and direct it to pre-planned alternate targets or change its mission plan to attack new targets. While in flight, the Tactical Tomahawk missile will be able to transmit its health, status, and limited imagery to the C3 nodes. The fire control system is also being upgraded and is called the Tactical Tomahawk Weapon Control System (TTWCS).

The Tactical Tomahawk missile retains the same WDU-36/B warhead as the Tomahawk Block III. Differences between Tomahawk Block III missile and the Tactical Tomahawk Baseline IV missile include significant structural modifications to the missile airframe and engine as well as modified terminal engagement parameters that could significantly affect system lethality. Therefore, live fire testing is required. Tactical Tomahawk TEMP 251-4 governing test and evaluation of Baseline IV systems was approved in FY02.

TEST & EVALUATION ACTIVITY

Tomahawk Baseline III

The lead operational test agency, the Operational Test and Evaluation Force (OPTEVFOR), completed two operational tests (OT) in FY03. TC2S software release 3.3 for the Theater Mission Planning Center/Afloat Planning System (TMPC/APS) was tested during OT-IIIG. TMPC/APS software version 3.3 rehosted the Mission Distribution System to personal computer hardware (PC-MDS). The move to PC-MDS simplifies hardware updates, decouples software updates from hardware updates, and makes commercial network communications solutions available to the TC2S.



Operational Test-IIC (Tactcal Tomahawk Baseline IV OPEVAL) is currently underway in preparation for a June 2004 full-rate production decision.

OPTEVFOR began OT-IIIZ, evaluating ATWCS software release 1.7.2.1, in FY03 but their test activities have not yet been completed. This software is an evolutionary improvement on software release 1.7.1, evaluated in FY02. The improvements are designed to reduce mission response time and increase system throughput; to incorporate strike planning and coordination functionality and ensure compatibility with existing and future Naval and Joint C3I systems; to improve human computer interface technologies to reduce operator workload; and to provide on-line embedded training that incorporates simulations and instruction for individuals, functional groups, ship teams, and C2 teams/staffs.

Tactical Tomahawk Baseline IV
OT-IIA, an operational assessment of Tactical Tomahawk, was completed by OPTEVFOR in FY03. Key test events included a Functional Ground Test, completed on May 17, 2002. The Functional Ground Test exercised most facets of missile operation while the missile was confined to a test stand. The operational assessment also used data derived from the first two missile developmental test (DT) flights (DT-0 and DT-1). Both were launched from fixed sites with the prime contractor assuming primary responsibility for test conduct. The Program Office completed DT-0 in August 2002, and DT-1 in November 2002. OPTEVFOR also used data from DT of TTWCS and TC2S for their operational assessment.

OT-IIB was conducted by OPTEVFOR in FY03. This test evaluated the backward compatibility between Tomahawk Baseline IV's TTWCS and the Tomahawk Block III All-Up Round (AUR). Test events included two 48-hour at-sea battle group scenarios in which TTWCS will receive tasking and intelligence inputs; perform mission planning, engagement planning, and C3 functions; and launch simulated missiles, including salvo launches. Also included were two Block III AUR test flights, a maintenance demonstration, and supplementary battle force simulation exercises at Naval Surface Warfare Center – Dahlgren Division.

Naval Air Warfare Center – China Lake completed two live warhead sled tests and two live warhead flight tests against realistic targets in FY03.

TEST & EVALUATION ASSESSMENT
Tomahawk Baseline III
OT-IIIG testing resulted in OPTEVFOR rating TC2S TMPC/APS software version 3.3 operationally effective and operationally suitable. OPTEVFOR resolved all Critical Operational Issues as satisfactory and recommended fleet introduction of TC2S software version TMPC/APS 3.3.

Tactical Tomahawk Baseline IV
OT-IIA resulted in OPTEVFOR rating Tactical Tomahawk potentially operationally effective and potentially operationally suitable. They rated the Training Critical Operational Issues Red, noting serious risk to a satisfactory resolution in future testing. The current embedded training architecture does not support Tomahawk Strike Network (TSN) two-way satellite-enabled communication between the Tactical Tomahawk AUR and C3 nodes when TTWCS is in training mode. TSN messages include in-flight updates to the mission plan, AUR health and status, and battle damage assessment imagery. Currently, fleet personnel are limited to the training they can derive from simulations contained within their own shipboard computers. The valuable learning implicit in live training exercise communications among ships, shore nodes, and simulated in-flight missiles is not currently available.

In the near term, Fleet personnel will be able to receive some of the needed training in shore-based training facilities, limited by the availability of training schedule time. The Navy's plan to incorporate live TSN communication with TTWCS in training mode is called the Integrated Training Architecture. According to current program plans, the Integrated Training Architecture will reach the Fleet in FY06. This is after the planned TTWS initial operational capabilities in FY04, but approximately concurrent with the arrival of significant numbers of Tactical Tomahawk AURs in the Fleet. DOT&E expects future testing to provide better understanding of this issue and the effectiveness of the Navy's proposed solutions.

Despite initial problems, OPTEVFOR has completed OT-IIB (TTWCS backward compatibility with Baseline III missiles and TC2S). Analysis and reporting is in progress. DT-IIC (Baseline IV Tactical Tomahawk technical evaluation), in preparation for Baseline IV Tactical Tomahawk OPEVAL, is also under way.

Results from four LFT&E test events completed in FY03 are still undergoing analysis. Quick look analyses suggest that LFT&E test objectives were met in the tests, and results were generally consistent with the pretest predictions. Data from the tests should support a limited demonstration of Tactical Tomahawk lethality in both functional modes (Precision Warhead Detonation and Vertical Dive Attack), and a similarly limited comparison of Block III and Tactical Tomahawk lethality.

The Program Executive Officer's (PEO) proposed test configuration for the IOT&E supporting the initial operational capability and beyond low-rate initial production decisions is inadequate. The PEO has proposed limited live communications with the TSN (one flight AUR plus three hardware-in-the loop AUR simulators), to be supplemented with more extensive scenario work in a laboratory, where all communications paths and the AURs would be simulated. The laboratory does not adequately replicate the operational environments aboard the launch platforms and other participating C2 nodes (battle group staff and higher commands). OPTEVFOR and the Program Office are discussing options for satisfying these concerns.

T-AKE 1 Class Dry Cargo/Ammunition Ship

The T-AKE 1 Class Dry Cargo/Ammunition Ship program provides a new multi-product (ammunition, provisions, and spare parts) ship class for resupplying Navy combat forces at sea. The Military Sealift Command will operate the ships which will replace the existing auxiliary replenishment (AFS-Stores and AE-Ammunition) ships. The *USNS Lewis and Clark* is the lead ship in this class. The T-AKE 1 class ships' intended primary mission is to provide logistics lift from friendly ports or by transfer at sea from specially equipped merchant ships to the battle group replenishment station ships. In its secondary mission, the T-AKE 1 will be capable of remaining on station with the battle group to fill the station ship role in conjunction with a T-AO (fuel-replenishment) class ship.

The T-AKE 1 class will be capable of 14,000 nautical mile endurance at a sustained speed of 20 knots. The ship will be able to replenish customer ships by connected and vertical replenishment, and is to be operated by civilian mariners of the Military Sealift Command. The Navy specified commercial construction standards (with some additional survivability criteria) and the ship will not be equipped with any self-defense weapons. Combatant forces will provide protection against threats in hostile areas.

The contract for detailed design and construction of the lead ship (with options for eleven follow-on ships) was awarded in October 2001. The ship design process remained on schedule and contracts for three additional ships have been awarded. Construction of the *USNS Lewis and Clark* commenced in September 2003, and delivery is scheduled for 2005.

TEST AND EVALUATION ACTIVITY

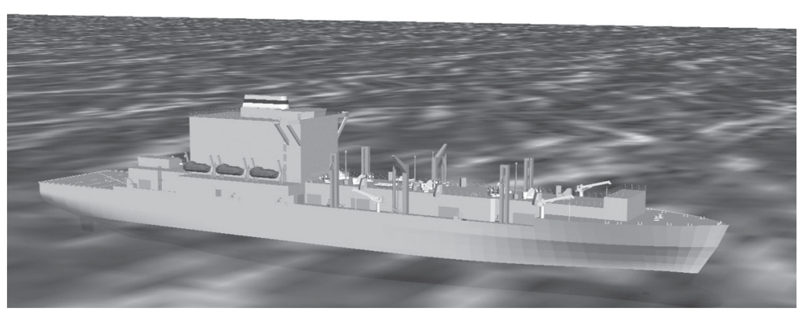
DOT&E representatives witnessed longitudinal strength testing of several full-scale panels of ship structure built to production specifications. This testing was part of a LFT&E investigation into the potential vulnerabilities of T-AKE 1 structure to underwater explosions. The Navy is building the T-AKE 1 hull to commercial standards and using construction materials not typically found in combatant ships.

The Operational Test and Evaluation Force (OPTEVFOR) completed the first operational assessment (Operational Test (OT)-IIA) of T-AKE 1 in December 2002. This assessment examined the potential of the ship design to achieve required performance levels. Modeling and simulation assessed the ship's cargo-handling capability. Experienced personnel assigned to the test team examined design documentation and assessed eight of the twenty critical operational issues for the ship. OPTEVFOR and DOT&E analyses revealed six areas with little or no risk: underway replenishment, cargo handling performance, survivability, compatibility, interoperability, and manning. Meanwhile, cargo stowage performance and mobility system performance were high risk.

TEST & EVALUATION ASSESSMENT

The three-phase operational test, assessment, and evaluation strategy consists of two operational assessments and an IOT&E for the *USNS Lewis and Clark*. Based on the results of the first of those assessments, the design for T-AKE 1 appears to be sound, and the prospects for successful performance are high.

OT-IIA, completed in December 2002, noted high risk in the areas of mobility and cargo-handling. Although the original analysis indicated the rating for cargo handling had a perceived shortfall in transferable potable water capacity, additional analysis determined the capacity was sufficient. The finding for mobility was based primarily on modeling that indicated significant potential for capsizing in conditions as low as sea state 7. The threshold for a critical technical parameter captioned "sea keeping" is (in part) survival of ship, cargo, equipment, and



T-AKE will be able to replenish customer ships by connected and vertical replenishment, and is to be operated by civilian mariners of the Military Sealift Command.

personnel in sea state 9, all headings, zero speed. This is an unachievable goal for a T-AKE 1-size ship. It was apparently set as a result of modeling findings that simulated only a subset of the important capsizing mechanisms. The critical technical parameter has been modified to require survival in see state 8 (significant wave height up to 60 feet) when the ship has propulsion power to maintain a favorable heading into the seas. The modeling conducted to support the operational assessment indicates that T-AKE 1 should achieve this level of performance.

In LFT&E, the longitudinal strength testing and the analysis of the test results will continue into FY04. Preliminary results indicate the existing analytical tools used to predict the strength of the hull and the ship's response to underwater explosion loading can be used reliably in the vulnerability assessment of T-AKE 1. Other events in the LFT&E surrogate test program are behind schedule due to over-commitment of test resource. This may contribute to a delay in completing the Detail Design Vulnerability Assessment Report and, with four ships already under contract, may reduce the likelihood that any deficiencies identified in the assessment will be corrected in the ship design.

Unmanned Combat Aerial Vehicle - Navy

The Unmanned Combat Aerial Vehicle - Navy (UCAV-N) program is developing an aircraft carrier-based, signature-controlled aircraft with an airborne endurance goal of 12 hours. The UCAV-N will have three missions: penetrating surveillance/reconnaissance, strike, and the suppression of enemy air defense.

The Defense Advanced Research Projects Agency (DARPA) and the Office of Naval Research led the UCAV-N Advanced Technology Program that originated in February 2000. Program goals include demonstrating that a carrier-based, survivable, multi-mission platform is technically feasible and developing technology capable of transitioning to the Navy's UCAV-N acquisition program.

Two contractor teams were funded to participate in the program. The science and technology program had two phases. Phase I, consisting primarily of trade studies, ended in March 2002. Both contractors were funded to enter Phase IIA to develop computer simulations and model their concepts of operation. This year, the Navy funded both contractors for follow-on Phase IIB to actually build the demonstrator aircraft. One contractor will build two X-47B air vehicles, and the other will deliver two X-45C air vehicles.

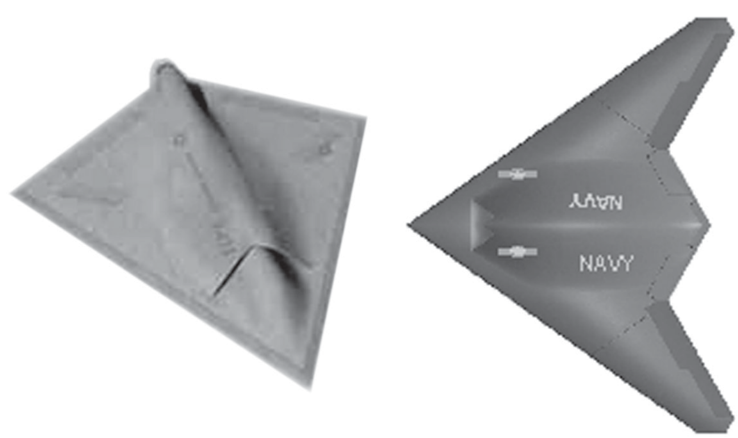
In December 2002, the OSD program decision memorandum adjusted future funding for both Navy and Air Force UCAV development – including the procurement of several air vehicles in the FY07-09 timeframe. The program decision memorandum also directed the Navy and Air Force to initiate a joint program office to manage UCAV development, which was the number one priority of the UAV Planning Task Force. In conjunction with the Joint Program Office planning, OSD/ Program Assessment and Evaluation led a UCAV options study to determine how best to use a variety of UCAVs in the future military force.

In June 2003, OSD established the Joint Systems Management Office for the Joint Unmanned Combat Air Systems, which began operation in October 2003. This joint office is to lead a seven-year effort to develop technologies for Air Force and Navy UCAVs. Fourteen aircraft are to be delivered in time to begin a two-year operational assessment in 2007. During this assessment, DARPA is to measure how well various technologies meet the Air Force and Navy requirements, and by 2010 OSD will use DARPA's assessment to decide whether to pursue joint or separate UCAV systems.

TEST & EVALUATION ACTIVITY

The X-47A Pegasus conducted taxi tests in 2002 and had its first flight February 23, 2003, at Naval Air Station China Lake, California. During this first flight, the aircraft accelerated and became airborne without incident, climbed to a maximum altitude of 3,300 feet, attained a maximum airspeed of 150 knots, decelerated to the 110 knot recovery speed, and landed within 20 feet of its touchdown point, flying autonomously through waypoints. According to contract officials all test objectives were met including low-speed handling qualities, air vehicle performance, navigation performance, and collection of dispersion data. After completing data analysis, the Pegasus effort will wind down and the team members will transition to the Joint Unmanned Combat Air Systems program.

Pegasus flight operations were conducted solely on weekends in order to avoid flights when manned aircraft were operating.



The Unmanned Combat Aerial Vehicle - Navy program is developing an aircraft carrier-based, signature-controlled aircraft with an airborne endurance goal of 12 hours.

TEST & EVALUATION ASSESSMENT

DOT&E supports the competitive nature of the operational assessment and the opportunity for side-by-side flight evaluations of the X-45 and X-47. DOT&E plans to work with the operational test agencies to ensure that relevant early operational data are collected to support transition to a formal acquisition program. The inability to mix manned and unmanned flight operations in controlled airspace could be a significant hurdle during UCAV development and severely restricts the number of test flight days available to UCAV developers.

USMC H-1 Upgrades

This program combines upgrades of two USMC H-1 aircraft: the AH-1W Cobra attack helicopter and the UH-1N light utility helicopter, to be upgraded to the AH-1Z and the UH-1Y respectively. The common elements of the two will be twin engines, drive trains, a new four-bladed rotor, tail sections, and integrated digital cockpits. In addition, the AH-1Z attack helicopter will gain an upgraded targeting system, and both will have upgraded navigation systems. The upgrade will extend the lives of the two H-1 models well into the 21st century.

TEST & EVALUATION ACTIVITY

DOT&E approved the Test and Evaluation Master Plan which calls for the T&E program to be conducted in two phases: integrated contractor/government developmental testing and operational testing. Both the AH-1Z and the UH-1Y will undergo OT&E and LFT&E.

Planning and execution of an Early Operational Assessment (OT-IIA) was the major test activity during FY03. OT-IIA was conducted at Naval Air Station Patuxent River, Maryland, from February 12 to March 27, 2003, and included 36.5 flight hours (22 sorties) and 11 missions in two H-1 Upgrade aircraft flown by operational test pilots. OT-IIA supported a low-rate initial production decision for three AH-1Z and six UH-1Y aircraft.

At the completion of OT-IIA, operational testers continued to monitor developmental testing and provide Marine maintainers assistance with aircraft maintenance and validate maintenance documents and procedures. Next year, operational testers will conduct another operational assessment that will provide data to support a second low-rate initial production decision. OT&E for both aircraft will be conducted prior to the full-rate production decision in FY06.

DOT&E designated the H-1 Upgrades Program as a covered system for LFT&E in June 1996. The LFT&E strategy covering both aircraft was approved by DOT&E in July 1996 and was included in the program's Test and Evaluation Master Plan approved for Milestone II in November 1996. Fifteen of the 18 component-level ballistic test series have been completed. FY03 tests include static tests of the main rotor yoke, the pitch change adapter, and the swashplate. These tests also involved post-hit fatigue tests on the standard test fixtures used to qualify these parts for flight. Planning has begun for the full-up system-level ballistic tests scheduled for 2QFY05. A battle damage repair team is expected to participate in the live fire testing to ensure that the aircraft system maintenance procedures take into account the possible nature of battle damage.

TEST & EVALUATION ASSESSMENT

The OT-IIA confirmed known issues with the aircraft design (identified in earlier developmental testing) and clarified the operational implications of these developmental issues early in the development phase. The Program Manager is taking advantage of early learning to develop and implement corrections on the aircraft.

Because the aircraft are under development, aircraft maturity imposed limitations on the degree of operational realism that could be achieved during OT-IIA. Major test limitations included software immaturity, a restricted flight envelope, contractor maintenance, and an absence of key-ground support equipment and diagnostic aids. Preliminary indications are that all Key Performance Parameters will be met if the program's plans to mitigate observed deficiencies are successful.

Both aircraft are projected to be substantially more survivable and crashworthy if hit by threat weapons. Vulnerable area estimates predict the vulnerable area of the new aircraft will be roughly half (AH-1Z) to two-thirds (UH-1Y) that of the in-service aircraft.

The AH-1Z attack helicopter demonstrated a doubling in payload and a 20 percent increase in range and endurance over the AH-1W aircraft. The digital cockpit enhanced pilot situational awareness and reduced workload in some areas. However, poor targeting performance of the newly installed Targeting Sight System (TSS) degraded mission effectiveness and increased pilot workload. Problems with TSS stability, focusing, target loss during field-of-view changes, and anomalous TSS behavior must be resolved before this aircraft can be considered operationally effective.

The UH-1Y utility helicopter demonstrated a significant increase in payload, range, speed, and situational awareness over the legacy UH-1N utility aircraft. Assuming internal fuel cell problems can be corrected, the UH-1Y may be able to achieve the required mission radius of 110 nautical miles. The design of the aircraft increases the possibility of tail strikes (mitigated by the redesign of the tail boom stinger), infrared signature, and hover limitations. Excessive noise levels in the UH-1Y cabin degraded mission performance and elevated cabin temperatures might change mission effectiveness in hot weather. Collectively, these problems, if uncorrected, will limit the effectiveness of the UH-1Y across the full range of utility helicopter missions.

Both aircraft are projected to be substantially more survivable and crashworthy if hit by threat weapons. Vulnerable area estimates predict the vulnerable area of the new aircraft will be roughly half (AH-1Z) to two-thirds (UH-1Y) that of the in-service AH-1W and UH-1N aircraft. To date, testing has demonstrated that the components of the AH-1Z and the UH-1Y will retain or exceed the degree of damage tolerance found in their predecessors. The test results have been used to make several design changes that improve survivability.

V-22 Osprey

The V-22 Osprey is a tilt-rotor vertical/short takeoff and landing multi-mission aircraft developed to fill multi-Service combat operational requirements. The MV-22 is intended to replace the current Marine Corps medium-lift assault helicopters (CH-46E and CH-53D). The Air Force requires the CV-22 to provide a long-range vertical takeoff and landing insertion and extraction capability and to supplement Special Operations Forces MC-130 aircraft. The tilt-rotor design combines the vertical flight capabilities of a helicopter with the speed and range of a turboprop aircraft, permits aerial refueling, and allows for worldwide self-deployment. The current design also affords a greater degree of survivability than existing medium-lift helicopters.

DOT&E completed an independent evaluation of test adequacy, operational effectiveness, suitability, and survivability and submitted the required OT&E and LFT&E reports to the Secretary of Defense and congressional defense committees in time to support the Milestone III decision review in November 2000. Based on the findings in these reports, the Navy delayed the Milestone III decision. The Milestone III decision was delayed again following a V-22 mishap in December 2000. All V-22 flying was halted following the December 2000 mishap.

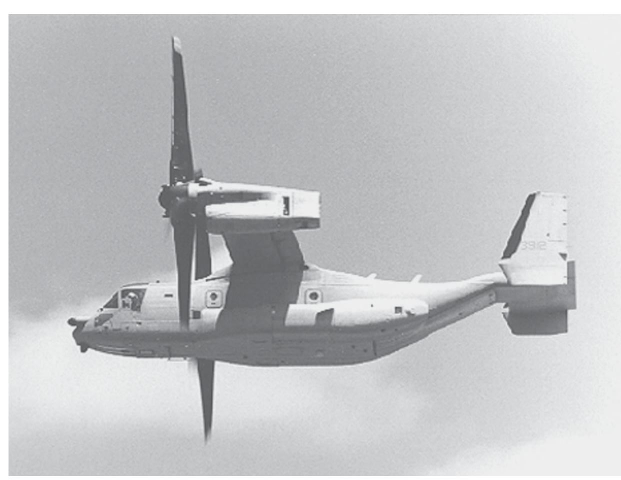
During the non-flying period, the program conducted complete design reviews of all critical V-22 systems and designed an extensive developmental and operational test program to address concerns raised by several high-level independent review panels and to lead to the fleet's return to flight. DOT&E participated in these reviews and approved a revised Test and Evaluation Master Plan. As soon as the first aircraft was modified with system safety changes, developmental flight testing resumed.

TEST & EVALUATION ACTIVITY

The first MV-22 returned to flight on May 18, 2002. Flight testing was deliberate and methodical, with flights interspersed with a rigorous schedule of inspections for mechanical defects. In August 2002, the CV-22 returned to flight at Edwards Air Force Base, California, following a similar pattern of flights and inspections. As of November 1, 2003, nine V-22 aircraft are in service, amassing a total of more than 930 developmental flight-test hours at three locations.

The approach to return the V-22 to operational flight was, and continues to be, event-based; each block of testing begins only upon completion of the necessary preceding test events. After a thorough ground-test of the flight control software in laboratories and simulators and flight validation, the first priority was high-rate of descent (HROD) flight-testing to investigate vortex ring state (VRS). In addition, testing of low-speed maneuvering flight and all engine-off characteristics were conducted, as well as continued developmental testing of communication and navigation systems, tactical sensors, antenna patterns, climb performance, handling qualities, aerial delivery of passengers and cargo, aircraft infra-red signature, a new anti-vibration suppression system, and the CV-22 multi-mode radar and electronic warfare systems. One aircraft has been fitted with a complete anti-ice/de-ice system and is deployed to Nova Scotia for icing trials.

All aircraft have been involved in a series of line clearance inspections to verify that the new line clearance requirements have solved aircraft reliability problems with hydraulic lines. The line clearance inspections performed by the Integrated Test Team since returning to flight confirmed that the solutions to the V-22 hydraulic system reliability problems are effective. In more than 930 flight hours, there has been no evidence of hydraulic line chafing on any of the flight-test aircraft, and inspection intervals have increased as planned on all aircraft. The Block A configuration further improves the design of electrical and hydraulic lines, with the goal of no line clearance inspections on fleet aircraft.



The V-22 offers significant maneuverability and handling advantages compared to conventional helicopters.

On August 28, 2003, the Marine Corps activated a new tilt-rotor test squadron, VMX-22. The squadron, which will report to the Navy's Commander, Operational Test and Evaluation Force, will plan and conduct OT&E and develop tactics, techniques, and procedures for the operational employment of the V-22. An operational assessment (OT-IIF) will be done in conjunction with developmental test and evaluation beginning in mid-2004. After confirmation of the safe flight envelope in the HROD tests, the Navy plans to issue a limited flight clearance to operational V-22 units which will allow training flights to prepare for a second phase of operational evaluation (OPEVAL II or OT-IIG) to address the issues raised in the November 2000 OT&E report (testing not conducted, waived items, and correction of deficiencies). Overall degree of mission accomplishment by a sea-based Marine Expeditionary Unit equipped with MV-22 aircraft will be evaluated in OPEVAL Phase Two, scheduled to begin in late 2004. Following that, DOT&E will submit a second OT&E report containing an assessment of test results and the design changes.

The first full-up Block A aircraft was delivered to Naval Air Station Patuxent River in August. This configuration forms the basis of all fleet aircraft and includes completely redesigned engine nacelle areas, reliability improvements, and several system upgrades. The Block A configuration will be tested in both OT-IIF and OT-IIG.

TEST & EVALUATION ASSESSMENT

In the November 2000 OT&E report, DOT&E concluded testing had been adequate to determine the MV-22's operational effectiveness, operational suitability, and survivability. However, additional testing was needed to verify correction of deficiencies, the effectiveness and suitability of waived items, and to investigate the phenomenon of VRS. The MV-22 was assessed by DOT&E as operationally effective, but not operationally suitable. Results from OT-IIE (OPEVAL Phase I) indicated that the V-22 would provide major range, speed, and payload improvements to meet Marine Corps and Special Operations Forces requirements. The V-22 offers significant maneuverability and handling advantages compared to conventional helicopters (e.g., rapid deceleration upon arrival at a landing zone and rapid acceleration during departure). When tactics are fully developed, these capabilities should provide substantive advantages in mission accomplishment and survivability.

Based on developmental tests since returning to flight, DOT&E has increased confidence that the V-22 characteristics involving VRS are well understood and knowledge of VRS consequences is widespread in the V-22 community. Several factors contribute to this confidence:

- Extensive HROD testing confirmed the V-22 VRS envelope; the flight conditions necessary to enter VRS were verified and closely matched predictions by aerodynamic modeling and simulations.
- Published operating limitations appear adequate for normal conditions. DOT&E and the program will investigate the question of whether that margin may be reduced under unusual wind or maneuvering conditions.
- Published operating limitations are equivalent to all other rotorcraft and testing has proven that V-22 has more margin between the limitation and the VRS boundary.
- In maneuvering testing inside the VRS region, pilot control inputs delayed VRS onset and did not precipitate it.
- The flight simulators and flight syllabus emphasize avoiding the phenomenon.
- Flight manual cautions, warnings, and advisories were amended.
- An HROD warning system is present for both pilots and appears functional.
- Readability of the pilots' vertical speed indicator has improved.
- Nacelle tilt is a powerful VRS recovery tool, demonstrated and understood.

These items tend to reduce the likelihood of another mishap caused by VRS.

For any rotorcraft, including the V-22 tiltrotor, the ability to save the aircraft– or at least ensure the survival of its occupants– in the event of a single or dual engine failure must be determined. In either the airplane or helicopter mode, the recommended procedure in the event of an engine failure is to convert to airplane mode, proceed immediately to a suitable landing spot, convert back to helicopter mode and land as soon as possible. The ability of the V-22 to perform single-engine landings is better than the helicopters it replaces. In the event of either sudden dual-engine failures, or a single failure of one engine coupled with a failure of the interconnecting drive train, while the aircraft is in either airplane or in the helicopter mode, the recommended method to recover is to tilt the nacelles down and attain the best glide speed available, then flare to a survivable landing. In 2003, the program demonstrated by flight-test the recommended speed and altitude approaches to the landing field that allow the pilot to perform a survivable landing if the second engine fails during approach. This testing validated the fidelity of the V-22 simulators. Although testing of this procedure all the way to landing is not practicable, limited testing has confirmed that, while the aircraft can perform an auto-rotative descent, it cannot consistently auto-rotate to a safe landing. The approach to safety adopted long ago by the program is to minimize the possibility of such disastrous occurrences through system design. DOT&E will pursue, in conjunction with the program office and VMX-22, possible means to minimize the Fleet Marine Force mishap rate.

The effectiveness of the V-22's vulnerability reduction features was demonstrated during LFT&E. A continuous process of design refinements has been an integral part of the overall system engineering effort since the start of live fire testing, and several design changes have been made based on the test results, such as revising the sponson fuel tank structure. This process continues with particular emphasis on addressing the concerns outlined in the November 2000 LFT&E report.

The following are survivability assessments of the design changes and efforts to address the results of the original LFT&E program:

- Fire protection can be effectively provided to the mid-wing nacelles, main landing gear dry bays, and underfloor areas.
- The design changes to the hydraulic system made since November 2000 have a negligible impact on the aircraft's vulnerability.
- The aircraft battle damage repair program continued to experience delays due to insufficient funding and is now nearing a contract award. It is programmed to be funded through FY06.
- The impact of adding internal mission auxiliary fuel tanks, countermeasure dispensers, and improvements to the engine nacelles require further study.

VXX Presidential Replacement Helicopter Program

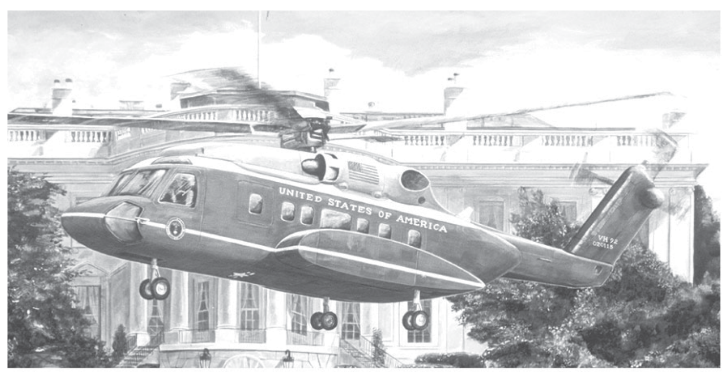
The VXX will be the primary Presidential vertical lift platform employed by Marine Helicopter Squadron One (HMX-1). With the added emphasis on rapid and reliable Presidential lift and additional requirements in response to current world conditions, a fielded replacement to the VH-3 is sought by 2008. The VXX program will use a spiral acquisition strategy to field two increments of capability. The initial operational capability will be achieved after four Increment 1-configured aircraft are fielded with all required support equipment, training support, and publications. Increment 2 is intended to field 23 aircraft with a full operational capability, which will support all White House requirements. An analysis of alternatives determined that two helicopters have the potential to satisfy the requirements for the Presidential lift mission within the stated time constraints: the Sikorsky H-92 and the Lockheed Martin-Augusta Westland-Bell Helicopter Textron US101.

TEST & EVALUATION ACTIVITY

The VXX program is pre-Milestone B. The Operational Requirements Document, Test and Evaluation Master Plan, and Acquisition Strategy are currently being staffed. DOT&E is working with the White House and the Marine Corps to understand the requirements and ensure the testability of those requirements. DOT&E anticipates an operational assessment for Increment 1 in FY08 and an initial operational test and evaluation of Increment 2 capability in FY10. The program will be covered and a robust live fire test and evaluation will be a significant component of the testing of this aircraft.

TEST & EVALUATION ASSESSMENT

To field an initial operational capability by 2008, the VXX program will require an aggressive schedule. It is imperative that early operational assessments be incorporated in this program to assist in the early identification of issues and areas of risk.



The VXX will be the primary Presidential vertical lift platform employed by Marine Helicopter Squadron One.

Advanced Extremely High Frequency (AEHF) Satellite Communications System

The Advanced Extremely High Frequency (AEHF) satellite communications system is designed to provide secure, survivable communications to U.S. warfighters during all levels of conflict. It will follow Milstar as the protected backbone of DoD's military satellite communications architecture. The first flight of the AEHF satellite program, named Pathfinder, will be programmed to operate initially as a Milstar II satellite (in lieu of an additional Milstar satellite to replace Flight 3, which placed the satellite in a non-operational orbit). The second flight will then be launched as a fully capable AEHF satellite. After it is operational, Pathfinder will be reprogrammed on-orbit as an AEHF satellite.

The first three program phases: AEHF Technology, Engineering Models, and System Definition have been completed. At Milestone B, the Defense Acquisition Board authorized fabrication and assembly of the first two satellites (SV1, SV2), development and deployment of the ground command and control segment, and advanced procurement for three additional satellites (SV3, SV4, and SV5) within the Future Years Defense Program. A separate tailored Milestone C was anticipated, following completion of the system-level Critical Design Review (CDR), to provide final authorization for production of SV3, SV4, and SV5. However, a February 2003-approved Acquisition Program Baseline incorporates a revised strategy that deletes SV4 and SV5 with a decision point in 1QFY05 to evaluate Transformational Communications development and the need, if any, for additional AEHF satellites. The first AEHF launch is scheduled for 1QFY07 and the second launch for 2QFY08.

TEST & EVALUATION ACTIVITY

The Air Force Operational Test and Evaluation Center (AFOTEC) performed an early operational assessment (EOA) and operational impact assessment (OIA) in support of the Milestone B decision in 4QFY01. An operational assessment (OA) will be conducted in FY04 to support the Milstar Joint Program Office CDR decision. An OA will look at progress from Production Design Review/CDR events and will also assess coverage via modeling and simulation. A second OA will be conducted in FY06 to assess readiness of the AEHF Mission Control Segment to support the first AEHF launch. An OA in FY07 will evaluate the results of the developmental test/operational test performed on the Pathfinder satellite to verify its full capability to function as a Milstar II low-data-rate/medium-data-rate satellite.

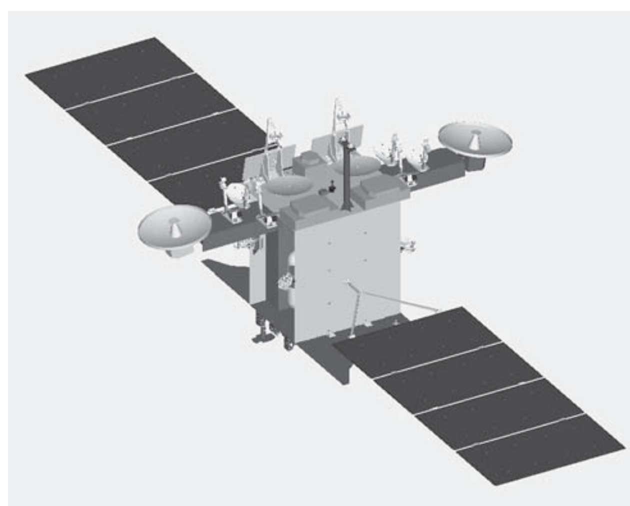
Multi-Service operational test and evaluation (MOT&E), to be conducted in FY08, will evaluate whether the entire system, including equipment, personnel, procedures, training, and logistics support, is effective and suitable based on the operational requirements.

The test will exercise satellite-to-satellite cross-links to evaluate theater-to-theater communications, network control, satellite control, and interoperability.

TEST & EVALUATION ASSESSMENT

AFOTEC performed an EOA and OIA based on results of engineering model tests, the contractor system design review presentation, modeling and simulation, and a review of program documents. Satisfactory progress is being made by the Program Office on the four major technology risk areas: nuclear hardening and shielding, performance of the nuller spot beam, performance of the phased array antenna, and electric propulsion. DOT&E is concerned with the proposed use of turbo coding because of its susceptibility to nuclear fading.

The potential lack of terminal synchronization is a risk to successful MOT&E. In addition, AFOTEC – the lead operational test agency – identified the following risks to the test program: pressure to reduce the minimum developmental testing as defined in the September 2001



Satisfactory progress is being made by the Program Office on the four major technology risk areas: nuclear hardening and shielding, performance of the nuller spot beam, performance of the phased array antenna, and electric propulsion.

Test and Evaluation Master Plan, insufficient software testing, the need for a payload simulator that is common to all of the terminal development programs, and availability of Pathfinder for MOT&E after it has become an operational asset. Monitoring the fidelity of the AUST-T terminal simulator and the payload simulators is imperative. If their configurations do not remain standardized and consistent with the true payload, the new terminals will not be compatible with the payload or with each other. Also, modeling and simulation will be used for both developmental and operational testing to assess nuller spot beam performance in a variety of single and multiple jammer scenarios. However, contractor model validation testing will be limited to only single jammer cases. DOT&E is concerned that the contractor needs more robust validation testing to reduce risk associated with using this model to evaluate nuller operational performance.

In addition to those items identified by AFOTEC, the program manager identified a high program risk associated with the development of the cryptographic capability to support the AEHF data rate. This includes the manufacture of a highly complex Application Specific Integrated Circuit (ASIC). To reduce the probability of a first-pass manufacturing failure of this ASIC, the foundry process is being initially exercised by the manufacturer with a test chip that represents 90 percent of the final ASIC design. Although the program remains on schedule for a December 2006 launch, schedule slips in cryptographic development have consumed the entire available margin.

AIM-120 Advanced Medium Range Air-to-Air Missile (AMRAAM)

AIM-120 is an all weather, radar-guided, air-to-air missile with launch-and-leave capability in both the beyond-visual-range and within-visual-range arenas, enabling a single aircraft to simultaneously engage multiple targets with multiple missiles. The Air Force and Navy, as well as several foreign military forces, use the AIM-120. Currently employed by the F-15C, F-15E, F-16, F/A-18C/D, and F/A-18E/F, AIM-120 will also be employed by the F/A-18E/F, F/A-22, and Joint Strike Fighter.

The AIM-120C variant with clipped wings was developed to reduce missile size in order to allow for increased internal carriage in the F/A-22. Lethality improvements have been incorporated into the missile, culminating in a new warhead and lengthened rocket motor. All current U.S. deliveries are of the AIM-120C configuration. The program's acquisition strategy is to improve missile capability incrementally through software and hardware modifications that are grouped in three pre-planned product improvement (P^3I) phases, the first two of which have completed development and are fielded.

The third phase of the development program is underway to improve weapons system effectiveness and lethality. The Phase 3 missile, scheduled to begin production in FY04 as the AIM-120C-7, will include new guidance section hardware and software. The antenna, receiver, and signal processing portions of the system are being upgraded to handle the requirements to counter new threats, and will be compressed to create room for future growth. Some existing software will be re-hosted to a new higher-order language (C++), some existing software will be re-hosted and modified to function with the new hardware, and some additional software algorithms are being written to react to the new Phase 3 threats.

TEST & EVALUATION ACTIVITY

DOT&E approved the Test and Evaluation Master Plan (TEMP) for the P^3I Phase 3 missile in June 2002. Developmental test and evaluation of the Phase 3 missile has started with a small number of captive carry missions, hardware-in-the-loop testing, and end-to-end shots. The Air Force's Air Combat Command and the Navy's Air Test and Evaluation Squadron will conduct the operational test and evaluation under the oversight of the Air Force Operational Test and Evaluation Center and the Navy's Commander Operational Test and Evaluation Force in FY04. The operational test and evaluation will consist of captive carry, simulations using the contractor's model, and ten guided free-flight evaluations against threat representative targets. The evaluation will include integration on F-15, F-16, F/A-18C/D, and F-/A-18E/F aircraft. In accordance with the TEMP, free-flight events will be repeated as necessary to ensure that missile capabilities in the discrete scenarios are fully evaluated.

TEST & EVALUATION ASSESSMENT

The Phase 3 P^3I missile is largely a new missile with distinct capabilities from previous variants of the AIM-120. Hardware and software changes in the guidance section are significant. The improvements sought by the user are intended to increase the air-to-air combat capability of both Services. However, as acknowledged in the TEMP, the program will not deliver all of the Phase 3 requirements called for in its joint operational requirements document. In the upcoming follow-on operational test and evaluation, DOT&E will independently assess the impact of any required capability that is not developed and operationally tested when reporting the operational effectiveness and suitability of performance of the missiles actually tested.

The Phase 3 P^3I missile is largely a new missile with distinct capabilities from previous variants of the AIM-120.

Three of four Phase 3 developmental test shots were unsuccessful due to a variety of factors dealing with aircraft integration and materiel failures that are currently assessed by the Air

Force as not pertinent to technical development of the Phase 3 missile. A fourth shot was successfully conducted. DOT&E continues to monitor progress towards accreditation of the model and readiness for operational testing. The limited number of planned live shots places a strong reliance on modeling and simulation to confirm the full weapons employment envelope and operational effectiveness of the Phase 3 P^3I AMRAAM missile. The modeling and simulation suite has not yet been delivered to the government organizations that must understand and validate it. If this situation is not corrected, completion of operational testing on schedule is in jeopardy. Additional live test shots will have to be added to the planned operational test to ensure an adequate effectiveness evaluation in the event that the modeling and simulation suite cannot be validated.

ALR-69A Radar Warning Receiver (RWR)

The Air Force first deployed the ALR-69 in the early 1970s. It has served as the radar warning receiver for multiple aircraft types since then. The Air Force established a modification program to improve reliability and maintainability as well as the system's performance in geo-locating threat emitters and in specific emitter identification. The resulting system will be designated the ALR-69A. As required by the Operational Requirements Document, only minor changes to the aircraft installation provisions will be necessary.

The development of the ALR-69A is to be a spiral development. The first phase of the development, the Core program, addresses the issue of obsolescent parts and incorporates digital receiver technology. This effort will reduce the number of line replaceable unit types in the system from nine to five, and the total number of line replaceable units from twelve to eight.

The second phase, known as the Increment, incorporates software algorithms that improve the resolution of time and angle measurements. These improved resolutions will lead to an improved direction finding capability and, in turn, a geo-location capability. The Increment also provides the capability for specific emitter identification. Development of the Increment capability is under contract.

The program suffered from technical difficulties that have resulted in a slip of approximately one year and a growth of development costs from $36.5M to $63M. Development of the Core system for the C-130 aircraft is proceeding, and development for the F-16 has begun. Contracts for aircraft integration have yet to be established.

TEST & EVALUATION ACTIVITY

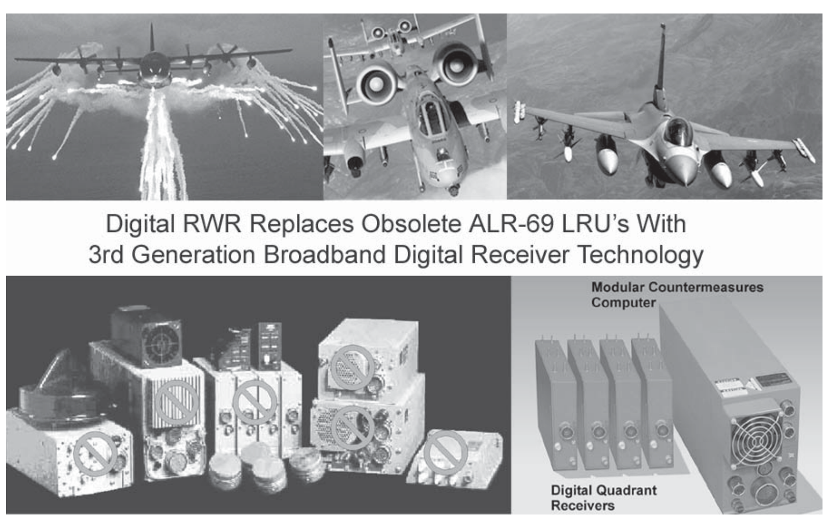
DOT&E will use the DoD Electronic Warfare test process to evaluate performance of the ALR-69A. This will include hardware-in-the-loop testing, on-aircraft ground testing in an integrated systems test facility, and flight tests at an open-air range.

Tests of the Core system for the C-130 will begin early in FY04. The Air Force will conduct an operational assessment (OA) mid-FY04 to support a low-rate initial production (LRIP) decision. The Air Force Operational Test and Evaluation Center (AFOTEC) plans to report results of the OA when it has sufficient information to evaluate ALR-69A capability to meet performance requirements. This may or may not include the results of developmental flight tests. The program office has operational testing scheduled in FY05, followed by a Milestone III decision for the C-130 installation in early FY06.

The F-16 configuration begins testing in mid-FY05 and leads to a production decision in early FY07. The Increment (the upgraded precision location capability) for the C-130 begins testing early in FY05 and will run through late FY06. The program office has not established a schedule for testing the Increment on the F-16.

TEST & EVALUATION ASSESSMENT

An initial draft Test and Evaluation Master Plan (TEMP) for the ALR-69A is in review within the Air Force, but it only addresses testing of the Core system on the C-130. An adequate TEMP will need to address C-130 Core and F-16 Increment I. DOT&E has numerous issues with the timing of the test strategy.



The ALR-69A is a spiral development upgrade to the existing ARL-69.

DOTE also has concerns with the plan to use an OA that may not be based on flight tests and the increased risk that the system will enter LRIP with significant performance flaws. The program office can mitigate this risk by keeping the number of LRIP units small.

The program plans to use a favorable Milestone III decision as clearance to buy all units with only minimal testing to verify each installation. It is DOT&E's position that the ALR-69A should be tested on each individual aircraft prior to the acquisition decision maker approving the acquisition of those units. The basis for resolving this issue will be review and approval of the TEMP.

B-1B Conventional Mission Upgrade Program (CMUP)

The B-1B, produced by The Boeing Company, is a variable-geometry heavy bomber. The aircraft has four afterburning turbofan engines and its maximum takeoff weight is 477,000 pounds. With air refueling, the B-1B's four-man crew can deliver approximately 50,000 pounds of conventional bombs or precision-guided weapons to targets anywhere in the world at penetration speeds up to Mach 1.2.

IOT&E of the B-1B was conducted from 1984 through 1989. The B-1B achieved initial operating capability as a nuclear bomber in FY87. Starting in 1993, the Conventional Mission Upgrade Program (CMUP) marked the aircraft's transition from a nuclear to a conventional role. Initial conventional load was limited to 84 Mark 82 500-pound general-purpose bombs. Block changes carried out under the CMUP have upgraded the aircraft's capabilities as follows:

- Software upgrades to offensive and defensive systems (Block B).
- Capability to deliver CBU-87/89/97 cluster bombs (Block C).
- Communication system upgrades, addition of Global Positioning System navigation, and the capability to deliver the GBU-31 Joint Direct Attack Munition (Block D).
- Avionics computer upgrade to enable the delivery of three different weapon types (one type from each weapon bay) on a single mission and the capability to employ Wind Corrected Munitions Dispenser weapons (Block E, full-rate production in April 2003).

In addition to these block upgrades, the remaining capability enhancement planned for the B-1B under the CMUP is the integration of the Joint Stand-Off Weapon (JSOW) and the Joint Air-to-Surface Standoff Missile (JASSM).

TEST & EVALUATION ACTIVITY

IOT&E of the B-1B Block E began in September 2002 and completed in January 2003. Testing consisted of 20 missions and totaled 106 flight hours. DOT&E delivered a test and evaluation report assessing the operational effectiveness and suitability as well as survivability of the B-1B Block E to Congress and the Secretary of Defense in April 2003. Testing to evaluate changes to the Block E, necessitated by shortfalls in performance identified during B-1B Block E IOT&E, began in May 2003 and should conclude in November 2004.

Developmental flight testing to integrate JSOW and JASSM weapon capability on the B-1B began in March 2003. Operational testing should begin in December 2003. The program will be a combined developmental/operational test and evaluation with a small, independent operational test and evaluation phase to confirm the results of combined testing. Scheduled events consist of JSOW and JASSM separation test vehicle performance and the transfer of targeting data to JSOW and JASSM captive flight vehicles. A release of a representative load of the qualified inventory of B-1B Block E weapons will also be conducted to ensure JSOW/JASSM integration software has not degraded the fielded accuracy capability. The confirmation phase should include the release of a guided JSOW and JASSM weapon.

TEST & EVALUATION ASSESSMENT

Operational testing did not confirm that the B-1B Block E system actually tested would be effective in combat. However, it would be suitable. Compared to the performance of the B-1B Block D in IOT&E, the B-1B Block E demonstrated a

Operational testing during JSOW/JASSM integration testing will also seek to confirm that B-1B Block E IOT&E effectiveness and suitability shortfalls are resolved.

16 percent decrease in weapon release rate and a reduction in accuracy of Mark 82 low-drag weapons. When employing the Ground Moving Target Indicator/Ground Moving Track mode of the radar to engage moving targets, the B-1B Block E system demonstrated a hit rate of 14 percent. In addition, the operational test indicated a tendency for Wind Corrected Munition Dispenser weapons to go to unintended impact points with miss distances as high as 6,500 feet, thus increasing the chance of collateral damage. While technical order publications, weapons load checklist procedures, and maintainer training deficiencies are resolved, effectiveness and suitability shortfalls remain.

Since the conclusion of IOT&E, operational testing was initiated to confirm the effectiveness and suitability of hardware and software solutions intended to rectify deficiencies identified in B-1B Block E IOT&E. Operational testing is expected to conclude in November 2004. Operational testing during JSOW/JASSM integration testing will also seek to confirm that B-1B Block E IOT&E effectiveness and suitability shortfalls are resolved.

Developmental flight-testing of JSOW and JASSM integration on the B-1B has demonstrated satisfactory weapon safe separation. Combined developmental and operational testing as well as independent operational testing begins in December 2003.

The B-1B LFT&E program for Block D identified a number of vulnerabilities to threats. These baseline vulnerabilities are also in Block E. However, there is no significant increase in vulnerability due to the addition of B-1B Block E-unique equipment.

B-2

The B-2, produced by Northrop Grumman, is a multi-role, low observable (LO) bomber capable of delivering conventional and nuclear munitions. It has four turbofan engines and twin side-by-side weapons bays. System avionics include a multi-mode radar, Global Positioning System-aided navigation, a Defensive Management System (DMS) for radar warning functions, and a Terrain Following/Terrain Avoidance (TF/TA) system. The bomber's current principal weapon is the 2,000-pound Joint Direct Attack Munition (JDAM, GBU-31).

The basic aircraft continues to undergo multiple modifications, some of which are aimed at correcting deficiencies in the original aircraft design, while others are intended to enhance capability and improve the aircraft's operational effectiveness and suitability. Planned modifications for FY04 and beyond include addition of an extremely high-frequency satellite communication system, upgrades to the DMS, advances in LO materials, Link-16 integration, weapon integration, and periodic software upgrades. Weapons being added include the Enhanced GBU-28 (EGBU-28), the Joint Air-to-Surface Stand-off Missile (JASSM), and the 500-pound JDAM (GBU-38).

The B-2 radar requires an upgrade called the Radar Modernization Program (RMP) to move the radar to a new operating frequency. This upgrade is necessitated to avoid interference with primary authorized users of the current B-2 radar frequency. The RMP will feature an active electronically scanned array and is scheduled to undergo IOT&E in FY07.

The B-2 was employed in combat operations during Operation Allied Force (March through May 1999), Operation Enduring Freedom (October 2001), and Operation Iraqi Freedom (March through April 2003).

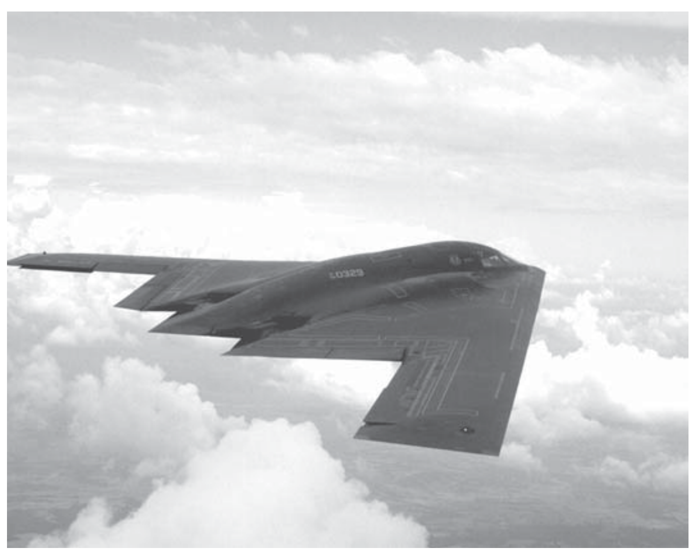
TEST & EVALUATION ACTIVITY

FY03 operational test efforts focused on the evaluation of upgrades to the aircraft operational flight program software, the weapon delivery capability, the Joint Standoff Weapon (JSOW) return to operational service, EGBU-28 weapon integration, DMS threat data file improvements, the validation of threat templates to support mission planning, the effectiveness of standoff jamming platforms in support of B-2 employment, and improvements to the reliability and maintainability of LO systems. A Test and Evaluation Master Plan to support continued B-2 modifications is also in development. Annexes to the Test and Evaluation Master Plan will provide plans for major upgrades requiring operational test and evaluation, including the B-2 RMP. Test planning for the RMP is progressing in support of a Milestone B review by the Air Force in May 2004.

The B-2 program is not under formal oversight for LFT&E. However, upgrades or modifications to the B-2 may alter aircraft baseline susceptibility. IOT&E of any modification will assess whether alteration to susceptibility occurs.

TEST & EVALUATION ASSESSMENT

Although the overall mission-capable rate for FY03 continues to fall short of original requirements (due primarily to LO maintainability), deployed aircraft during Operation Iraqi Freedom were able to sustain a high mission-capable rate. This rate was sustained due to the availability of two deployable B-2 shelters at Diego Garcia and the exceptional performance of deployed maintenance personnel. B-2 deployability is now assessed as satisfactory for locations with deployable shelters or climate-controlled hangars.



Although the overall mission-capable rate for FY03 continues to fall short of original requirements (due primarily to LO maintainability), deployed aircraft during Operation Iraqi Freedom were able to sustain a high mission capable rate.

The most promising near-term improvement to LO maintainability (alternate high-frequency materials (AHFM), in conjunction with the implementation of a primer/sealer) has not undergone OT&E or reached the operational squadrons. The Air Force plans to verify through OT&E of AHFM-modified B-2 aircraft that no degradation to B-2 baseline LO characteristics occurs and that AHFM can support the Air Force sortie generation requirement. However, the B-2 community does not currently possess an organic capability to accurately identify LO defects and verify the LO quality of repairs. This is primarily due to the lack of integrated diagnostic tools. Sole reliance on the LO Combat Readiness Model to evaluate aircraft LO capability is also not effective, given limitations in modeling and inspection routines. Operational tests during FY03 demonstrate the LO Combat Readiness Model is incorrect 83 percent of the time in predicting B-2 signature suitability for combat operations.

The DMS does not provide adequate situational awareness to avoid pop-up threats. DMS mission data file improvements continue to be made, but additional upgrades that may resolve DMS capability shortfalls are not funded.

Operational testing of the Situational Awareness Communications upgrade, which is an enhancement to mission flexibility, demonstrated the ability to enable the warfighter to plan and transmit missions to aircraft en route. This capability was used in Operation Iraqi Freedom.

Five JDAMs were released during an Air Force Quick Reaction Test in December 2002 and 583 JDAMs were delivered during Operation Iraqi Freedom. Results identified in the Quick Reaction Test met requirements. The addition of the smart bomb rack assembly with the next operational flight program software upgrade in 2004 should provide the capability to deliver up to 80 500-pound JDAM weapons. The Air Force carried out separation and guided weapon releases of up to 80 500-pound JDAM in FY03. Developmental testing indicates the potential for the 500-pound variant to meet requirements when delivered from the B-2. The Air Force plans operational testing of the B-2 with this JDAM variant in FY04.

The Air Force conducted operational testing of the JSOW (Baseline) weapon on the B-2 in March and April 2003, including captive carry releases and live launches of three JSOW (Baseline) weapons, to restore the JSOW to B-2 operational use. Although only one weapon dispensed bomblets within Operation Requirements Document criterion, the Air Force elected interim operational fielding of the JSOW (Baseline) on the B-2 provided workarounds are employed. These workarounds do not affect the ability of the B-2 to employ the JSOW effectively. However, additional tests of JSOW on the B-2 are required to increase confidence in JSOW/B-2 effectiveness.

Developmental testing of the EGBU-28 on the B-2 indicates the weapon has the potential to meet user requirements. However, the Air Force identified potential upgrades as a result of operational testing for possible future implementation. Integration testing of the EGBU-28 should conclude in FY04.

C-5 Avionics Modernization Program (AMP) and the Reliability Enhancement and Re-engining Program (RERP)

The current C-5 fleet operates throughout the Air Force active, reserve, and National Guard components in various missions and environments. C-5 missions include strategic airlift, emergency aeromedical evacuation, airland transport of a brigade-size force in conjunction with other organic aircraft and transport of outsize/oversize cargo. The C-5 aircraft must perform missions at night and in adverse weather, and be capable of receiving fuel in-flight during intercontinental missions.

C-5 modernization encompasses both the Avionics Modernization Program (AMP) and the separate Reliability Enhancement and Re-engining Program (RERP) denoted C-5 AMP/RERP. The full modernization effort incorporates a “glass cockpit” with digital avionics, a new aircraft propulsion system, and reliability improvements. Modified commercial engines, nacelles, thrust reversers, and pylons will be integrated into the legacy C-5 airframe. The anticipated performance improvements are intended to optimize cargo carrying capabilities, to include fully loaded take-offs and landings on relatively short runways, and to meet the performance requirements of the Global Air Traffic Management initiative. Additionally, the re-engining is intended to provide significant reliability, maintainability, and availability improvements. A commercial engine support concept (including two levels of maintenance and warranties) will be integrated into the C-5 logistics support system infrastructure. Candidate subsystems for reliability enhancement include the flight control, hydraulics, environmental control, electrical, and fuel systems. Specific upgrades and the extent of the expected reliability improvement will be identified from a series of trade studies.

The C-5 was developed and procured prior to the statutory requirement for LFT&E. Hence, the basic aircraft has never completed a system-level live fire evaluation. The RERP modification is an Acquisition Category I program and is a covered program for LFT&E. The C-5 RERP Test and Evaluation Master Plan was approved October 2001 in support of a Milestone B review.

TEST & EVALUATION ACTIVITY

A combined test force is located at the contractor facility in Marietta, Georgia. The combined test force includes the contractor and government personnel performing combined developmental and operational testing. Co-locating personnel allows for greater test efficiency and less duplication. C-5 AMP laboratory and flight tests are ongoing.

The first flight of a C-5 AMP aircraft (a B model) was accomplished on December 21, 2002. A second AMP test aircraft (an A model) flew in 2003. Software installation is planned to occur in four versions. Versions 1.1 and 1.2 have been flight-tested. Development, laboratory tests, and flight tests of Version 2.1 have slipped due to software problems identified in the earlier versions. As a result, development and flight testing of version 2.2 has slipped. The impact to the RERP timeline is not yet clear.

Several live fire activities were completed in 2003. Wing leading-edge fire suppression system baseline LFT&E testing was completed in April 2003. The engine fan rotorburst analysis was completed in May 2003, and ballistic testing of C-5 honeycomb structure surrogate sandwich panels was completed in June 2003.

The C-5 Avionics Modernization Program and the Reliability Enhancement and Re-engining Program incorporate a “glass cockpit” with digital avionics, a new aircraft propulsion system, and reliability improvements.

TEST & EVALUATION ASSESSMENT

There is a high schedule risk for the C-5 AMP development and test programs. The C-5 AMP schedule has slipped at least four months from the original schedule. If not completed as planned, this high-risk schedule will impact the C-5 RERP schedule. The C-5 RERP program is dependent upon the success of the C-5 AMP program.

A preliminary reliability demonstration, included as part of the RERP IOT&E, is required prior to the RERP full-rate production decision. In the current Test and Evaluation Master Plan, four aircraft are planned to fly approximately 200 sorties for approximately 800 flying hours between IOT&E and the reliability demonstration. Due to funding issues, the number of aircraft for developmental testing was reduced to three. This may impact the number of aircraft available for IOT&E. In order to assess the impact to IOT&E, AFOTEC is developing a model and the Air Mobility Command is providing field data. The model will be used to verify IOT&E planning and the viability of a three-aircraft reliability evaluation.

The LFT&E engine fan rotorburst analysis examined the trajectories of various-size fragments arising from an in-flight engine fan failure. The analysis indicated that the probability of inducing damage to C-5 critical systems was negligible; and therefore, in-flight engine fan rotorburst does not contribute to the overall system-level vulnerability of the C-5.

C-17 Globemaster III Airlift Aircraft

The C-17 is a four-engine turbofan aircraft capable of airlifting large payloads over intercontinental ranges without refueling. It is intended to allow delivery of outsize combat cargo and equipment directly into austere airfields. The C-17 is required to deliver passengers and cargo between continents, provide theater and strategic airlift in both air/land and air-drop modes, and augment aeromedical evacuation and special operations missions.

IOT&E of the C-17 was conducted in three phases from May 1992 to August 1995. Based upon results of IOT&E and live fire testing, DOT&E submitted an OT&E/LFT&E report to Congress to support the full-rate initial production decision in November 1995. The report assessed the operational effectiveness and suitability of the aircraft to conduct operational missions within the context of the existing airlift system. The C-17 was judged to be operationally effective (with limitations) and operationally suitable. Combined developmental test and evaluation and follow-on test and evaluation involving the contractor, the Air Force Flight Test Center, Air Mobility Command, and the Air Force Operational Test and Evaluation Center (AFOTEC) occurred on a nearly continuous basis since the production decision in 1995.

TEST & EVALUATION ACTIVITY

C-17 follow-on tests that verify correction of operational limitations are being monitored. These include the On-Board Inert Gas Generating System (OBIGGS), introduction of the composite material horizontal tail, an extended range fuel containment system, crew protection armor, liquid oxygen bottle design, and changes related to the Strategic Brigade Airdrop mission.

One important survivability upgrade still in progress involves improvements to the OBIGGS. High failure items (e.g., compressor, air separation module, and bleed pressure regulator) are tracked on a weekly basis to ensure spare parts are available. FY03 funding supported the initiation of a two-stage effort to improve OBIGGS. In stage one, reliability upgrades are being implemented for high failure rate items in the current OBIGGS system. In stage two, OBIGGS will be redesigned for improved reliability. The first production aircraft with the redesigned OBIGGS is aircraft P138, planned for delivery in FY05.

DT&E will continue at Edwards Air Force Base, California, as part of the Follow-on Flight Test Program. AFOTEC's-Detachment 5 at Edwards Air Force Base and the Air Mobility Command's 33rd Flight Test Squadron remain involved through ongoing communication with the program office and the combined contractor/government C-17 Test Team resident at Edwards Air Force Base.

The C-17 aircraft are delivered in a block configuration with each block containing approximately fifteen aircraft. Block XIII/XIV has software modifications and improved station-keeping equipment used in flying formation with testing scheduled to be complete in 2004. Block XV is planned to contain the upgraded on-board inert gas generating system along with navigation and safety modifications. The Block XVI will contain an avionics modernization package and a weather radar modification with testing to be complete in 2006. Additional enhancements, modifications, and corrections to existing deficiencies are concurrent and include a fuel system retrofit, main landing gear deficiency corrections, and a wheel brake and tire cost saving initiative. Detailed developmental and operational test planning is underway.

The C-17 carries outsize combat cargo and equipment over intercontinental ranges directly into austere airfields.

Since completion of initial LFT&E testing, two major structural modifications have been incorporated that require further analyses and additional testing. The horizontal tail has been changed to a composite material construction, and an additional fuel tank – the Extended Range Fuel Containment System – has been added in the center-wing area of the fuselage to extend the aircraft's flight range. An agreement was reached between DOT&E and the Program Executive Office, Airlift & Trainers in January 2003 to provide available test data on the structural changes to DOT&E. The report (dated April 1984) contained data on generic composite materials rather than the composite materials actually used in the C-17 tail section. This data is considered insufficient to validate the assumptions and simulations used by the Air Force in their ballistic vulnerability analyses. To address this data void, DOT&E has requested the Air Force conduct ballistic tests on coupons of the actual C-17 composite horizontal tail structure.

TEST & EVALUATION ASSESSMENT

The combined efforts of the Program Executive Office, program office, the flight test center, the test team and the user, resulted in an additional production representative aircraft will be provided to the test community to achieve a greater tempo of testing. Requests for flight test time on operational aircraft compete with high operational mission demands. Also, the large numbers of aircraft undergoing planned modifications further limit the aircraft available to perform operational missions, training, and testing. These challenges have affected the depth and duration of testing conducted following aircraft modification and upgrade.

The C-17 Test and Evaluation Master Plan (TEMP) is four years out of date. An update to the TEMP must be submitted to better address continuing flight tests, particularly the Follow-On Flight Test Program at Edwards Air Force Base, California, and operational testing by AFOTEC and the Air Mobility Command. The TEMP must also define the future LFT&E program. In addition, an updated operational test plan must be submitted for DOT&E approval that defines the scope of testing for the next four years and delineates specific responsibilities. A team has been formed to scope and define the contractor/developmental test/operational test required for that time period.

C-130 Avionics Modernization Program (AMP)

The purpose of the C-130 Avionics Modernization Program (AMP) is to lower the cost of ownership of the U.S. military's C-130 fleet, while complying with the Air Force Navigation and Safety Master Plan, required navigation performance requirements, and other applicable Global Air Traffic Management requirements. This will be done through a cockpit modernization program that replaces aging, unreliable subsystems, and adds equipment necessary to meet navigation and safety and Global Air Traffic Management requirements. New equipment is intended to lower the cost of ownership by reducing cockpit crew manning as well as increasing aircraft reliability, maintainability, and sustainability. The C-130 AMP is intended to provide an improved precision airdrop capability for the combat delivery fleet, meet Night Vision Imaging System requirements, and improve the C-130's precision approach and landing capability. This program provides the interfaces necessary to integrate real time information in the cockpit. A standard cockpit layout is planned allowing pilots to be trained to fly in any AMP aircraft cockpit and to undergo mission qualification when reaching a specific unit.

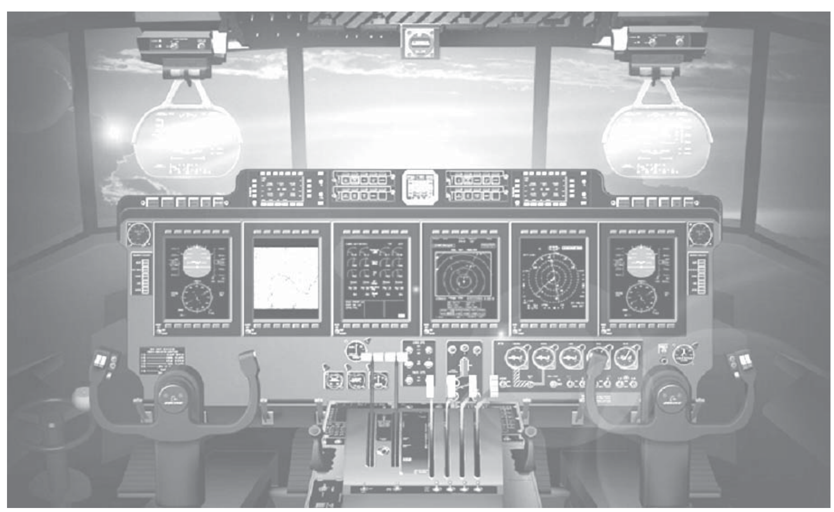
In addition, selected Special Operations Forces aircraft will undergo additional modification under the C-130 AMP/ Common Avionics Architecture for Penetration (CAAP) program. A Test Planning Working Group has been established to provide a forum for test organizations to participate in the C-130 AMP/CAAP test planning process. The using commands and the Air Force Operational Test and Evaluation Center will provide crew members to support ground tests and flight tests during combined developmental test/operational tests and dedicated OT&E.

The LFT&E program, managed by the program office, will develop a C-130 fleet-wide system-level vulnerability analysis. The program will include a vulnerability analysis and ballistic testing of AMP electronic systems and those systems it directly affects, together with mission abort vulnerability analyses.

The Milestone B decision resulted in the C-130 AMP contract in July 2001. Contractor ground tests will be conducted at Boeing facilities in San Antonio, Texas, and Long Beach, California. Following a series of flights at the contractor facility, initial prototypes will transition to Edwards Air Force Base, California, for the start of formal developmental test and evaluation. Developmental test and evaluation flight tests will be accomplished by a combined government/contractor integrated test team. Air Force Operational Test and Evaluation Center personnel will participate as part of the government contingent.

TEST & EVALUATION ACTIVITY

The program is in the System Design and Development phase. Low- rate initial production for the combat delivery and CAAP aircraft is planned for FY06. The full-rate production decisions are planned for FY08 and FY09, respectively. An LFT&E integrated team and a test plan working group have been created to formulate the specifics of the LFT&E program and the Test and Evaluation Master Plan.



The C-130 Avionics Modernization Program upgrades the cockpit by replacing aging, unreliable subsystems, and adds equipment necessary to meet navigation and safety and Global Air Traffic Management requirements.

The successful testing of AMP components across a broad range of aircraft configurations and mission requirements will continue to be a significant challenge. The concept is feasible; however, it is essential that the various users (eight different commands) commit to a unified fleet management approach for the modification of all aircraft. Fleet management of more than 700 aircraft is one of the keys to success. A tentative plan calls for some aircraft being retired, some moved from one unit to another to manage structural life, some sent to depot, and others used for test purposes. In addition, concurrent development of different Mission Design Series modifications will add risk to the technical developments and to the schedule.

The following table shows the different Mission Design Series (MDS) of the C-130s to be modified and some of the special test requirements applicable to them:

C-130s and Special Test Requirements by MDS

MDS	Nomenclature	Special Tests
C130E/H/H1/H2/H3	Combat Delivery	Global Air Traffic Alert and Collision Avoidance System, Terrain Awareness Warning System, Night Vision Imaging System, Flight Management System
AC-130H/U	Gunship	Gunfire Accuracy, Enhanced Situational Awareness, Defensive Systems
EC-130H	Compass Call	Mission Unique
HC-130N/P	Combat Rescue	Mission Unique
MC-130E	Combat Talon I	Terrain Following/Terrain Avoidance Navigation
MC-130H	Combat Talon II	Terrain Following/Terrain Avoidance Navigation, Enhanced Situational Awareness, Defensive Systems
MC-130P	Combat Shadow	Mission Unique
LC-130H	Ski	Mission Unique

TEST & EVALUATION ASSESSMENT

The entire C-130 AMP/CAAP program has been restructured due to funding changes and a renewed emphasis on the missions of the Special Operations Forces aircraft. The restructuring proposes to accelerate the previously planned risk reduction effort (18 months of flying the APN-241 radar in a Special Operations Forces Combat Talon I aircraft with testing at a government range) for feasibility studies on the radar, new data processing algorithms, and enhanced situational awareness features for terrain following/terrain avoidance missions with low probability of intercept. There should be less risk to the CAAP portion of the program due to this change, but it could also lengthen the completion of AMP for other platforms.

The C-130 AMP Test and Evaluation Master Plan was approved by DOT&E in September 2002. An update is required for submittal in FY04 due to program funding changes that will impact the currently planned test schedule.

C-130J Airlift Aircraft

The C-130J is a medium-range, tactical airlift aircraft designed primarily for the transport of cargo and personnel within a theater of operations. The cargo area can adapt to accommodate a combination of passenger, cargo, and/or aeromedical airlift missions. Variants of the C-130J are intended to perform missions such as weather reconnaissance (WC-130J), electronic combat (EC-130J), and aerial refueling (KC-130J). The WC-130J is discussed in this report, the EC-130J is undergoing modification, and the KC-130J is addressed in a separate report.

The C-130J is more than 70 percent new, relative to previous models. Significant differences include an advanced integrated digital avionics system, a redesigned flight station intended to facilitate a two-person cockpit, a new propulsion system intended to provide improved take-off, climb and cruise performance, and cargo handling system enhancements.

Contractor developmental test and evaluation began in spring 1996, and as capability is added, will likely continue past 2006. The C-130J aircraft procurement is proceeding under a commercial acquisition strategy that entered a multi-year procurement in 2003.

The Federal Aviation Administration (FAA) awarded a Type Certificate for a commercial version (Lockheed 382J, not produced or on contract) of the paper aircraft in 1998. However, significant military requirements were not included in the original FAA certification, and the contractor has not maintained FAA certification of government-required deficiency corrections and modifications. This necessitates additional testing by the Air Force and other U.S. government users.

DOT&E designated the C-130J aircraft for LFT&E oversight in May 1995 and approved the Test and Evaluation Master Plan in July 1999. Threats include man-portable air defense systems, surface-to-air missiles, anti-aircraft artillery, air-to-air missiles, rockets, and small arms. The C-130J LFT&E vulnerability reduction program addresses wing dry bay fire, composite propeller blade ballistic vulnerability, engine and engine bay fire, vulnerability to man-portable air defense systems threats, and mission-abort vulnerability.

TEST & EVALUATION ACTIVITY

The operational test program structure has been adjusted to accommodate the developmental test releases of software. Originally, one production representative version of software was to be released. Due to the immaturity, the software was released in increments – Block 5.1, Block 5.2, and Block 5.3. Block 5.3.6 is an upgrade that integrates defensive systems operations with the mission computer. Block 5.4 is now designated the production representative version. Block 6.0 will include global air traffic management capabilities and Block 7.0 is undefined at this time.

Qualification testing for mission software Block 5.3.6 is currently in test. Operational testing of Block 5.4 is scheduled for late CY05. Block 5.4 will contain some correction of previously documented deficiencies, but many fixes will not be addressed until Version 6.0 and Version 7.0 are installed in the FY06 and FY08 timeframes, respectively. The operational test plan is being revised to reflect the current structure of the test program.
The C-130J LFT&E Vulnerability Reduction Program (VRP) Phase 2 (composite blade testing) completed fatigue testing of ballistically damaged propeller blades during 2003. VRP Phase 4 (engine nacelle fire suppression system testing) test planning and test article manufacturing began in July 2003.

The C-130J is a medium-range, tactical airlift aircraft designed primarily for the transport of cargo and personnel within a theater of operations.

TEST & EVALUATION ASSESSMENT

C-130J

Major issues confronting the C-130J program include funding of logistics support and training systems; hardware, software, and technical order deficiencies; manufacturing quality; subsystem reliability; failure to meet required measures of system effectiveness and suitability; and resolution of documented deficiencies.

Due to system immaturity, operational testing was initially segmented into three phases of testing: Phase 1A, Phase 1B, and Phase 2. Phase 1A evaluated the ability of the aircraft to be used to train pilots. Phase 1B evaluated the aircraft's ability to perform the air/land mission. Phase 2, planned for FY06, will evaluate the ability to perform all missions to include airdrop. Based on the evaluation of test results conducted from Phase 1A and Phase 1B, the aircraft is not operationally effective. The airdrop mission cannot be evaluated until deficiency corrections are implemented and the developmental tests are completed in FY06. Aircrew workload issues, software discrepancies, and cargo loading and constraint requirements are still major issues. The using commands (United States Air Force, Air Force Reserves, and Air National Guard) are unable to verify manpower requirements to field this system until the crew workload evaluation is complete.

DOT&E determined that the aircraft is not operationally suitable. The evaluated reliability, maintainability, availability, and logistics supportability during Phase 1B were below operational requirements. Deficiencies were noted with on-aircraft integrated diagnostics and fault isolation systems, portable maintenance aids, maintenance technical orders, and the availability of spare parts. Additional contractor field service representatives are required to assist in the maintenance of the aircraft for the foreseeable future.

Although hardware and software modifications in Block Upgrade 5.3 showed improved navigation functions, flight displays, technical publications, and reduced nuisance faults, a large number of deficiency reports remain open that need to be resolved to achieve operational capability that is equal to the current C-130E/H fleet. An executable plan delineating deficiency correction with adequate funding that will result in an operational capability has not been formulated. Without an executable plan, the units with aircraft that have already been delivered and those that will receive additional aircraft prior to the correction of documented deficiencies are unable to perform the full range of essential combat delivery functions.

Assessment of the live fire VRP ballistic testing of the C-130J composite propeller blades awaits completion of the 46th Test Wing live fire test report. Test facility limitations narrowed the realism of the testing. The test facility was unable to support ballistic testing of dynamically rotating propellers. As a result, ballistic testing was accomplished on stationary blades with fatigue testing of the damaged blades conducted separately after the ballistic testing was complete.

WC-130J

Four major issues confront the weather reconnaissance aircraft. The radar cannot perform the hurricane reconnaissance mission, continuous satellite communication is not achieved, there is propeller delamination, and there is excessive vibration in the auxiliary crew member's station.

The low-power color radar was designed as a weather avoidance radar, but it was installed in the WC-130J to perform the weather penetration mission. The radar does not support operational requirements for the weather mission. The program office has developed a plan to correct this deficiency. Additional software modification tests were planned for late 2003 (storm season), but testing was not accomplished due to software deficiencies. Hardware modifications will be tested approximately 26 months after the contract is awarded. Initial operational capability may be no sooner than FY06. Since the WC-130J cannot perform its primary mission, the correction of this deficiency is critical. The secondary impact is that the ten older WC-130H models that currently perform the mission were to be converted to aerial refueling tankers and transferred to Air Combat Command. That will not occur until the WC-130J is fully operational.

A proposed fix to the propeller delamination problem has been installed on test aircraft. Data are currently being collected by the Air Force Reserves. The fix must be tested in a hurricane environment.

Combat Survivor Evader Locator (CSEL) System

The Combat Survivor Evader Locator (CSEL) is a personnel locator system designed to provide survivor/evader location and two-way communication between survivor/evaders and rescue forces. It is designed to enable command elements and search and rescue forces to locate and maintain contact with CSEL-equipped personnel. CSEL is also intended to provide an interim survivor capability until fielding of the Joint Tactical Radio System (JTRS), a new system designed to provide seamless joint communications capability for a wide range of users (air, ground, and maritime). Fielding of JTRS will not likely occur until 2012.

CSEL is a complex aerospace command and control system that includes hand-held radios, unmanned base stations, and rescue center workstations. It relies on support from UHF satellite communications, the Secret Internet Protocol Router Network (SIPRnet), national systems, Search and Rescue Satellite Aided Tracking (SARSAT) system, and the Global Positioning System (GPS). The hand-held radio features line-of-sight UHF/VHF voice, beacon, GPS, and over-the-horizon data modes for worldwide coverage. The over-the-horizon segment includes four unattended UHF base stations that control satellite communication links with hand-held radios and interface with national assets, the SARSAT system, and Joint Search and Rescue Centers (JSRC) via the SIPRnet. The ground segment displays and prepares data burst messages for transmission to/from the hand-held radio via UHF base stations.

The Air Force Operational Test and Evaluation Center, Army Test and Evaluation Command, and Operational Test and Evaluation Force (the OTAs) conducted operational assessments in 1998 and 2001. The second operational assessment resulted in low-rate initial production approval for CSEL. The OTAs requested and received production radios for a multi-Service operational test and evaluation (MOT&E) beginning in 2003. A full-rate production decision is planned for 2QFY04. OSD- NII submitted a program budget decision to reduce production and continue development. The delay would allow the program to reach program requirements, but would unnecessarily delay production to do so. DOT&E does not support this program budget decision since it leads to fewer systems in the warfighters' hands without speeding or increasing capability.

TEST & EVALUATION ACTIVITY

The following test activities occurred during FY03:

- February 2003, combined testing, Fort Bragg, North Carolina, to address operational effectiveness.
- April 2003, development testing, Fort Huachuca, Arizona, to validate system readiness for OT&E.
- May 2003, combined testing, Fairchild Air Force Base, Washington, to assess operational suitability (reliability).
- May 2003, combined testing, Kirtland Air Force Base, New Mexico, to evaluate operational suitability (maintainability).
- June 2003, MOT&E, Davis-Monthan Air Force Base, Arizona, an Air Force OT&E.
- July 2003, MOT&E, *USS John C. Stennis* (CVN 74) Task Force Exercise, San Clemente Island, California, a Navy OT&E.
- July 2003, MOT&E, Little Creek, Virginia, Navy operational test for Navy Special Operations Force (Seals).

The Combat Survivor Evader Locator includes hand-held radios, unmanned base stations, and rescue center workstations.

- August 2003, MOT&E, Exercise Desert Rescue, Naval Air Station, Fallon, Nevada, a multi-Service operational test and evaluation, joint and coalition interoperability.
- September 2003, combined testing, Hurlburt Field, Florida, water integrity testing.
- October 2003, combined testing, Fort Huachuca, Arizona, GPS jamming susceptibility.

TEST & EVALUATION ASSESSMENT

The operational assessment conducted by the OTAs in 2001 determined CSEL to be potentially effective and suitable, but not ready for operational employment. The OTAs identified several areas that required corrective action prior to the start of MOT&E: Concept of Operations updates, battery improvements, training, manning requirements, ORD requirements, fielding plan, and communications infrastructure. The contractor subsequently announced that all system deficiencies generated from both operational assessments have been corrected. These fixes were validated during developmental testing in 2002. Because of software and integration problems with the new Selective Availability Anti-Spoofing Module, the contractor encountered difficulties in providing the requested numbers of production representative hand-held radios for MOT&E. The delays and the lack of hand-held radios caused the operational test agencies to reschedule MOT&E several times in 2002 and 2003.

CSEL was tested in joint and coalition environments, and integrated into end-to-end combat rescue scenarios with operationally representative survivor/evaders, Joint Search and Rescue Centers, life support, and rescue forces. While CSEL has made substantial progress in the past 18 months, there are still issues with employment concepts, training, hand-held radio data loading and maintenance, information assurance, batteries, and national asset support. The OTAs conducted MOT&E test events from June to October 2003 and are in the process of analyzing and reporting the results. MOT&E findings have demonstrated certain individual capabilities (radio function, message relay, JSRC receipt, etc.), but have had difficulty in showing total system capability in end-to-end tests that exercise all aspects of the CSEL system. Deficiencies have been identified in water intrusion and ground reference point calculations. Both are being re-tested in late 2003. DOT&E expects the evaluation to be complete before the end of the calendar year in order to support the Milestone review in March 2004.

The number of users requesting survivor radios continues to grow. Survivor radio needs cannot be met with just one system (either PRC-112 "Hook" radios or CSEL). The Personnel Recovery Advisory Group recommended immediate efforts to provide capabilities with both systems. They recommend immediate implementation of an over-the-horizon capability for PRC-112 (which CSEL has, but Hook lacks) and terminal area guidance for CSEL (which Hook has, but CSEL lacks). The goal of both efforts is to provide a wide-ranging interim capability for survivor communications until the implementation of JTRS. DOT&E supports these recommendations and also recommends follow-on operational test and evaluation of Hook and CSEL. The follow-on operational test and evaluation must conduct end-to-end testing of each system in its respective operational environment. Evaluation of these results will provide the user with the best picture of Combat SAR communication capabilities, and assist combatant commanders in choosing the appropriate system for their use. DOT&E is nominating the PRC-112 radio for the oversight list in order to support this evaluation.

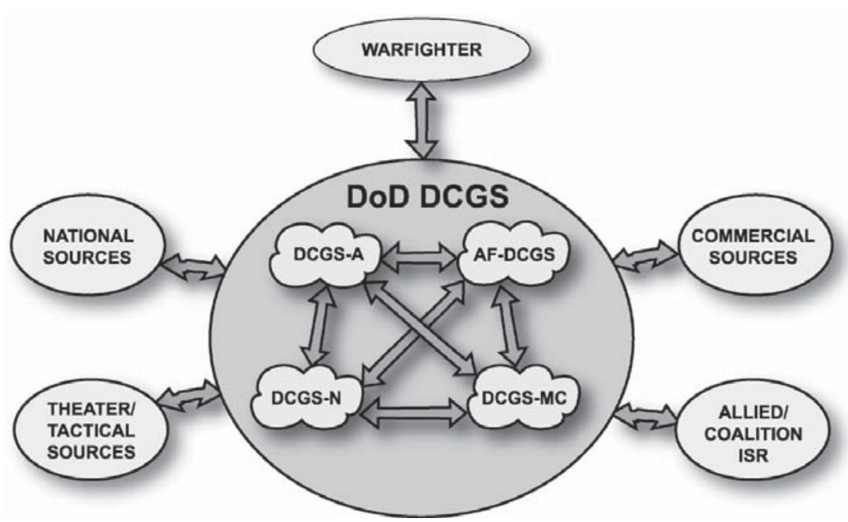
Distributed Common Ground/Surface Systems (DCGS)

The DCGS is a family of systems capable of receiving, processing, exploiting, and disseminating intelligence in support of a Joint Force Commander. DCGS objectives include receiving imagery at ground and surface systems from national and tactical sensors and exchanging intelligence between ground and surface systems through use of common components and compliance with standards. Architectural requirements for the family of systems are stated in the Joint Chiefs of Staff-approved Capstone Operational Requirements Document. U.S. Joint Forces Command (USJFCOM) is the user representative for the family of systems. The Joint Interoperability Test Command (JITC) is responsible for testing the architecture and certifying interoperability. Operational tests of individual systems are the responsibility of the appropriate Service test agency. The Air Force DCGS (AF DCGS) and Distributed Common Ground System-Army (DCGS-A) are on the OSD test and evaluation oversight list.

The AF DCGS is a worldwide-distributed, network-centric, system-of-systems architecture designed to conduct collaborative intelligence operations and production for the Air Force. The system delivers direct and indirect intelligence, surveillance, and reconnaissance (ISR) information to the Joint Force Air Component Commander in support of ISR management, intelligence preparation of the battlespace, predictive battlespace awareness, indications and warning, current intelligence, assessment of military force and support capabilities, analysis of enemy courses of action, targeting and weaponeering, mission planning, and air combat training mission execution. In addition, both the Army and Navy are considering use of the network infrastructure that is part of the Air Force program. The 46th and 605th Test Squadrons are responsible for a field development evaluation of AF DCGS.

The DCGS-A is a single integrated ISR ground processing system. The DCGS-A is the Army's primary system for tasking, processing, correlating, integrating, exploiting, and disseminating ISR assets and information. The DCGS-A enables the ground commander to achieve situation understanding by accessing multiple sources of data, information, and intelligence. Furthermore, the DCGS-A facilitates development of situational understanding by allowing the commander to visualize, analyze, and understand the threat and environment, predict threat intentions, execute targeting, conduct ISR integration, and support information operations. The DCGS-A will also serve as the primary ground station for Army airborne and ground sensor systems defined for the Objective Force (e.g., Aerial Common Sensor, Prophet, UAVs).

There will be three types of DCGS-As: fixed, mobile, and embedded. Fixed DCGS-As will be located in rear, sanctuary locations such as at a home station located in the U.S. or at a theater regional operations center. Mobile DCGS-As will be a single vehicle or multiple vehicles that will operate with forward deployed units. All mobile DCGS-A vehicles will be the same and will be deployed in numbers tailored to meet specific missions. The embedded DCGS will be a software capability hosted on Future Combat System (FCS) vehicles, Aerial Common Sensor aircraft, and other platforms. On FCS vehicles, the embedded DCGS-A will meet the FCS ISR requirements, which include the capability for the synchronization and control of organic sensors, sensor data fusion, corroboration, visualization, and access to the common operating picture (COP).



The DoD Distributed Common Ground/Surface System is a family of systems capable of receiving, processing, exploiting, and disseminating intelligence in support of a Joint Force Commander.

TEST & EVALUATION ACTIVITY

- JITC completed a working draft of the Capstone Test and Evaluation Master Plan (TEMP).
- JITC is developing plans to evaluate the architecture during USJFCOM Combined Joint Task Force Exercise (CJTFEX) 04-2 on the East Coast.
- Air Force test agencies are planning for the potential participation of AF DCGS in CJTFEX 04-2.
- During FY03, the DCGS-A program undertook the development of a test strategy to be published in its TEMP prior to the Milestone B in FY04.

TEST & EVALUATION ASSESSMENT

JITC has established interoperability certification programs with 23 of the 26 systems that are members of the DCGS family, but only about three of the systems have been granted interoperability certifications. Many of the systems do not have a Joint Chiefs of Staff-approved interoperability key performance parameter that is a prerequisite for interoperability certification testing.

CJTFEX 04-2 will be the first opportunity to accomplish an operational assessment of a joint network of Service DCGS systems. Participation of individual Service systems is still to be determined. Lack of Service participation may limit the joint nature of the architecture.

Seeing, understanding, and acting are vital to the success of the Army's FCS and Objective Force. Providing and integrating command and control, ISR, and communications connectivity stands out as the most critical challenge and the most vital aspect of developing, fielding, and employing FCS capabilities. As the Army's ISR processing system, the DCGS-A will be a lynchpin of the ISR network that supports FCS. Understanding first will require the DCGS-A to integrate and fuse data from multiple ISR sources. Currently, there is minimal capability to perform automated fusion. Presently, building the COP requires substantial human interface with inadequate assurance that it is current due to latency. Achieving a low-latency COP will require significant technological advances in fusion. A significant portion of DCGS-A will be software, and software development will be the greatest risk to the program.

E-3 Airborne Warning and Control System (AWACS)

The E-3B/C Airborne Warning and Control System (AWACS) is a commercial Boeing 707-320C airframe modified with an AN/APY-1 or AN/APY-2 radar. It is equipped with generalized and specialized mission computers, multipurpose displays, and clear and secure multiple-voice and data link communications. The United States has 33 E-3B/Cs assigned to Air Combat Command, Pacific Air Forces, and Air Force Material Command. AWACS has been employed in support of joint and multinational operations around the world since the late 1970s. NATO, the United Kingdom, France, and Saudi Arabia also operate variants of the E-3B/C. Finally, Japan operates a variant of the E-3B/C installed on a 767.

Block 40/45 will replace the aging AWACS computer system and the operator terminals with a network of commercial off-the-shelf operator workstations linked to several commercial off-the-shelf computers. A Gigabit Ethernet Local Area Network that adds digital communications for control of the radios, and for internal communications, will connect these computers. Block 40/45 will provide theater commanders enhanced surveillance and control capabilities while contributing to information superiority needed to control the battlespace. In addition, it will improve E-3B/C reliability and availability.

Block 40/45 upgrades will enable the Air Force to incorporate several necessary improvements to AWACS functionality including multisource integration, increased electronic support measures system memory, integration of the Intelligence Broadcast System, and data link infrastructure. These improvements will be achieved through new tracking algorithms, software control of the communications subsystem, improved human-machine interfaces, and reduced data link latency. The Block upgrade, which supports continued improvements to E-3B/C information correlation functions that will enable the E-3B/C to support the Single Integrated Air Picture, will extend AWACS capabilities through the 2025-2035 timeframe.

TEST & EVALUATION ACTIVITY

The Air Force established a Block 40/45 Test and Evaluation Working Integrated Product Team that produced a Test and Evaluation Master Plan, which DOT&E approved in May 2003.

TEST & EVALUATION ASSESSMENT

Re-hosted radar software led to problems during the E-3B/C Radar System Improvement Program. The problems were due to inadequate protection of aircraft radar hardware under certain operating conditions and degradation of the long-range detection and tracking performance of the beyond-the-horizon radar. Both issues have been corrected, and steps were taken in both the ground and air test procedures to prevent recurrences. The Block 40/45 program will require re-hosting significantly more software. DOT&E will work with the Air Force Operational Test and Evaluation Center and the Block 40/45 program to prevent a repetition of the types of problems experienced with the Radar System Improvement Program.

Block 40/45 upgrades will enable the Air Force to incorporate several necessary improvements to the Airborne Warning and Control System including multi-source integration, increased electronic support measures system memory, integration of the Intelligence Broadcast System, and data link infrastructure.

E-4B Modernization Program

The E-4B is a militarized Boeing 747-200 aircraft that provides a survivable national airborne operations center for senior leadership. The fleet of four aircraft, based at Offutt Air Force Base, Nebraska, contain multiple and redundant secure national and strategic communications systems along with computerized workstations and databases. The E-4B is a long-range aircraft with endurance supported by an in-flight air refueling capability.

The E-4B requires numerous improvements to maintain flight worthiness and improve command, control, and communications capabilities. The next near-term major improvement is a Block 1 modification and includes an Audio Infrastructure Update, Global Air Traffic Management compliance updates, and the Senior Leadership Communications System.

TEST & EVALUATION ACTIVITY

DOT&E reviewed a test concept to baseline current E-4B/national airborne operations center capabilities for those systems to be replaced by Block 1 modifications. This baseline will be used to compare the performance of the appropriate Block 1 modification systems.

A Test Plan Working Group and an Integrated Product Team have been established to develop the Test and Evaluation Master Plan.

Depot planning for the integration of a prototype Block 1 modification kit is nearing completion and the E-4B aircraft serving as the test bed was inducted into the modification facility November 4, 2003.

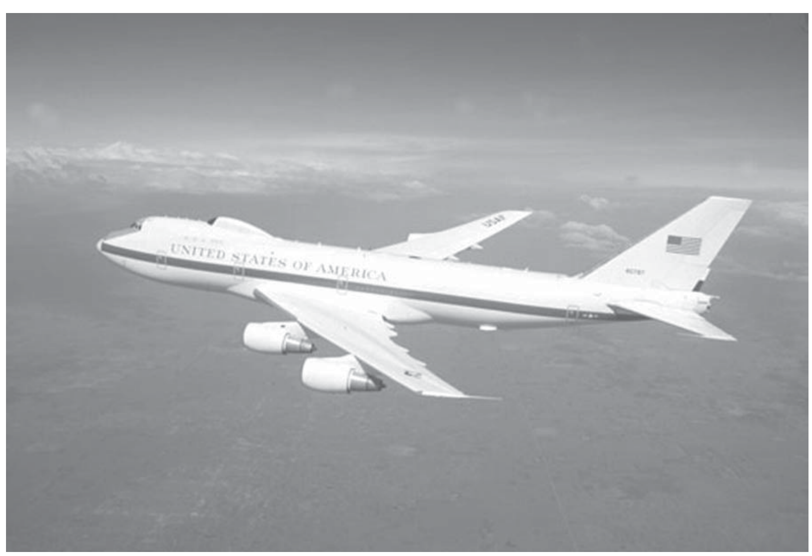
The Air Force initiated test planning for developmental testing and combined developmental and operational testing with the first on-aircraft test event scheduled for March 2004.

TEST & EVALUATION ASSESSMENT

The Block 1 modification test planning process will identify appropriate test events for early insight into developmental maturity and identify risks to a successful field development evaluation.

The E-4B program has not yet submitted a Command, Control, Computers, Communications, and Intelligence System Support Plan; consequently, joint interoperability information exchange requirements have not been developed for the E-4B platform. Definition of the information exchange requirements is needed to complete the baseline test and development of the Block 1 modification joint interoperability Critical Operational Issue and associated test planning and resolution. DOT&E will coordinate the preparation of this document with the Assistant Secretary of Defense/Network and Infrastructure Integration and the Joint Interoperability Test Command.

The Air Force Block 1 modification operational requirements document has not been completed. An approved requirements document is needed to complete the Test and Evaluation Master Plan. DOT&E has contacted the sponsoring command to ensure requirements, including key performance parameters, are identified.



The E-4B is a militarized Boeing 747-200 aircraft that provides a survivable national airborne operations center for senior leadership.

E-10A Multi-Sensor Command and Control Aircraft (MC2A)

The Multi-sensor Command and Control Aircraft (MC2A), recently designated the E-10A, is intended to meet the Air Force's need to integrate Command and Control Intelligence, Surveillance, and Reconnaissance (C2ISR), and Information Warfare functions on a single platform. Integration of these functions will improve the effectiveness of military operations through information superiority by supporting rapid decision analysis, increased battlespace awareness, and shortened decision cycles. The initial E-10A capability will include the Multi-Platform Radar Technology Insertion Program (MP-RTIP) sensor and Battle Management Command and Control (BMC2) suite enabled by an open-system architecture. The sensor will support a Ground Moving Target Indicator capability and limited air-to-air and cruise missile defense support. The Multi Platform-Common Data Link (MP-CDL) will provide the data link to other airborne and ground platforms prosecuting the ground war. Other capabilities may include interfaces to Space-Based Radar, reception of data from, and control of unmanned aerial vehicles and combat operations functions. The initial effort will include both hardware and software growth provisions to permit incorporation of additional sensor configurations, as well as other BMC2 functionality for future developments. A second spiral is tentatively planned to expand the E-10A support to air-to-air and cruise missile defense with additional sensors (e.g., IFF) and additional BMC2 functionality.

The MC2A evolved from the Block 40 upgrade to the Joint Surveillance Target Attack Radar System E-8C (a B-707), designated the RTIP. The Air Force restructured the RTIP as MP-RTIP and directed the program office to develop a scalable sensor for multiple platforms. An analysis of alternatives was conducted to determine whether to install the sensor on a B-707 or on a newer aircraft. Using this analysis, the Air Force decided a B-767-400ER best suited the needed capability and growth. After the aircraft was chosen, the Air Force further decided to integrate the MP-RTIP onto the E-10A.

The E-10A program is critically dependent on the MP-RTIP and MP-CDL. MP-RTIP provides the primary sensor for the E-10A. MP-CDL is the only projected data link with sufficient bandwidth to enable transmission of the data generated by the E-10A.

TEST & EVALUATION ACTIVITY

The E-10A program developed an independent evaluation strategy that includes the incorporation of the MP-RTIP capability with the BMC2 suite.

The E-10A Integrated Test Team is writing a Test and Evaluation Master Plan for the E-10A to satisfy the Milestone B exit criteria.

The Air Force Operational Test and Evaluation Center is planning an early operational assessment to support the E-10A Milestone B review in FY04.

TEST & EVALUATION ASSESSMENT

The Air Force has used E-10A participation in operator-in-the-loop (OITL) events to explore how it can contribute to the conduct of the air war. Information gained from the OITL events will help scope the future spirals of the E-10A and ensure that the initial effort provides adequate provisions for follow-on spirals. Testing E-10A will present significant challenges that must be addressed early. The MC2A will provide simultaneous air, ground,

The Multi-sensor Command and Control Aircraft, recently designated the E-10A, is intended to meet the Air Force's need to integrate Command and Control Intelligence, Surveillance, and Reconnaissance, and Information Warfare functions on a single platform.

and sea C2ISR support and targeting information to all the Services. It will require a high degree of joint interoperability for both ground combat and air defense. Demonstrating the ability to support the joint prosecution of the air and ground wars simultaneously will require carefully planned field tests augmented by modeling and simulation, and will demand an unprecedented level of joint cooperation.

Finally, the risk associated with the interdependency of two Acquisition Category ID programs (E-10A and MP-RTIP) along with the MP-CDL must not be underestimated. E-10A is dependent on MP-RTIP to deliver its primary sensor. MP-RTIP is dependent on E-10A to provide a test platform for the sensor and the MP-CDL to serve as the pipeline for radar data to the users. Planned delivery of the three must be closely coordinated to ensure no part of the overall system has to wait for the delivery of the others. Due to the scope and the long lead-times required for these programs, such delays will significantly increase risk.

Evolved Expandable Launch Vehicle (EELV)

The Evolved Expendable Launch Vehicle (EELV) program fulfills government satellite launch requirements currently served by Delta II, Atlas II, Titan II, and Titan IV. The EELV will be DoD's only medium, intermediate, and heavy payload space launch capability after current heritage inventories are exhausted. FY03 marked the transition to the new launch vehicle, which is expected to provide launch services through 2020.

The government intends to maintain an ongoing competition between two contractors, Boeing and Lockheed Martin, rather than down-selecting to one. Boeing's EELV family of launch vehicles is designated the Delta IV, and Lockheed Martin's family the Atlas V. DoD will acquire launch services from these contractors. Production and launch operations responsibilities, as well as ownership of all EELV flight hardware and launch pad structures, will remain with the contractor. DoD will lease launch pad real property and other on-base facilities required for operations to the contractors. The contractors have shared development costs with the government to satisfy both DoD civil launch requirements and commercial launch needs.

The EELV system includes launch vehicles, infrastructure, support systems, and interfaces. The contractor is standardizing payload interfaces, launch pads, and infrastructure so that all configurations of each contractor's EELV family can be launched from the same pad and payloads can be interchanged between vehicles in the same class (i.e., medium, intermediate, or heavy). The EELV program will maintain current mass-to-orbit capability while increasing launch rate and decreasing costs. Potential savings will be generated through the commercial launch market and shared development by government and commercial customers.

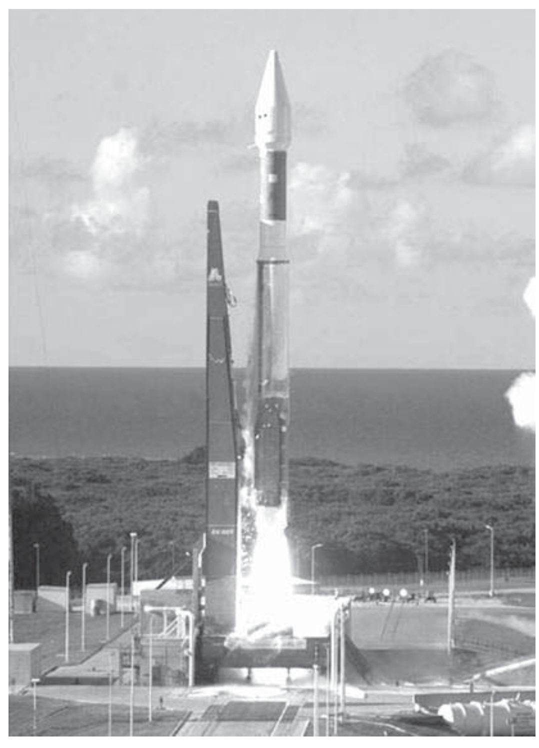
TEST & EVALUATION ACTIVITY

FY03 DOT&E activity consisted of:

- Attendance at several wet dress rehearsals.
- Participation in the Program Office-run Flight Readiness Reviews that occur before each launch.
- First-hand observation of launch day activities (sitting on console with ability to hear contractor communications).
- Witnessing EELV launches including spacecraft separation.
- Participation in both the contractor-run post-launch data reviews and the Special Programs Office-run post launch briefings.

DOT&E also participated in Test Integrated Product Team meetings, with the goal of updating the September 1998 Test and Evaluation Master Plan and ensuring critical documentation and data are available for independent review and analysis.

The Air Force Operational Test and Evaluation Center (AFOTEC) conducted an EELV operational assessment (OA) II from April 2001 to December 2002 to support the first government launch.



Since OperationalAssessment II marked the end of AFOTEC's Evolved Expandable Launch Vehicle test program involvement, DOT&E arranged for additional system performance analysis through a detailed test plan laid out in the 2003 Test and Evaluation Master Plan.

TEST & EVALUATION ASSESSMENT

There do not appear to be any insurmountable problem areas affecting the EELV program as a whole. Both the Atlas V and Delta IV boosters have launched successfully. Post-flight analyses for the launches indicate that first and second stage engine performance and orbital insertion were nominal. Further, both contractors' vehicles have successfully flown with solid boosters strapped to the main booster.

AFOTEC completed OA II on December 18, 2002, and found the system to be a potentially effective and potentially suitable launch service which can support the requirements of the National Launch Forecast. Areas that were rated as making satisfactory progress with qualifications included vehicle design reliability; logistics supportability; and a number of payload interfaces. OA II supported the Air Force Space Command's launch readiness review for the first government payload launch, a Defense Satellite Communications System payload launched March 11, 2003.

Since OA II marked the end of AFOTEC's EELV test program involvement, DOT&E arranged for additional system performance analysis through a detailed test plan laid out in the 2003 Test and Evaluation Master Plan. Specifically, DOT&E will be involved in a final operational test phase that will encompass several launches presently planned for each contractor, and should include medium launch vehicles, heavy lift vehicles, and East Coast and West Coast launches. This final phase of operational testing has been identified as the Post-OA-II operational evaluation (POE).

This POE concept relies almost exclusively on combined developmental/operational testing. Due to the current acquisition strategy, there are no further scheduled dedicated operational test events. The test strategy includes extensive use of models and simulations to predict individual subsystem and total system performance. Despite the commercial involvement in the program, the government needs to evaluate system effectiveness and suitability and how well the system can support DoD missions.

F/A-22 Raptor

The Air Force is developing the F/A-22 Raptor as its next-generation air dominance fighter. It is intended to replace the current fleet of F-15C Eagle fighters and will also have an air-to-surface attack capability. Planned Raptor missions include air superiority (both counter-air and destruction of enemy air defenses), strategic target attack, and close air support in high threat environments. Key features of the F/A-22 include low radar observability (with internal weapons carriage) and supersonic cruise capability in non-afterburning power, combined with superior maneuverability and excellent handling qualities. Other features critical to the F/A-22 are an integrated avionics suite incorporating offensive and defensive sensors; an electronically scanned, active element radar array; and an advanced electronic warfare system with a variety of identification and countermeasures capabilities. Enhanced logistics features include an integrated maintenance information system and advanced Diagnostics and Health Management (DHM) to achieve reduced maintenance manpower and improved deployability. Armament consists of six AIM-120C radar-guided air-to-air missiles, two AIM-9 infrared guided missiles, and a 20 mm M-61 cannon. Alternatively, two 1,000 pound Joint Direct Attack Munitions (JDAMs) are intended to be carried internally along with two AIM-120s and two AIM-9s.

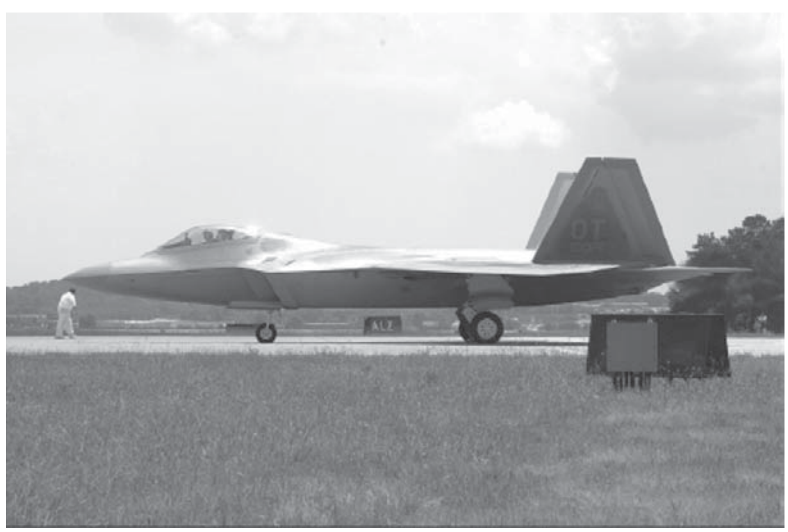
TEST & EVALUATION ACTIVITY

Performance of the F119 engine has generally been excellent. Full-scale airframe static testing and the first of three (originally four) planned fatigue lifetimes of testing have been completed and the second fatigue life testing is nearly complete. The program now plans to complete three fatigue lifetimes prior to the completion of the ongoing engineering and manufacturing development phase in November 2005. Expansion of flight test into the high-speed, high-G load regions of the performance envelope is ongoing. Radar testing continues in conjunction with the communications, navigation, and identification and electronic warfare subsystems that provide the other components of integrated closed-loop tracking. However, software instabilities and problems with the communications, navigation, and identification and electronic warfare subsystems have seriously hampered progress of the avionics flight test program. Resolution of these avionics instabilities and performance problems are essential to continued progress and this issue has received significant attention. An independent OSD avionics working group, which includes national-level software experts and DOT&E participation, is working with the contractor and the Air Force to help address efforts to correct software deficiencies.

Safe separation unguided missile launches have been conducted at high angles of attack, under supersonic conditions, and at high roll rates. Guided missile launches, essential to validate the F/A-22's combat capability, are continuing in accordance with DOT&E-approved operational scenarios. Stealth testing has included measurements of radar and infrared signatures, evaluations of signature stability over time, and low observable maintenance testing. Measured radar signatures have been consistent between test aircraft and are generally meeting system specifications. The Air Force plans to validate the processes and procedures for the maintenance and restoration of RCS that are in development.

Wing leading edge dry bay LFT&E ballistic testing was conducted during October 2002. The test article was an actual F/A-22 aircraft with vertical tails, engines, and electronic components removed.

Due to continuing technical and schedule risk, OSD maintained an extremely high level of scrutiny on the program including convening



AFOTEC plans employ the F/A-22 in air-to-air roles in several realistic Offensive Counter Air and Defensive Counter Air scenarios.

Quarterly Defense Acquisition Board (DAB) reviews chaired by the Defense Acquisition Executive (DAE). DOT&E participates in regular Air Force Readiness to Test meetings in order to track progress and understand issues. At the July 2003 DAB, the DAE directed that a preliminary phase of operational testing and evaluation (OT&E Phase I) be conducted to establish a performance baseline prior to the start of IOT&E. If demonstrated performance during OT&E Phase I is successful and the F/A-22 weapons system, as tested, does not require substantial modification prior to the start of IOT&E, the results from OT&E Phase I could be used to reduce the scope of the subsequent IOT&E. The intent is for the Air Force Operational Test and Evaluation Center (AFOTEC) to determine what works, what does not, and what needs to be fixed before entering IOT&E. DOT&E approved the Air Force test plan for OT&E Phase I and IOT&E, including a comparison test using the F-15C, on September 10, 2003. AFOTEC will conduct OT&E Phase I and the IOT&E, which are both mission-oriented operational tests. AFOTEC plans employ the F/A-22 in air-to-air roles in several realistic Offensive Counter Air and Defensive Counter Air scenarios.

TEST & EVALUATION ASSESSMENT

DOT&E has focused attention on determining whether or not the Air Force is providing a production representative weapons system for the upcoming operational testing. To this end, the program continues to identify modifications to be implemented on production representative test aircraft. Differences between the aircraft planned for operational testing and production aircraft exist, particularly in the avionics hardware, aircraft canopies, and maintenance information systems. DOT&E continues to review and assess the impact of differences on performance with the Air Force to ensure an adequate evaluation.

Only one flight test aircraft incorporates the structural modifications and special instrumentation needed to enable the flight envelope to be fully cleared to its airspeed, altitude, and G-load design limits. This situation poses a schedule risk in clearing the required flight envelope prior to IOT&E. Additionally, all operational test aircraft currently have multiple operating limitations, including the aircraft intended to be production representative and available for operational testing. Successful conduct of IOT&E requires an adequate flight envelope and unmonitored flight clearance (without control room support to monitor loads/stresses during maneuvers typical of visual “close-in” air combat).

Avionics software instabilities have resulted in an inefficient avionics test program, delays in integrating required functionality, and delays in fixing system deficiencies. Resolving avionics system instabilities and functionality issues has required dedication of an F/A-22 test aircraft to stability testing, development of numerous software fixes, and extensive regression testing. Additional software problems were sometimes created during incorporation of planned functionality and the software stability resolution process, further complicating efforts to achieve the planned software integration schedule. Additional time may be required to incorporate and validate all necessary stability and functionality-related avionics modifications prior to an event-driven start of IOT&E. While significant progress has been made by the program in reducing the root causes of software instabilities, several remain as well as numerous deficiencies in functionality that will potentially affect mission performance.

Maintainability and sortie generation require adequate integrated diagnostics. This capability will not be available until after planned software is implemented that allows maintenance personnel to operate the interface between planned support equipment and aircraft systems. Integrated diagnostics is required for an adequate IOT&E suitability evaluation. Maintaining the operational test aircraft during the IOT&E will require some contractor-operated special test equipment; consequently, the user has modified the maintenance concept for units that will operate initial production lots. In addition to sufficiently mature DHM, flight-line maintenance lacks the functionality in the integrated maintenance information system necessary to troubleshoot and track aircraft maintenance as well as adequate, useable technical order data for performing the required routine maintenance tasks. Recently, the Air Force determined that an F/A-22 unit will not need to deploy with as many personnel or materiel to repair low observable defects as was originally envisioned. However, maintaining the aircraft’s low observable features depends on validation of maintenance procedures, signature assessment system software and databases through adequate flight test.

The maintainability dilemma is exacerbated by lower than predicted reliability in aircraft systems and the cockpit canopy has fallen far short of its service life requirement, resulting in the need to procure additional spare canopies to support the IOT&E. Low aircraft systems reliability, in concert with the other suitability factors mentioned here, has resulted in very low sortie generation rates despite a significant amount of maintenance performed on aircraft used for operational test pilot and maintainer training. This has caused the operational test unit to re-plan the training program required prior to IOT&E. The suitability deficiencies must be corrected and adequate spare parts provided to be able to fully train the operational test force and subsequently succeed in IOT&E.

End-to-end weapons integration missile shots have had mixed results. Four shots have demonstrated the capability to engage and destroy enemy aircraft in specific, discreet combat representative scenarios. However, three other shots indicated fire control deficiencies exist that need to be resolved in development. Some F/A-22 weapons separation, fully integrated guided missile test launches, and JDAM testing are planned to be done concurrently with IOT&E. JDAM employment is planned for follow-on test and evaluation, to be conducted after IOT&E. DOT&E believes that a large F/A-22 development risk, from both a technical and schedule perspective, lies in the integration of the avionics suite with realistic air-to-air and, eventually, air-to-surface weapons employment.

The F/A-22 Air Combat Simulator (ACS), an integral part of the planned IOT&E, is intended to model the dense surface-to-air and air-to-air threat and electronic signal environment that is impractical or too costly to generate in open-air trails. Development of the ACS (consisting of four actual F/A-22 cockpits installed in visual scene domes and ten other manned interactive cockpit stations) continues, but delays in integrated avionics flight test and threat model-related development have affected ACS verification, validation, and accreditation activities. The contractor has taken steps to improve ACS realism and has a plan to provide a dense track environment in which to model F/A-22 performance. There is a risk that ACS cannot be accredited and contingency plans for additional open air testing are called for in the IOT&E test plan.

The ballistic vulnerability LFT&E program surfaced several vulnerabilites that the Program Office is working to resolve.

Significant F/A-22 operational capability is being deferred until after the start of IOT&E. Deferred testing includes the ferry configuration, external stores and JDAM carriage and release, full missile and gun employment envelope, and numerous system specification compliance test points. Deferred mission avionics capabilities include JDAM employment, AIM-9X integration, helmet mounted cueing system integration, Joint Tactical Information Data System transmit capability, and transition to the planned production version of the F/A-22 Common Integrated Processor, with attendant changes to avionics core processing. An updated Test and Evaluation Master Plan is required for DOT&E approval that details the test strategy for an adequate follow-on test and evaluation for the deferred capability, as well as deficiencies identified in IOT&E.

DOT&E assesses technical and schedule risk in providing an effective and suitable production representative weapons system for a successful IOT&E by the planned March 2004 start date as high. In particular, a sufficient amount of time must be allowed to incorporate fixes to test aircraft prior to the start of IOT&E, based on the assessment of performance in the preceding OT&E Phase I.

Global Broadcast Service (GBS)

The Global Broadcast Service (GBS) will augment and interface with other communications systems and provide a continuous, high-speed, one-way flow of high-volume data, audio, imagery, and video information streams at multiple classification levels to deployed and garrisoned forces across the globe. GBS consists of a space segment, fixed and transportable transmit suites, and fixed and transportable receive suites. The space segment of the current phase of GBS consists of four GBS transponders on each of three Ultra High Frequency Follow-On (UFO) satellites and leased commercial satellite transponders as required to meet demand.

GBS acquisition Phase I, conducted from FY96 to FY98, was used to develop the user requirements and concepts of operations. GBS Phase II, scheduled for completion in FY06, will develop near-worldwide GBS core operational capability and further refine operational requirements and employment concepts. GBS Phase III, scheduled to begin in FY06, is being addressed as part of the Transformational Communications Military Satellite Communications (TCM) program.

Technical problems and subsequent program delays led to a Joint Requirements Oversight Council decision to defer a small subset of capabilities, field the system with non-deferred capabilities, and then incrementally field upgrades until all the Operational Requirements Document (ORD) thresholds are met.

Three rounds of combined developmental test/operational test (DT/OT) were conducted between January 2001 and December 2002 at contractor and government developmental facilities on the East Coast, and in the Pacific Theater at operational locations. DT/OT #3 performed in November 2002 consisted of three major activities: Navy DT and an operational assessment (OA) of Shipboard Receive Suites (SRS) and Subsurface Receive Suites (SSRS); Air Force-led joint testing of fixed and transportable receive suites; and Army DT and an OA of the Theater Injection Point (TIP). Results indicated that the system would be ready for the multi-Service operational test and evaluation (MOT&E).

In late 2002, the GBS program was directed to shift their architecture from commercial Asynchronous Transfer Mode (ATM) equipment, with customized government application software, to an Internet Protocol (IP)-based approach. Production representative IP suites will be available for initial testing by the Services before the end of 2003.

The shift to IP occurs, however, as the Services are gearing up for their production buys starting in 2004. The Combined Test Force is working with the Program Office to support an aggressive combined DT/OT program leading up to a MOT&E in 2005, in time to support a 2005 beyond low-rate initial production acquisition decision. Because of the aggressive schedule, the MOT&E will not be able to test all terminal types and demonstrate all the deferred ORD capabilities. Therefore, a second MOT&E is projected for the beginning of 2006 to support the Initial Operational Capability (IOC) 2/IOC 3 declaration.

The incremental combined DT/OT strategy has worked in concert with the incremental fielding and evolutionary release of software builds to effectively bring the system to its present condition.

TEST & EVALUATION ACTIVITY

DT/OT with the TIP took place in three phases:

- Ku-band testing (May 6-17, 2002)
- Logistics Maintainability Demonstration (May 20-22, 2002)
- Ka-band testing (June 10-21, 2002)

The Air Force Operational Test and Evaluation Center (AFOTEC) and the 46th Test Squadron conducted the third round of DT/OT and pre-certification testing of the ATM-based GBS near the end of 2002.

MOT&E was postponed until FY05 due to ATM-based system limitations and GBS architecture transition to IP.

Operational test of the Navy SRS was conducted by the Operational Test and Evaluation Force in late 2003.

The Program Office and test community rewrote the Test and Evaluation Master Plan to reflect the IP-based strategy and it is currently in the signature process.

TEST & EVALUATION ASSESSMENT

Pre-certification testing indicated that most of the ATM-based system was ready to enter MOT&E. However, there were still a number of effectiveness and suitability issues with both the TIP and SRS. Given the limitations on the TIP and SRS, along with the projected phase-out of the ATM equipment, DOT&E supported an AFOTEC recommendation to defer the MOT&E for the IP-based system. AFOTEC wrote an OA using the pre-certification test data to support the declaring IOC 1 declaration. The Air Force Space Command has delayed declaring IOC 1, originally scheduled for September 2003. The incremental combined DT/OT strategy has worked in concert with the incremental fielding and evolutionary release of software builds to effectively bring the system to its present condition.

Broadcast software and overall system performance. The most recent testing indicates that product reception rates were 96 percent for unclassified data, 93 percent for classified data, and 100 percent for video products – both classified and unclassified. Spot beam control was successful for 100 percent of the requested moves within an average of six minutes. Some problems still exist with dynamic tuning and the loss of permanent virtual circuits with cryptography equipment. In addition, dynamic bandwidth allocation will not be possible until implementation of the IP architecture. Overall, reliability, availability, and maintainability are good.

Navy Receive Suites. The Navy 2002 OA determined that the SRS and SSRS are potentially effective and suitable. Product reception rates for the SRS were 77 percent for unclassified products and 82 percent for classified products, below the ORD threshold of 90 percent. Results from the Navy OT during August – September 2003 are still pending. Antenna blockage due to superstructure and other antennas is a Navy-unique problem. When a ship holds a course for a lengthy period such as during flight operations, this could pose a serious operational problem.

Theater Injection Point. TIP test results are fair, with an overall product reception rate of 44 percent for unclassified data and 28 percent for classified data. Generally, testing went well with the Ku-band broadcast, but significant problems occurred during the Ka-band broadcast. Hardware issues persist and there is no trained crew capable of operating the TIP without extensive support from a Raytheon contractor. Due to these deficiencies, the Joint Forces Command stated the TIP should not be deployed until corrective actions are implemented. Receive sites also lack adequate operating procedures with respect to reception of the TIP broadcast.

Other Considerations. AFOTEC found that the GBS system is in good condition with respect to interoperability and information assurance, but identified the following concerns of particular note:

- Slow connectivity and large data products. The GBS system delivers data to the Receive Suites at a rate of up to 23.5 megabits per second. In forward locations, the local area tactical networks are not always capable of disseminating this information rapidly enough to the end users.
- Beam Movements. Current operational security procedures call for three different beam movements to support a single submarine reception – two fictitious locations and one true location, so as not to compromise submarine locations. Since GBS operations support multiple submarines in theater and there is up to ten-minute programming delay in conjunction with each beam move, this could eventually result in a significant loss in broadcast time.

Global Command and Control System - Air Force (GCCS-AF)

The Global Command and Control System – Air Force (GCCS-AF) consists primarily of the Theater Battle Management Control System (TBMCS) with additional functionality provided under the umbrella of the Air Operation Center-Weapon System (AOC-WS) program. TBMCS provides hardware, software, and communications interfaces to support the preparation, modification, and dissemination of the Force-level Air Battle Plan (ABP). The ABP includes the Air Tasking Order and Airspace Coordination Order. TBMCS unit-level operations and intelligence applications provide Air Force Wings the capability to receive the ABP, parse it, and manage wing operations and intelligence to support execution of the ABP.

TBMCS supports the development and sharing of a common relevant operational picture of theater air and surface activity. Common TBMCS applications and interfaces provide a network for joint force data sharing. The TBMCS intelligence and targeting applications at the theater Joint Force Air Component Commander level, at the Air Support Operations Center (ASOC), and the Direct Air Support Center supports the coordination of precision engagement fires, safe passage zones, and near real-time warnings of impending air attack. The air and surface surveillance and weapons coordination engagement options enable synchronized operations and employment of the correct weapons for each target to generate the desired results. Engagement intentions and results assessments are shared by all TBMCS network participants, contributing to improved decision making by commanders.

TBMCS fielding includes every theater air component, all Navy aircraft carriers and command ships, all Marine Air Wings, and all Air Force flying wings and Air Support Operations Center squadrons. Army Battlefield Coordination Detachments also interface with TBMCS.

Since 1994, TBMCS has been under development and OSD placed it on oversight in 1999. The Program Management Office is the Air Force Electronic Systems Center at Hanscom Air Force Base, Massachusetts. The Air Force Operational Test and Evaluation Center became the lead test organization and coordinated the planning and conduct of two TBMCS Version 1.0.1 multi-Service operational test and evaluations, as well as operational tests of four subsequent enhancement releases. The 605th Test Squadron took the lead for future operational assessments. The unit-level intelligence (UL-Intel) and unit-level operations (UL-Ops) portions of TBMCS are tested and fielded separately, but interoperate with the Force-level system.

The TBMCS program made significant improvements since being on oversight and is compliant with the acquisition requirements for Major Automated Information Systems. Coordination among the Services for defining Service-unique requirements significantly improved, and the Service operational test agencies all work well together on this program.

The AOC-WS program is new and without a funding line for FY03. Test activity has been primarily limited to small, but high-priority improvements are needed to support Central Command efforts in the Middle East. Both TBMCS and AOC-WS are being combined to form GCCS-AF, and testing processes involving Service operational test agencies may need adjustment. TBMCS 1.1 and 1.1.1 versions, which were previously assessed as effective and suitable, are executing well in the field.

The Global Command and Control System - Air Force consists primarily of the Theater Battle Management Control System with additional functionality provided under the umbrella of the Air Operation Center-Weapon System program.

TEST & EVALUATION ACTIVITY

The following test activity took place during FY03:

- TBMCS UL- Intel Spiral 7 FDE, April 2003.
- TBMCS 1.1.2 (Force-level) Combined Developmental Test/Operational Test, May 2003.
- AOC-WS 10.0.2 Combined Developmental Test/Operational Test, May 2003.
- TBMCS UL-Ops Spiral 7 Development Test, June 2003.

TEST & EVALUATION ASSESSMENT

TBMCS UL-Intel is using a nine-month spiral development approach, with time programmed in the schedule for fixing problems found during early testing. During Spiral 7, this approach worked very well and problems found during developmental testing were fixed before the system entered final developmental evaluation. As a result, the final developmental evaluation went smoothly, and the system was assessed to be effective and suitable.

TBMCS 1.1.2 experienced a response slowdown associated with the intelligence server. Subsequent testing by the 46th Test Squadron in an automated developmental test environment revealed the problem still exists, and this version is currently assessed as not effective and not suitable. DOT&E agrees with the responsible test organization that this problem should be fixed before fielding approval.

Most systems within the AOC-WS baseline are produced and tested separately. Testing of AOC-WS 10.0.2 focused heavily on defining the AOC-WS end system configuration based on the evolving baseline used by Central Command, bringing the system under close configuration management and ensuring the various systems interoperate. Significant progress has been made. Eliminating the need for the virtual private network surrounding TBMCS will offer further improvements.

TBMCS Unit-level Operations Spiral 7 experienced numerous delays due to problems found in the software during developmental testing. Unit-level Operations Spiral 7 will be operationally tested in April 2004.

Joint Air-to-Surface Standoff Missile (JASSM)

The Joint Air-to-Surface Standoff Missile (JASSM) is a cruise missile launched from beyond-area air defenses in order to kill hard, medium-hardened, and soft/soft-distributed targets. It uses an Inertial Navigation System/ Global Positioning System for en route navigation and an imaging infrared seeker for refined terminal guidance. Threshold integration aircraft are the B-52H and F-16 Block 50.

The F-16 testing has been moved to follow-on operational test and evaluation (FOT&E) due to lack of an operationally representative software and aircraft. FOT&E will evaluate F-16 operational JASSM capability and address outstanding issues from IOT&E. JASSM Key Performance Parameters are missile mission effectiveness (the ability to survive and kill a defined target set), interoperability, missile range, and aircraft carrier operability. The Joint Requirements Oversight Council approved moving the Carrier Operability Key Performance Parameter until after Milestone III due to funding limitations and F/A-18 E/F test aircraft availability. F/A-18 E/F integration will be evaluated in a Navy FOT&E in FY04 or later.

The Air Force plans to buy more than 3,700 missiles over 13 years. The Navy currently plans to purchase 450 JASSMs. Approximately 360 missiles per year are planned for full-rate production.

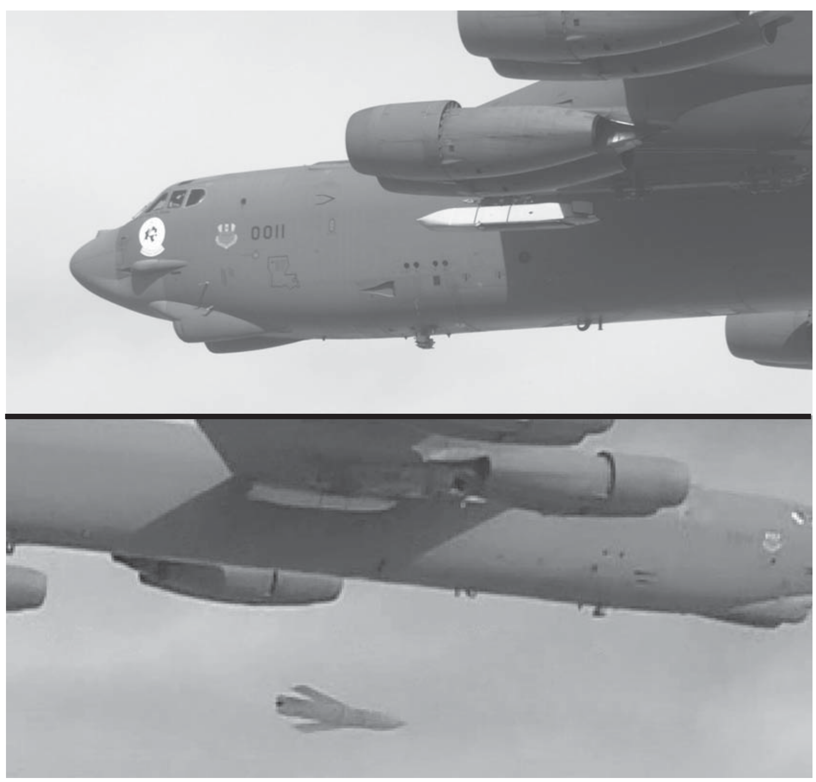
TEST & EVALUATION ACTIVITY

JASSM completed development testing in FY03. Problems discovered in development testing include fuze arming and an elevon failure. In November 2002, operational testing was stopped and JASSM was de-certified after the elevon failure. Lockheed Martin Integrated Systems (LMIS) developed a fix for the elevon and completed developmental testing with the corrected version. The Program Executive Officer re-certified JASSM for operational test in April 2003. Operational testing resumed in May to address issues found in operational testing during 2002, including water intrusion, mission planning, controls and displays, production missile coating, and production survivability signature. The Program Office provided missiles which incorporated these fixes. Mission planning and controls/ displays issues were applicable to F-16 as well as B-52 aircraft, but a representative F-16 was not available for the JASSM operational test. DOT&E granted approval to the operational test team to move F-16 testing into FOT&E. Any other issues found during IOT&E will be addressed in FOT&E.

The operational test team conducted 15 live-launch missile missions during multiple mission planning exercises and numerous ground handling evaluation events.

TEST & EVALUATION ASSESSMENT

DOT&E assesses seven operational test missions as successful, two missions as “no test” (due to test-unique circumstances that prevented test conduct or range constraints that don’t exist operationally), and six missions as failures. The mission successes show JASSM to be capable against the required targets. JASSM meets



The Joint Air-to-Surface Standoff Missile to kill hard, medium-hardened, and soft/soft-distributed targets.

the Key Performance Parameters of range, missile mission effectiveness, and interoperability. One mission discovered a problem with missile mission data changes. The crew changed missile missions (a typical crew procedure) leading to the loss of the preplanned seeker template for that missile. The missile successfully struck the target without seeker updates. The solution to this problem will be implemented with a missile software change and tested in FOT&E.

Of the six JASSM missiles with live warheads launched at realistic targets, four hit their targets. Two shots were required to kill a hardened bunker; however, a single shot killed a medium hardened bunker. The attack of a weapons bunker resulted in the failure of the warhead to detonate and no kill was achieved. There were a total of 15 live-warhead launches against realistic targets (developmental test and operational test), nine of which provided useful lethality data. Twice JASSM demonstrated it can kill a hardened bunker in just two shots and it can kill a representative medium-hardened bunker, communications van, radar, and weapons bunker with a single shot. Of the three flights in which the warhead failed to detonate (twice in FY01 against a radar and once in FY03 against a weapons bunker), the causes of failure have been identified only for the FY01 occurrences.

The six failures include problems in fuzing (two failures), engine start (one failure), and B-52 carriage and interface (three failures). The fuze failures were attributed to production quality control and are being mitigated by extra steps in fuze qualification and production oversight. The engine failure was attributed to damage from a foreign object in the fuel line and is being mitigated with changed production procedures to reduce the possibility of reoccurrence. The B-52 problems were attributed to computer processor and carriage equipment problems. These are being deferred to a later date when the B-52 avionics can be updated. In the short term, they are mitigated by changes in crew procedures to try to prevent the problems from reoccurring.

Reliability and maintainability testing included captive-carry, environmental, and aircraft loading evaluations on the B-52. Rainwater collected inside the protective ground covers and the missile itself, causing paint bubbling and electrical failures. The events completed after recertification show the viability of the fixes implemented to correct problems with water intrusion/retention and missile durability found during previous operational testing. These events also included testing with a re-designed missile cover. The redesigned cover does not mitigate all risks and problems found in using such a cover, but it corrects the mission-essential problems of water intrusion/retention.

The Air Force intends to develop and field a JASSM-Extended Range variant to increase the missile's standoff range. At a minimum, the engine and fuel system will be modified. DOT&E is working with the Air Force Operational Test and Evaluation Center and the JASSM Program Office to develop a test and evaluation strategy for this new capability.

Joint Direct Attack Munition (JDAM)

The Joint Direct Attack Munition (JDAM), produced by The Boeing Company, is a low-cost, autonomously-controlled, adverse weather, accurate guidance kit for the Air Force/Navy 2,000-pound Mark 84 and BLU-109 general-purpose bomb and the 1,000-pound Mark 83 and BLU-110 general-purpose bomb. The JDAM tail kit and wind strake assemblies are also to be adapted to the Mark 82 500-pound bomb. There are no planned design changes to the bombs. However, the existing inventory of weapons will be configured with JDAM guidance kits and wind strake assemblies. Guidance is accomplished via an Inertial Navigation System aided by the Global Positioning System (GPS).

The JDAM kit is required to yield a delivery accuracy of less than 13 meters when GPS is available and less than 30 meters when GPS is absent or jammed after release. JDAM is employed by a variety of fighter/attack and bomber aircraft, allowing precision engagement from all altitudes under adverse environmental conditions. The primary aircraft for integration and operational testing of the 2,000-pound JDAM were the B-52H and the F/A-18C/D. The F-16, F-14B, F-14D, F/A-18E/F, B-1, and B-2 are also operational users of the 2,000-pound JDAM. The 1,000-pound JDAM is to be tested and integrated initially on the F/A-18C/D, AV-8B, and F/A-22. The 500-pound JDAM is to be tested and integrated initially on the F/A-18C/D and B-2.

Low-rate initial production of the 2,000-pound variant was approved in April 1997. However, due to numerous problems with the design, the Under Secretary of Defense (Acquisition and Technology) approved the delay of Milestone III to 3QFY99. A total of four low-rate initial production decisions were rendered before a Milestone III approval in March 2001.

JDAM completed operational test of the 2,000-pound variant in August 2000. Operational tests were adequate to evaluate the operational effectiveness and suitability of the 2,000-pound variant. Test results demonstrated the 2,000-pound variant is operationally effective, but not operationally suitable. However, the high degree of effectiveness and substantial increase in targeting and weapon delivery flexibility were sufficient to justify fielding the 2,000-pound variant. The “not suitable” assessment resulted from shortfalls in container durability, system reliability, and a failure to meet mission-planning timelines.

DOT&E determined JDAM to be operationally effective only in combination with existing fuzes, specifically the FMU-139 and FMU-143. Testing is required with the FMU-152 Joint Programmable Fuze, but has not been completed due to numerous arming failures and subsequent decertification of FMU-152/JDAM combinations for both Air Force and Navy use. The Air Force will conduct operational testing of JDAM with the FMU-152 during initial operational test of the 500-pound JDAM variant in FY04 provided the FMU-152 completes developmental test and evaluation and production-representative fuzes are available.

MOT&E of the 1,000-pound JDAM variant delivered during the F/A-18 phase of operational testing confirmed operational effectiveness and suitability of the 1,000-pound Joint Direct Attack Munition when delivered from this aircraft.

TEST & EVALUATION ACTIVITY

The F/A-18 phase of the 1,000-pound variant multi-Service operational test and evaluation (MOT&E) concluded in January 2003. The F/A-22 phase of the 1,000-pound variant MOT&E is planned to begin in FY05.

Developmental flight test of the 500-pound variant began in FY02 and concluded in FY03. Testing consisted of separation tests and guided weapon release tests from both the F/A-18 and B-2 aircraft. MOT&E is planned for FY04 with the F/A-18C/D and the B-2.

TEST & EVALUATION ASSESSMENT

MOT&E of the 1,000-pound JDAM variant delivered during the F/A-18 phase of operational testing confirmed operational effectiveness and suitability of the 1,000-pound JDAM when delivered from this aircraft. Operational testing confirmed that JDAM reliability and mission planning now meet requirements. However, a redesigned JDAM container was not ready for evaluation during FY03 operational testing. Evaluation of a redesigned JDAM container will be conducted during initial operational test of the 500-pound JDAM variant. Delivery of the 1,000-pound variant from the F/A-22 is still necessary to complete MOT&E of the 1,000-pound JDAM.

Developmental tests of the 500-pound variant of the JDAM indicate performance that is comparable to the 2,000-pound and 1,000-pound variants.

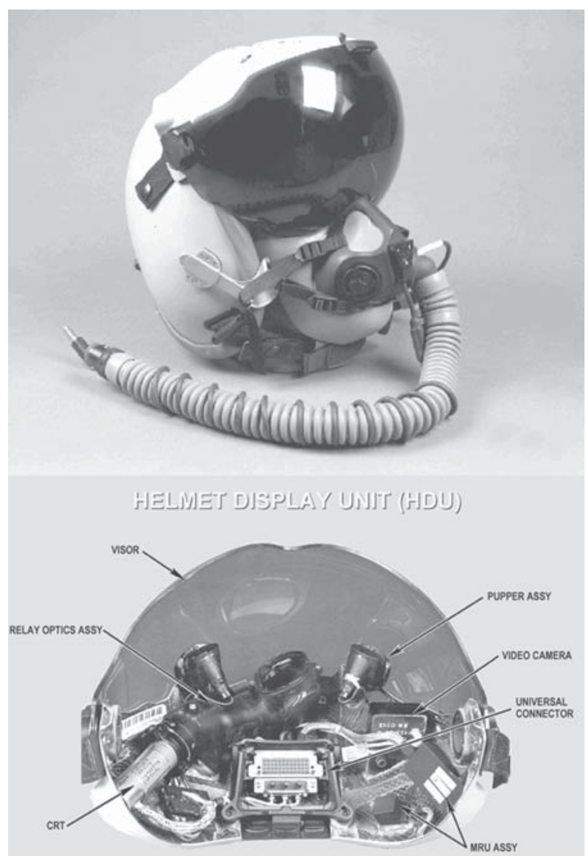
Joint Helmet Mounted Cueing System (JHMCS)

The Joint Helmet Mounted Cueing System (JHMCS) is a modified HGU-55/P helmet that incorporates a visor-projected heads-up display to cue weapons and sensors to the target. This new cueing system is intended to improve effectiveness in both air-to-air and air-to-ground missions. In close combat, a pilot must currently align the aircraft to shoot at a target. JHMCS allows the pilot to simply look at a target in order to designate it to one of the aircraft's weapons systems. This system projects visual targeting and aircraft performance information on the back of the helmet's visor, enabling the pilot to monitor this information without interrupting his field-of-view through the cockpit canopy. The system uses a magnetic transmitter unit fixed to the aircraft canopy rail and a magnetic receiver unit mounted on the helmet to define helmet pointing positioning. A Helmet Vehicle Interface interacts with the aircraft system bus to provide signal generation for the helmet display. This system demonstrates a significant improvement to a close combat targeting and engagement capability.

The JHMCS system will be employed in the FA-18C/D/E/F, F-15C/D, and F-16 Block 40/50 with a design that is 95 percent common to all three platforms. The Air Force has eliminated funding for JHMCS in the F/A-22. When used in conjunction with an AIM-9X missile, JHMCS allows a pilot to effectively designate and kill targets in a cone more than 80 degrees to either side of the nose of the aircraft, or high-off-boresight.

TEST & EVALUATION ACTIVITY

DOT&E approved the JHMCS Test and Evaluation Master Plan and the Air Force and Navy IOT&E plans for the system. Multi-Service operational test and evaluation (MOT&E) of JHMCS began in June 2001 for the Air Force and October 2001 for the Navy, and ended in June 2002. The final report on the MOT&E recommended fix-and-verification of eight deficient areas prior to a full-rate production decision. From January through March 2003, the Air Force Operational Test and Evaluation Center (AFOTEC) and the Navy's Operational Test and Evaluation Force (OPTEVFOR) performed Fix Verification on the eight deficient areas. While they found that several of the deficient areas were fixed or improved, the combined teams did not recommend the Air Force fielding or Navy fleet introduction until the Upper Helmet Vehicle Interface demonstrated to be more robust and yield a higher mean time between critical failure (MTBCF). On July 18, 2003, the Air Force headquarters (based on informal field reports of increased reliability) requested that AFOTEC reassess the JHMCS. The reassessment did not have OPTEVFOR participation. The Navy has equipped two squadrons with the JHMCS as an early operational capability and has used it for approximately ten months, flying over 4,700 JHMCS hours, including combat in Iraq.



The Joint Helmet Mounted Cueing System is a modified HGU-55/P helmet that incorporates a visor-projected heads-up display to cue weapons and sensors to the target. This new cueing system is intended to improve effectiveness in both air-to-air and air-to-ground missions.

TEST & EVALUATION ASSESSMENT

Initial tests for both the F/A-18C/D and F-15C revealed significant reliability deficiencies. The device that connects the helmet to the aircraft (helmet vehicle interface) was particularly unreliable. An operational assessment of the systems for the F/A-18C/D and

F-15C found the JHMCS potentially effective, but potentially not suitable due to numerous breaks in the helmet vehicle interface. Initial F-15C flight tests revealed that the legacy computer was slow in providing necessary data to JHMCS. This slow data input to the helmet, coupled with normal aircraft buffet during air combat maneuvering, made it difficult for the pilot to designate the target.

Since these initial tests, several corrections have been introduced, but have not improved reliability to an acceptable level. Based on MOT&E data collected from June 2001 to June 2002, DOT&E and the commanders of AFOTEC and OPTEVFOR determined that JHMCS was operationally effective, but not operationally suitable. Both the Navy and Air Force recommended delaying full-rate production until deficient areas are fixed and verified. DOT&E delayed its assessment to allow the Services time to fix the deficiencies.

The Air Force reassessment analyzed reliability data from Elmendorf Air Force Base, Alaska, and Nellis Air Force Base, Nevada, from April through July 2003. The MTBCF was 44.1 hours, just less than half the 93.7 hour requirement. The MTBCF achieved during MOT&E was one-third the required value (25.5 hours versus 74.3 hours). The requirement difference is based on different average sortie durations that are more fully described in the MOT&E final report. Preliminary data from the two still-deployed Navy squadrons indicate 81-91 flight hours between critical failures. While at first glance the Navy numbers suggest significantly better reliability, without the average sortie duration to calculate MTBCF on the same basis, no definitive conclusions should be made regarding reliability.

Based on MOT&E data and test observations, DOT&E determined that JHMCS was operationally effective, but not operationally suitable due to significant deficiencies in reliability and maintainability. DOT&E also concurs with the recommendation by both Services to delay full-rate production until deficient areas are fixed and verified. JHMCS brings a significant increase in combat capability by allowing aviators to look and designate air and ground targets in a matter of seconds without maneuvering their aircraft. If the Navy preliminary data noted above is confirmed through analysis, then DOT&E will consider revising its determination of operational suitability.

Both Air Force and Navy pilots who have flown the system concur that it adds substantial capabilities and remains a highly effective system. This capability, however, has two significant limitations: limited night utility and a Navy funding mismatch between the helmet and the high-off-boresite-angle missile, AIM-9X. The current system design should be enhanced to provide compatibility with night vision goggles. This could further expand the system's capability to include operations at night. The Navy's funding mismatch between the helmet and AIM-9X procurement resulted in the first F/A-18E/F squadrons deploying with only part (JHMCS) of their high-off-boresight combat envelope. The Navy will not realize the full air-to-air combat potential of the F/A-18E/F until it conducts follow-on operational test and evaluation of the F/A-18E/F with JHMCS and the AIM-9X missile, currently scheduled for spring of 2004.

Joint Mission Planning System (JMPS)

The Joint Mission Planning System (JMPS) program began in 1997 with the objective of replacing earlier planning systems and providing aircrews with well-structured automated flight planning tools for aircraft, weapons, and sensors. JMPS will provide support for unit-level mission planning of all phases of military flight operations and will eventually evolve to support Air Force, Navy, Marine Corps, Army, and U.S. Special Operations Command fixed and rotary wing aircraft, weapons, and sensors, including precision guided munitions (PGMs), cruise missiles, and unmanned aerial vehicles. It will have the capability to provide necessary mission data for the aircrew and will also support the downloading of data to electronic data transfer devices for transfer to aircraft and weapon systems.

A JMPS for a specific aircraft type will consist of the basic operating framework, common software components, and a basic mission planner, mated with a software module called a Unique Planning Component (UPC). UPCs provide functionality unique to a particular aircraft or weapon system.

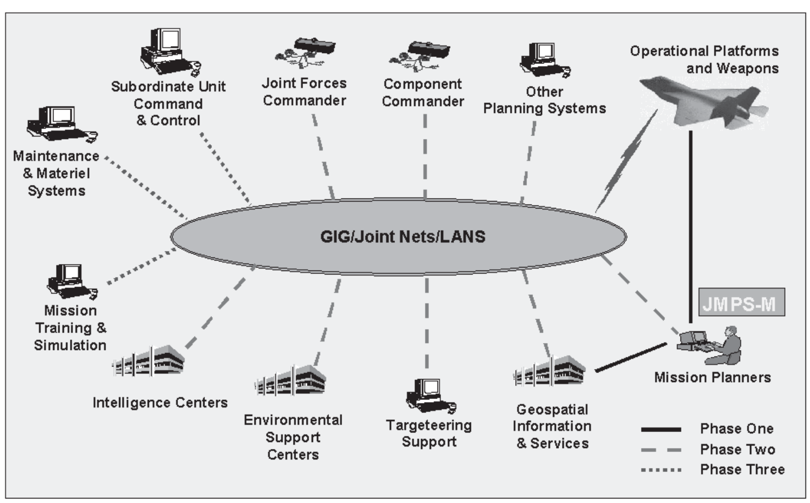
JMPS will be used in several different configurations for shipboard or land-based environments. Hardware is provided separately by each Service and will consist principally of commercial off-the-shelf computers, ranging from laptops to desktop systems to multi-processor workstations, depending upon the need for supporting specific weapon systems. Some configurations are non-network stand-alone configurations, while others include secure, network-connected systems, supported by servers. JMPS complies with the requirements of the Common Operating Environment, as applicable to Windows 2000.

Northrop Grumman Information Technology (NGIT) was selected in 1999 to develop JMPS Version 1.0 (JV1), the framework and common software components that enable basic flight planning capabilities. NGIT also delivered a Generic UPC and a Software Development Kit that can be used by independent developers to develop aircraft-specific and other common UPCs. JV1 was released on March 17, 2003, but will not be used operationally.

In July 2001, the Navy awarded a contract with NGIT to develop JMPS Version 1.1. Version 1.1 will be the first operational JMPS version to be fielded and will be used by Navy F-14, F/A-18, and E-2C aircraft. Version 1.1 augments JV1 with crypto key support, Global Positioning System almanac capability, and other functions. It also adds PGM planning capability, allows mission planning in a networked server environment, enables "walk away" mission planning, interfaces with critical data sources (weather, imagery, target data, threat data, and Strike Planning Folder), and provides functions needed to plan and prosecute Navy combat missions. JMPS Version 1.1 is being developed using a spiral development process with three beta releases. It is scheduled to enter OT&E in March 2004 and to be fielded by September 2004. JMPS Version 1.1 is also planned to replace the AV-8B Mission Support System in late 2004 and the EA-6B Tactical EA-6B Mission Support system in mid-2005.

In March 2003, the Air Force tasked NGIT to add capabilities to JMPS that will lead to JMPS Version 1.2. Version 1.2 will enable Air Force PGM planning and linking of PGM routes to aircraft routes. Other changes and enhancements to JMPS and the development of a UPC will allow fielding a JMPS planning system for the F-15E in 2005. Development of JMPS UPCs for other Air Force aircraft will begin in FY04, upon selection of a Mission Planning Enterprise contractor (or contractors).

In May 2003, the Air Force increased and centralized mission planning funding resulting in the Air Force program being designated a Preliminary-Major Defense Acquisition Program.



The Joint Mission Planning System will provide support for unit-level mission planning of all phases of military flight operations

TEST & EVALUATION ACTIVITY

Early builds of the Navy's JMPS Version 1.1 underwent an Enhanced Development Test (EDT) at the Naval Air Warfare Center–Weapons Division, Pt. Mugu, California, and Space and Naval Warfare, Philadelphia, Pennsylvania, in October 2002. The EDT expanded on the usual developmental test activities by having aviators representing the user communities plan realistic missions and comment on how Version 1.1 performed. The fleet aviators were also invited to originate deficiency reports on problems they encountered during testing.

A second phase of EDT (EDT Phase 2) was carried out at Pt. Mugu in March 2003 on Version 1.1, Build 0.2, which was released in February 2003. EDT Phase 3 on Version 1.1, Build 0.25 was conducted at Pt. Mugu during June 2003. During these test periods, a group of multi-Service fleet aircrew evaluated the system in stand-alone and client-server configurations.

The design of Version 1.1 was frozen in September 2003. Current plans call for a nine-week period for integration testing of UPCs. In December 2003, a final EDT will be conducted on the final Version 1.1 and beta versions of UPCs. A three-month period of regression testing will then lead to an OT&E readiness review in February 2004. OPEVAL of Version 1.1 will proceed in parallel for all aircraft platforms for a six-month period beginning in March 2004. Fleet release is expected in September 2004.

TEST & EVALUATION ASSESSMENT

The EDT periods conducted on JMPS Version 1.1 have been valuable in identifying performance issues of concern to aircrews early-on that are being addressed before delivery of the final product. EDT Phase 1 identified numerous discrepancies and high-risk operational issues that could have prevented JMPS from being effective and suitable. The areas with the most discrepancies were route planning, printing of briefing materials, performance calculations, and tasking.

EDT Phase 2 saw progress in JMPS performance and a reduction in the number of deficiencies reported. Stability and maturity of the software was improved; however, system performance issues persisted. Among the concerns reported were slowness in accessing mapping data, calculating route data, starting up the program, and filtering threats. Some functions were rated as "user-unfriendly," because of the complexity of operation or the time it took for execution.

EDT Phase 3 provided fleet user evaluations of several new Version 1.1 functions, including mission binders, collaborative planning, early versions of UPCs for F/A-18, E-2C, EA-6B, and the Electronic Warfare Tactical Information Report and Management System. Over 80 hours of testing was conducted using operationally realistic scenarios. Once again, performance problems requiring further development were identified and a significant number of deficiency reports were generated. Nevertheless, the user community assessment concluded that JMPS Version 1.1, Build 0.25 had a markedly lower risk for entry into OT&E compared to previous developmental versions of the software.

Test planning for OT&E of JMPS Versions 1.1 (Navy) and 1.2 (Air Force) continued throughout FY03. The planned test programs appear to be adequate; however, the details of these plans have yet to be documented in approved Test and Evaluation Master Plans (TEMPs) or test plans. Both the Navy and Air Force TEMPs are still in draft form. The Air Force TEMP is in final coordination within the Air Force. The Navy (JMPS-Maritime) TEMP is not expected to complete Navy coordination until January 2004. Delays in the TEMPs resulted in part from delays in approval of the Services' Operational Requirements Documents (ORDs). The Navy's ORD was signed in June 2003, but the Air Force ORD remains in coordination.

Considering the status of JMPS, the Navy's TEMP and test plans are seriously overdue and the Air Force TEMP and test plans need to be delivered soon. This represents a high risk to the Navy system entering OT&E on schedule.

Joint Primary Aircraft Training System (JPATS)

The Joint Primary Aircraft Training System (JPATS) is a system of primary flight training devices tailored to meet Air Force and Navy aircrew requirements. The principal JPATS mission is to train entry-level Air Force, Navy, and Marine Corps student pilots in primary flying skills to a level of proficiency at which they can transition into advanced training. Such training leads to qualification as military pilots, navigators, and naval flight officers. JPATS is designed to replace the Air Force T-37B and Navy T-34C aircraft and their associated ground-based training systems.

The JPATS consists of the T-6A Texan II air vehicles, simulators and associated ground-based training devices, a training integration management system (TIMS), instructional courseware, and contractor logistics support. The Services will acquire common aircraft and the remaining components will be as common as possible. Logistics support is tailored to each Service's maintenance concept.

Initial student training began in October 2001 at Moody Air Force Base, Georgia. Currently, aircraft are being delivered to Laughlin Air Force Base in Del Rio, Texas, the second entry-level student training base, and to the Naval Air Station in Pensacola, Florida, where naval flight officers training began September 2003.

TEST & EVALUATION ACTIVITY

A multi-Service system-level, end-to-end test with a class of entry-level students began in June 2002 at Moody Air Force Base, Georgia, and concluded in January 2003. The composition of the class was twelve Air Force and five Navy students who were observed throughout the entire course. This was the first time the aircraft and the ground-based components were evaluated as a complete system.

In addition to student training, resolutions for some of the previously identified deficiencies were addressed. The two major safety related deficiencies from the T-6 OT&E were corrected. First, the environmental control system has been redesigned. Retrofits on delivered aircraft and installation on production aircraft are in progress. A second deficiency was the ultra-high frequency radio being intermittent in certain aircraft attitudes. An additional antenna is being installed on all aircraft to fix this discrepancy.

Follow-on operational test and evaluation (FOT&E) began in October 2003, and will continue for approximately two years. DOT&E approved the test plan for FOT&E in September 2003. Four major areas that will be assessed during FOT&E are a Navy-specific T-6A evaluation at Naval Air Station Pensacola, Florida; an Air Force TIMS evaluation at Laughlin Air Force Base, Texas; a T-6A suitability evaluation at Laughlin Air Force Base, Texas; and a Navy TIMS evaluation at Naval Air Station Corpus Christi, Texas.

The suitability evaluation at Laughlin Air Force Base includes a reliability and maintainability demonstration involving 25 aircraft and roughly 2,000 flight hours that will be conducted in FY04 to assess operational suitability and determine whether the aircraft is meeting contractual requirements.

TEST & EVALUATION ASSESSMENT

DOT&E's beyond low-rate initial production report to Congress, dated November 2001, concluded that the T-6A aircraft was operationally effective (with numerous limitations, deficiencies, and workarounds) and

Joint Primary Aircraft Training System is designed to replace the Air Force T-37B and Navy T-34C aircraft and their associated ground-based training systems.

not operationally suitable. Deficiency and safety related areas included the engine, environmental control system, ultra-high frequency and very-high frequency radio performance, flight manuals and checklists, the emergency oxygen system, ground egress, the trim systems, power control lever, wheel brakes, cockpit storage, and rear view mirrors. Improvements have been noted in the past year. Still unresolved are the inter-cockpit communications system, the emergency oxygen system, the slow rate of pitch trim (the trim system is currently in redesign), and braking performance. Suitability will be re-evaluated during FOT&E.

The T-6A ground-based training system consists of three major components: simulators and other aircrew training devices, the computer-based courseware, and the TIMS. The aircrew training devices and the computer-based courseware are working well with minor deficiencies. However, TIMS was not operationally effective or suitable during the end-to-end evaluation. Numerous workarounds and real-time changes were required to keep the system running. Functions that worked included academics, student status, schedule viewer, and the gradebook. Functions that required workarounds include the schedule build (flight-level only), training forecast schedule, maintenance, and the flight surgeon inputs. Many deficiency corrections have been incorporated since the last evaluation and the TIMS will be re-evaluated during FOT&E.

KC-135 Global Air Traffic Management (GATM) Upgrade

The purpose of the Global Air Traffic Management (GATM) program is to preserve DoD access to global air traffic routes and airfields into the 21st century by equipping aircraft to meet the requirements of the worldwide Future Air Traffic Management (ATM) System. The KC-135 is the lead DoD upgrade platform.

The key elements of the new ATM environment consists of communications, navigation, and surveillance (CNS). In this environment, aircraft must maintain accurate position, and send aircraft position and intent to ground Air Traffic Control facilities and other aircraft via a data link. The FAA and other air traffic control entities mandated reduced vertical separation minima (RVSM) in specific areas and required navigation performance (RNP) in the future. In addition to digital radios and satellite communications, voice communications are augmented by direct controller-pilot data link communications (CPDLC). The Mode S transponder, Automatic Dependent Surveillance (ADS), and the Traffic Alert and Collision Avoidance (TCAS II) components make up the surveillance capability. These capabilities allow reduced aircraft separations and new ATM procedures to be introduced maximizing the use of desirable airspace while maintaining safety standards. A summary of the CNS upgrades with associated equipment is listed in the table below.

Category	Component
Communication Digital Radios to Handle Reduced Channel Spacing and Data Link	8.33 Radios, SATCOM/HF/VHF, Controller-Pilot Data Link Communications
Navigation Better Horizontal/Vertical Position Accuracy to Enable Reduced Separation	Horizontal - 30 nm vs. 100 nm, Vertical - 1000 ft vs. 2000 ft, No Frequency Modulation Radio Interference
Surveillance Enhanced Situational Awareness, Automatic Position Reporting Collision Avoidance	Automatic Dependent Surveillance, Mode S, Traffic Alert and Collision Avoidance

TEST & EVALUATION ACTIVITY

The KC-135 GATM test and evaluation program was conducted in three phases during the initial fielding of the GATM elements: Phase I and Phase II/IIA were Qualification Test and Evaluation, and Phase III was the dedicated IOT&E. Phase I (October 2001 to January 2002) involved laboratory testing of the prototype configuration. Phase II (January 2002 to November 2002) involved ground and flight test of the installed GATM equipment on prototype aircraft. Phase IIA (October 2002 to August 2003) involved the installation of the production representative changes on prototype aircraft and ground and flight testing.

The KC-135 Global Air Traffic Management upgrade - the lead DoD platform - provides access to global air traffic.

The Air Force Flight Test Center was responsible for developmental test and evaluation, laboratory, ground, and flight test with the prime contractor as the participating test organization. During Phase II/IIA, the Air Force

Operational Test and Evaluation Center (AFOTEC) participated in order to determine readiness for IOT&E. Upon completion of Phase IIA, AFOTEC conducted Phase III IOT&E in October 2003 on GATM production representative aircraft.

Two distinct Integrated Systems Evaluations were performed during the developmental phase to prepare for the IOT&E. The Integrated Systems Evaluations were conducted in operationally realistic global environments to demonstrate readiness for IOT&E.

DOT&E approved the Test and Evaluation Master Plan and Operational Test Plan in September 2003.

TEST & EVALUATION ASSESSMENT

AFOTEC conducted the IOT&E from September 15, 2003, to October 8, 2003. The aircraft located at Fairchild Air Force Base, Washington, the initial operational unit for GATM-equipped tankers, conducted local air refueling sorties, maintenance demos, and information assurance testing. One aircraft flew around the world to demonstrate capability across a range of air traffic control centers, including operation in 12 of the 17 Flight Information Regions of military interest. The majority of future air navigation (FANS) system airspace was accessed, as well as other regions where the KC-135 performs its mission. Air refueling was conducted during several of these missions.

The results of the testing are being evaluated. A detailed evaluation will be contained in the beyond low-rate initial production report in 2004.

Large Aircraft Infrared Countermeasures (LAIRCM)

The Air Force intends for the Large Aircraft Infrared Countermeasures (LAIRCM) system to enhance individual aircraft survival. The fundamental requirement for the LAIRCM system is to provide protection against man-portable, shoulder-fired, and vehicle-launched infrared guided missiles. The system will be installed on the C-17, C-130, and KC-135 aircraft. The Air Force intends for LAIRCM to autonomously detect and declare infrared threat missiles then track and jam the missiles to create a miss, resulting in aircrew and aircraft protection.

The system currently consists of five basic elements: a Control Indicator Unit (CIU), an ultraviolet Missile Warning Subsystem (UV MWS), a Fine Track Sensor (FTS) subsystem, a Countermeasures Processor (CP), and a laser jam source subsystem. The CP is the master system controller and the interface among the subsystems. The Air Force may install up to three laser jammers on each aircraft type. In 2003, the Air Force tasked the LAIRCM program to support two Quick Reaction Capability requirements to get IRCM equipment into the field as quickly as possible. The first capability installed and tested a one-jammer turret configuration (vice three on the full-up system) on the C-17. The second requirement installed a system on the MH-53M Pave Low IV helicopter gunship. LAIRCM will undergo developmental test/operational test (DT/OT) and IOT&E on the C-17 during FY04 to support the full-rate production decision.

In response to the urgent requirement stated in the LAIRCM Operational Requirements Document, the Aeronautical Systems Center developed an evolutionary strategy to yield a near-term solution for the protection of large transport type aircraft. The use of proven subsystem solutions, integrated into a LAIRCM system, is the first step in the LAIRCM Evolutionary Acquisition strategy to address the overall requirement. This first step, designated Phase 1, is to identify a near-term LAIRCM solution. The LAIRCM System Program Office, in association with Air Force Research Laboratory, conducted comprehensive market research to evaluate options available from industry as well as from government programs. Based on the market research, only four subsystems demonstrated the maturity and performance to provide a near-term solution. All or part of the selected subsystems will comprise the LAIRCM system. Four of the subsystems (CIU, FTS, CP, and UV MWS) will come directly from the Special Operations Command's (SOCOM) DIRCM program, presently in production. The final subsystem will be a Multi-Band Laser Subsystem, which has been developed by Northrop Grumman as part of its Internal Research and Development Program and has undergone considerable laboratory and field testing. The United Kingdom (UK) has installed the system on nine different aircraft types and there are plans for integration on eight additional aircraft types. SOCOM procured DIRCM systems under the UK contract. DOT&E approved the IOT&E Plan in October 2003.

TEST & EVALUATION ACTIVITY

All the subsystems, with the exception of the laser jammer, are non-developmental items and SOCOM had previously tested them as part of the special operations C-130 Directed Infrared Countermeasures (DIRCM) program. In 2002, the Air Force tested the multi-band laser as part of the LAIRCM system at the hardware-in-the-loop facility known as the Air Force Electronic Warfare Evaluation Simulator, and at the Aerial Cable Range during the operational assessment (OA) that supported the Milestone C low-rate initial production decision in August 2002. In FY02 and FY03, the SOCOM aircraft underwent Operational User Evaluation Tests on four different types of C-130s to ensure effective operation prior to deployment.

The Large Aircraft Infrared Countermeasures system is to provide protection against man-portable, shoulder-fired, and vehicle-launched infrared guided missiles.

In FY03, the primary T&E activities were two quick-look tests performed to support the Quick Reaction Capability (QRC) requirements on the C-17 and the MH-53 helicopter. Both aircraft needed IRCM protection for their operations in South West Asia. The C-17 installation, known as LAIRCM Lite, consisted of six missile-warning sensors (MWSs) and one laser jammer (vice the three planned for the standard C-17 configuration). The Air Force conducted effectiveness flights at Edwards Air Force Base, California. These tests consisted of irradiating the aircraft with ground-based missile plume stimulators to determine if the system produced the correct jamming energy from the aircraft to a sensor on the ground. The Air Force evaluated false alarm susceptibility and the robustness of the LAIRCM Lite system on the aircraft. The Air Force tested the MH-53 system, known as the MH-53 DIRCM system, in a similar manner at Eglin Air Force Base.

The Air Force Operational Test and Evaluation Center (AFOTEC) plans to conduct DT/OT and IOT&E for the C-17 and C-130 in FY04. The DT/OT tests will include open-air range tests, a sled test to ensure that the laser jamming can irradiate jamming energy on a missile seeker that is moving at realistic missile speeds, and several flights to test suitability in operational environments such as unprepared runways and tactical descents. AFOTEC has accredited models and simulations based on the FY02 OA and the QRC quick-look tests. Together with the open-air test data, these models will be used to evaluate the FY04 DT/OT and IOT&E results.

TEST & EVALUATION ASSESSMENT

LAIRCM, using the majority of the components of the already fielded DIRCM system, has met with success in its OA and DT/OT tests to date. The previously accomplished C-130 tests, the several successful live fire tests against the DIRCM system, and the extensive qualification and environmental tests that were performed on the DIRCM system all substantially mitigated the usual risks associated with complex systems in development. The DIRCM program had to solve several problems during its infancy, which resulted in a more mature system for LAIRCM. The only developmental component within LAIRCM is the multi-band laser, which to date has performed almost flawlessly during the 4,000 runs in hardware-in-the-loop tests, 150 hours of system operating time, and during the LAIRCM Lite and MH-53 DIRCM tests.

Prior to the QRC flight tests discussed above, one of the main concerns was whether the laser jammer could withstand the vibration and temperature environment in the C-17's tail section. Considerable engineering analysis and preliminary flight tests with representative mock-up models of the equipment were conducted to measure the vibration and temperature levels at that location. Incorporating a rigid truss assembly in the tail cone reduced the vibration levels. This appears to have been successful since there were no laser jammer failures during these flights. There were no failures in the MH-53 vibration environment.

Although the LAIRCM Lite and the MH-53 tests were successful, they were limited in scope. The MH-53 tests conducted at Eglin used two of the same laser jammers and four of the MWSs that are used in the C-17 system. Although both were abbreviated tests, the C-17 LARICM Lite and the MH-53 DIRCM systems performed adequately enough to be deployed as QRC systems. To support full-rate production of the multi-jammer system, a more detailed test and analysis of the system performance is required and scenarios that are more realistic should be performed. In order to test the interactions of the three-jammer configuration, scenarios that include more than one missile simulator/stimulator together with false alarm sources should be included. In addition, operational flight profiles should be flown that test the suitability of the system when aircraft lands on unprepared runways and conducts tactical descents. These types of tests are planned for the C-17 LAIRCM DT/OT in December 2003 and the IOT&E in January/February 2004. A similar DT/OT and IOT&E are planned for the C-130 in February- May 2004. Use of the modeling and simulation described earlier will support the overall system evaluation.

Milstar Satellite System

The Milstar satellite system supports strategic and tactical missions through global communications that are secure, jam-resistant, survivable, and have a low probability of intercept. Milstar provides worldwide coverage for multi-Service ground, airborne, submarine, and ship-borne terminal communications connectivity. There are three Milstar segments: space, terminal, and mission control.

The Air Force has launched six Milstar satellites between 1994 and 2003. The third Milstar launch placed the first low-data rate/medium-data rate (LDR/MDR) satellite (Flight 3) in a non-operational orbit. In lieu of an additional Milstar satellite to replace Flight 3, the Air Force Space Command (AFSPC) and the United States Strategic Command elected to wait for the first flight of the Advanced Extremely High Frequency (AEHF) satellite program (Pathfinder), currently scheduled for launch in December 2006.

AFSPC declared Initial Operational Capability (IOC)-1 for Milstar on July 21, 1997. The Milstar LDR system currently supports IOC-1 missions. Multi-Service operational test and evaluation (MOT&E) of the LDR/MDR satellites began in late FY01. The program office, the user community, and the operational test community are working toward an IOC-2 decision in December 2003. AFSPC is considering whether to declare IOC-2 in December 2003 despite the fact the communications resource planning and monitoring software will not have completed testing.

The Air Force Operational Test and Evaluation Center (AFOTEC), the lead operational test agency for the Milstar program, completed LDR IOT&E in March 1997. The Milstar IOT&E Final Report (August 1998) stated that the Milstar LDR system was effective and suitable with limitations. DOT&E and AFSPC directed AFOTEC to retest six measures of performance (MOPs). Of these, AFOTEC retested three connectivity MOPs during the period of September 1999 to February 2000. AFOTEC also conducted tests from June 2000 to May 2001 to re-evaluate two suitability MOPs. The final MOP, system endurance, has not yet been tested and is discussed in more detail below.

TEST & EVALUATION ACTIVITY

Most of the test activity this year involved developmental and combined developmental/operational testing of the mission planning element and Flight 6.

The Automated Communications Management System (ACMS) continued a series of test events to show that the mission planning element meets IOC-2 requirements to support MOT&E and a fielding decision. However, deficiencies discovered during testing have required additional software releases, with the next release planned for December 2003. Testing is currently scheduled to continue through March 2004, after the IOC-2 decision.

Flight 6 on-orbit tests focused on regression tests of Flight 5 issues: completion of the Milstar “ring” constellation, performance of multi-satellite MDR communications, inter-satellite timing resolution, and evolving ACMS capabilities.

Ongoing on-orbit testing and operational use of the low-data rate/ medium-data rate satellites indicate that the space segment is performing as expected.

TEST & EVALUATION ASSESSMENT

The Milstar Space Segment, as currently fielded with LDR and MDR capability, continues to perform well. Ongoing on-orbit testing and operational use of the LDR/MDR satellites indicate that the space segment is performing as expected. Formal assessment of MDR operational effectiveness and suitability will be made after the completion of MOT&E.

The loss of Flight 3 degrades operational utility. Worldwide coverage from 65 degrees South to 65 degrees North latitude will not be available for the Milstar MDR terminals until the launch of the AEHF Pathfinder satellite in FY07. The lack of a fourth MDR satellite will limit the ability to provide two-satellite coverage to some contingency operations and, therefore, limit the throughput of protected communications. Another impact of the loss of Flight 3 is that approximately 25 degrees of longitude will have no MDR coverage (based on current plan for satellite placement).

The Milstar Terminal Segment has mixed results. The Navy's LDR terminals have been successfully fielded for five years, while its MDR-capable version is currently experiencing reliability problems. The Air Force airborne terminal demonstrated the required reliability and maintainability. The Army ground terminals demonstrated reliability and maintainability shortfalls. The Army Test and Evaluation Command assessment of these shortfalls did not result in a critical mission impact based on current employment plans. Further discussion of the Navy's Extremely High Frequency Satellite Program terminals is provided separately in this annual report.

The LDR Mission Control Segment performed its mission successfully. During LDR IOT&E, however, the mobile constellation control station's endurance capability was not tested adequately. DOT&E directed a full test of the endurance requirement during follow-on testing. AFOTEC is working toward conducting the endurance retest in 2QFY04 and has identified their requirements to the United States Strategic Command to plan an appropriate test event.

Delays in development of ACMS are of concern. Because of the existing shortfalls of ACMS, the Army and Navy fielded their terminals with interim planning software (the Milstar Communications Planning Tool – integrated (MCPT-i)) as their primary planning tool, and do not plan to use ACMS. The Army has not yet tested nuller visibility, and interoperability between ACMS and MCPT-i should be verified.

There is currently no concept of operations for the Joint Task Force mission. Testing of the Joint Task Force mission is critical to evaluate interoperability of the Milstar system and terminals in an operational context. Some interoperability demonstrations have been conducted during developmental testing, including the Joint Interoperability Test Command MDR interoperability test. Informal results from these tests show coding, encryption, and modulation equipment incompatibility issues between Army and Navy terminals. Until the concept of operations is specified, it is not known if the limited equipment used in these tests is operationally representative.

Minuteman III Guidance and Propulsion Replacement Programs

The Minuteman III Intercontinental Ballistic Missile (ICBM) consists of three solid propellant stages (including rocket motors, inter-stage hardware, and ordnance), the liquid Propulsion System Rocket Engine, and the guidance set that can deliver up to three re-entry vehicles. Five hundred Minuteman III ICBMs are currently deployed at three operational bases.

The Guidance Replacement Program (GRP) is a set of hardware and software modifications designed to extend the service life of the Minuteman III while preserving its current capabilities. This program is needed to prevent a projected decline in reliability due to aging electronic components and unavailable replacement parts. GRP replaces the guidance computer, signal converters, and power distribution components while retaining the current Minuteman III inertial measurement unit.

The Propulsion Replacement Program (PRP) will extend the life of the Minuteman III operational force by replacing the solid propellant propulsion subsystems. In addition to hardware, PRP modifies two Minuteman III software elements: the Minuteman Operational Targeting Program and the Flight Program Constants Tape. These software modifications require use of the GRP-modified guidance system.

DOT&E conducted an independent assessment of the GRP program from 1996 through 1999. DOT&E determined that the GRP upgrades were operationally effective and suitable.

TEST & EVALUATION ACTIVITY

All programmed operational test activities have been completed for GRP and PRP. Both programs are currently in full-rate production.

TEST & EVALUATION ASSESSMENT

DOT&E found both GRP and PRP to be operationally effective and suitable even though accuracy performance, which is primarily attributed to the guidance system modified by GRP, fell slightly short of the operational requirement. DOT&E determined that the shortfall in accuracy is offset by the overall improvement in weapon system reliability, which makes the Minuteman III weapon system more operationally effective than Minuteman III with the current guidance and propulsion systems.

After seven flight tests with the modified guidance system, the Air Force found that accuracy results were not in agreement with expectations. Accordingly, the Air Force conducted a supplemental accuracy investigation that identified two primary sources of error in the guidance system software. One source was erroneous implementation of computational precision. In some navigation calculations, truncation was implemented where round-off was intended. In some guidance calculations, better approximations were needed to maintain adequate precision. The other primary error source was a small, undesired residual velocity bias introduced into the calculations that govern the attitude of the re-entry vehicles at deployment. The factors leading to the bias have a

The Minuteman III weapon system enhanced by GRP and PRP is more operationally effective than Minuteman III with the current guidance and propulsion systems.

complex dependence on the azimuth and trajectory. For test-flight missions from Vandenberg Air Force Base, California, to Kwajalein, the errors reinforce one another. In other trajectories, the errors might increase dispersion but not contribute significantly to the weapon delivery error. Operational trajectories would still have been less than optimum if this situation had not been discovered, so it is fortunate that the Westerly test trajectory highlighted the problem.

The Air Force initiated corrective actions though an Accuracy Upgrade Program (AUP). To date, the Air Force has conducted a total of four NS-50 flights with the AUP corrections, two in each of FY02 and FY03. The downrange biases observed previous to the AUP modifications appear to have been corrected. Additional NS-50 flights will be conducted in accordance with the FDE program. DOT&E will continue to monitor the results of this program.

Multi-Platform - Common Data Link (MP-CDL)

The Multi-Platform – Common Data Link (MP-CDL) was initially planned to replace the Joint Surveillance Target Attack Radar System (JSTARS) E-8C Surveillance and Control Data Link (SCDL), which transmitted data to/from the E-8C and its ground station, the Common Ground Station (CGS). The Air Force restructured the MP-CDL program to be the data link for a Network Centric Warfare capability to support Network Centric Collaborative Targeting (NCCT) Advanced Concept Technology Demonstration (ACTD), in addition to its role supporting the Multi-Platform Radar Technology Insertion Program (MP-RTIP) family of systems. Because of difficulties determining the requirements, the Air Force has restructured the program as a technology development and experimentation program. The MP-CDL program will produce a few systems with which to explore concepts and capabilities. If those capabilities meet an operational need, the Air Force may decide to produce them for employment on combat systems.

MP-CDL originated as a program to replace the JSTARS SCDL. The enormous quantities of data that the MP-RTIP sensor should generate, in particular Synthetic Aperture Radar imagery, drives the need for a replacement to the SCDL. MP-CDL provides several orders of magnitude greater throughput than the SCDL. MP-CDL will provide the means to exchange data between the JSTARS E-8C and CGS, Global Hawk, E-10A Multi-sensor Command and Control Aircraft, and the Army and Air Force Distributed Common Ground Systems. MP-CDL is currently planned as a line-of-sight (LOS) data link. The criticality of that LOS data link was demonstrated by the SCDL in Operation Iraqi Freedom. However, the Air Force is also considering a requirement for a beyond-LOS (BLOS) for the MP-RTIP family of systems because, in most contingencies (e.g., peacekeeping contingencies in the former Yugoslavia) BLOS has been the only means of transmitting data to the warfighters who needed it.

The Air Force restructured the MP-CDL program to support the NCCT ACTD. The NCCT ACTD requires the low data latencies provided by MP-CDL rather than its high throughput. The NCCT ACTD is intended to provide a combat capability by networking Command Control and Intelligence Surveillance and Reconnaissance assets into a collaborative entity. NCCT should dramatically improve target location accuracy, timeliness, and combat identification certainty for the warfighter. Networking optimizes high-speed machine-to-machine interaction between sensors for detection, association, and correlation of high-interest and time-sensitive targets. NCCT is focused on the find, fix, track, and assess elements of the find, fix, track, target, engage, and assess kill chain.

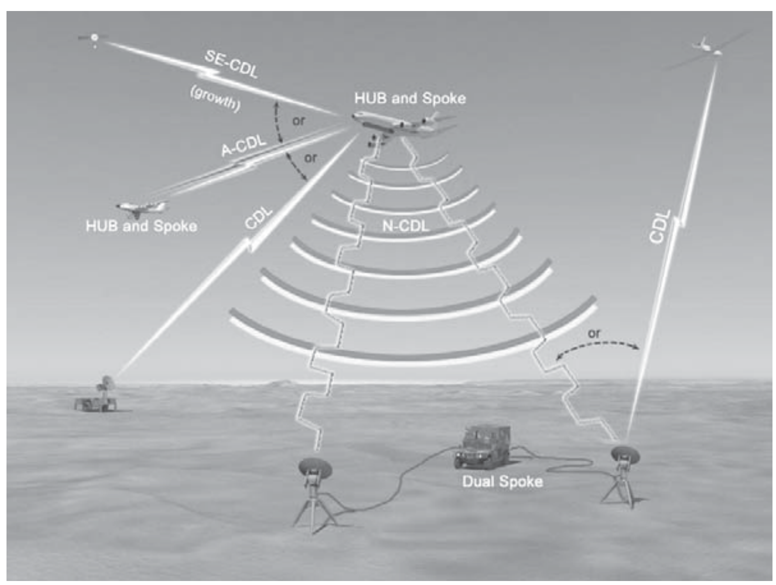
TEST & EVALUATION ACTIVITY

The Air Force Operational Test and Evaluation Center has begun development of an operational test concept for MP-CDL.

The MP-CDL Program Office has initiated Test and Evaluation Master Plan preparation for a Milestone B planned for 2005.

TEST & EVALUATION ASSESSMENT

The MP-CDL is being designed to connect many joint command, control, communications, computers, intelligence, surveillance, and reconnaissance (C4ISR) platforms. Therefore, coordination with each of these platforms will be crucial during development. Thus far, the MP-CDL program has not produced an Operational Requirements Document, in part because of CDL users' concerns that the MP-CDL's broadcast mode has potential to cause significant electromagnetic interference. The current acquisition strategy was conceived



The Multi-Platform-Common Data Link is being designed to connect many joint command, control, communications, computers, intelligence, surveillance, and reconnaissance platforms.

as a means to continue test and experimentation to support the MP-RTIP data link and NCCT requirements, while allowing the CDL community time to resolve the potential problems. However, the Air Force has indicated a need to field MP-CDL terminals produced under this strategy if MP-CDL meets the Air Force's requirements. Therefore, continued oversight of MP-CDL by the multi-Service CDL community and DOT&E will be required to ensure that the system meets joint requirements.

The linkage between MP-CDL and the NCCT ACTD is also a cause for concern. Many of the platforms that require MP-CDL to handle the large volumes of data generated by MP-RTIP are also platforms that will eventually participate in NCCT after it is fielded. This creates the possibility that platforms might end up with an MP-CDL terminal adequate to support NCCT's needs, but not MP-RTIP's needs.

Multiple-Platform - Radar Technology Insertion Program (MP-RTIP)

The Multiple-Platform – Radar Technology Insertion Program (MP-RTIP) evolved from the Block 40 upgrade to the Joint Surveillance Target Attack Radar System (JSTARS) E-8C, designated the Radar Technology Insertion Program (RTIP). The Air Force restructured RTIP as MP-RTIP and directed the Program Office to develop a scalable sensor for multiple platforms, including Global Hawk and NATO and allied Air-Ground Surveillance (AGS) platforms. Additionally, the MP-RTIP program conducted an Analysis of Alternatives to determine whether to install the sensor on a B-707 or on a newer aircraft. Using this analysis, the Air Force decided a B-767-400ER best suited their needs for capability and growth, which is now the E-10A Multi-sensor Command and Control Aircraft (MC2A) program.

The purpose of the MP-RTIP is to provide enhanced Wide Area Surveillance (WAS) system capabilities to the warfighter, a robust Global Hawk reconnaissance and surveillance capability, and enable NATO and allied AGS programs. To that end, MP-RTIP will include design of a modular, scalable two-dimensional active electronically steered array radar, and development, fabrication, and test of MP-RTIP radars suitable for future integration on various airborne platforms. The piloted aircraft for WAS will be the E-10A platform. Additionally, the Air Force will integrate a radar onto the Global Hawk platform and the United States will develop and demonstrate a radar suitable for the NATO AGS program, if NATO selects an MP-RTIP-based sensor.

The MP-RTIP sensor consists of three architectural elements. These elements are the antenna, the radio frequency electronics, and the signal processor. The architectural elements allow for common interface definitions across the various host platforms. The MP-RTIP software can function independent of the physical location of the hardware that it is controlling. The software architecture is also host platform independent to the maximum extent possible. A Radar Operating Services application is being co-developed by Northrop Grumman and Raytheon to provide a common interface between the common mode software and the hardware components.

In October 2003, the Under Secretary of Defense for Acquisition, Technology, and Logistics approved Milestone B for the program and authorized entry into System Development and Demonstration with the provision that the Air Force will fund the program to the Cost Analysis Improvement Group estimate that will be revised in 2004.

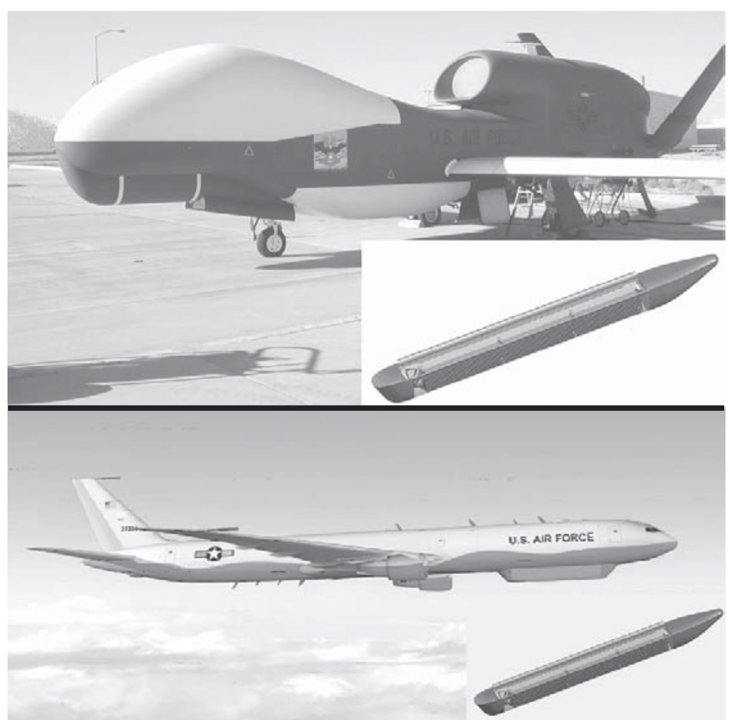
TEST & EVALUATION ACTIVITY

DOT&E approved the MP-RTIP sensor Test and Evaluation Master Plan in September 2003.

In support of the Milestone B decision, the MP-RTIP program conducted a classified operator in-the-loop (OITL) modeling and simulation event.

TEST & EVALUATION ASSESSMENT

MP-RTIP participation in OITL events has been used to explore how MP-RTIP can contribute to the conduct of the air war. Information gained from the OITL events will help scope future spirals of the E-10A and to ensure that the initial effort provides adequate provisions for follow-on spirals. Additionally, MP-RTIP conducted a classified OITL event, which showed its potential to positively impact the air war.



The purpose of the Multiple-Platform – Radar Technology Insertion Program is to provide enhanced Wide Area Surveillance system capabilities to the warfighter, a robust Global Hawk reconnaissance and surveillance capability, and enable NATO and allied AGS programs.

The risk associated with the interdependency of these multiple Acquisition Category 1D programs (E-10A, MP-RTIP and Global Hawk) must not be underestimated. The E-10A is dependent on MP-RTIP to deliver its primary sensor. MP-RTIP is dependent on E-10A to provide a test platform for the sensor. Planned delivery of the two will have to be closely coordinated to ensure neither has to wait for the delivery of the other. Due to the scope and the long lead times required for both programs, neither will be able to tolerate delays without experiencing significantly increased costs. The same coordination issues exist for MP-RTIP and Global Hawk.

National Airspace System (NAS)

The National Airspace System (NAS) program will replace three types of Air Traffic Control and Landing System equipment used to support the radar approach control mission. NAS includes voice switches, approach control and control tower automation, and airport surveillance radars.

When fully fielded, the DoD NAS program upgrade will include four programs:

- The Voice Communications Switching System (VCSS) is the communications component of the NAS modernization program.
- The DoD Advanced Automation System (DAAS) is designed to receive and process primary and secondary radar data, flight plan information, weather, airport environmental data, and administrative information (such as notices to Airmen).
- The Digital Airport Surveillance Radar (DASR) is designed to provide accurate target data to the local air traffic control facilities with improved target detection accuracy, clutter rejection, aircraft identification accuracy, altitude data, and weather capability.
- The Military Airspace Management System (MAMS) schedules, tracks, and documents utilization of special use airspace in a non-real-time manner, and interoperates with the Federal Aviation Administration (FAA). The Air Force moved MAMS from development to sustainment on October 1, 2000. Since then, three software versions have been released – one major release, and two minor releases.

The FAA is the lead organization for VCSS and DAAS acquisition. The Air Force Operational Test and Evaluation Center (AFOTEC) serves as the DoD lead for DAAS/DASR testing and sole test agency for MAMS. DoD is working with the FAA through an interagency agreement for all VCSS, DAAS, and DASR test activities. DOT&E will publish one beyond low-rate initial production report on NAS after all system-level testing is complete.

AFOTEC found the VCSS operationally effective, but not operationally suitable as a result of the VCSS DoD multi-Service operational test and evaluation (MOT&E) in 1999. DOT&E reviewed corrective actions taken after the MOT&E and found them adequate to rectify the suitability shortcomings. The full-rate production decision was executed in November 1999.

The MOT&E concept for DAAS and DASR included two phases of testing, Phase 1 (developmental test/operational test) and Phase 2 (dedicated operational testing). DAAS and DASR have been through two rounds of MOT&E, conducted from October 1999 through September 2002. In each round of operational testing, AFOTEC identified significant numbers of critical deficiencies, and while they eventually rated the DAAS operationally effective and operationally suitable in June 2001, the DASR was last rated by AFOTEC as not effective and not suitable in a February 2003 MOT&E 2 status report.

Based upon Milestone Decision Authority direction in November 2002, the Air Force Acquisition Executive, the NAS Program Office, and AFOTEC developed a new way ahead for NAS, leveraging the results of FAA testing to the extent possible, and planning for another round of MOT&E with DoD production representative test articles in the DoD environment.

DOT&E is concerned over the immaturity of configurations that have been repeatedly presented for operational testing.

TEST & EVALUATION ACTIVITY

During January and February 2003, AFOTEC and DOT&E conducted in-depth analyses of candidate dedicated operational test sites for MOT&E 3.

In April 2003, the principals from DOT&E, Air Force Test and Evaluation, AFOTEC, and the NAS Program Office collectively determined that the NAS way ahead included dedicated operational testing in MOT&E 3, to be conducted at Moody Air Force Base, Georgia.

The NAS General Officer Steering Group met in May 2003 and directed that the NAS program schedule be compressed to allow for a NAS Milestone III decision in 3QFY04. The NAS Program Office has recommended that dedicated operational testing in MOT&E 3 commence in March 2004 to allow for the NAS Milestone III decision to be made in September 2004.

Also in May, representatives from the user and acquisition communities met with DOT&E and the test community to receive clarification on the test concept to achieve understanding of the conduct of the test and the evaluation of collected data.

The Program Office and AFOTEC began work on an update to the May 2000 Test and Evaluation Master Plan for MOT&E 3.

TEST & EVALUATION ASSESSMENT

DOT&E is concerned over the immaturity of configurations that have been repeatedly presented for operational testing. After each test period, critical deficiencies were identified and the Program Office implemented plans to fix, regression test, and re-test operationally. AFOTEC discovered similar or additional deficiencies during each test event.

AFOTEC's test concept for MOT&E 3 remains the same two-phased approach as for the original MOT&E and MOT&E 2. In MOT&E 3, Phase 1 developmental test/operational test metrics associated with effectiveness parameters in the DoD NAS Operational Requirements Document will be examined using the results of testing conducted by the FAA Technical Center, making maximum use of the FAA's testing. The FAA's testing to support the DoD's Phase 1 developmental test/operational test has been completed, and the FAA published its results November 6, 2003. In MOT&E 3, currently scheduled for March 2004, Phase 2 dedicated operational testing will provide data to support final resolution of all DoD NAS Operational Requirements Document parameters and will examine mission accomplishment.

National Polar-Orbiting Operational Environmental Satellite System (NPOESS)

The National Polar-orbiting Operational Environmental Satellite System (NPOESS) is a tri-agency program jointly administered by DoD, the Department of Commerce's National Oceanic and Atmospheric Administration (NOAA), and the National Aeronautics and Space Administration (NASA). The program is managed by an NPOESS Executive Committee through an Integrated Program Office (IPO) and is being acquired under Air Force acquisition authority. NPOESS will provide a national remote sensing capability to acquire and disseminate global and regional environmental data for a period of at least ten years.

NPOESS Milestone I occurred in FY97. During the Program Definition and Risk Reduction Phase, The IPO awarded multiple contracts for each higher-risk sensor and/or suite of sensors, and for system studies. In 2002, the Secretary of Defense appointed the Secretary of the Air Force as the DoD Executive Agent for Space, and the IPO is now acquiring NPOESS under new DOD National Security Space Policy directives tailored for space programs. Following a Key Decision Point-C in August 2002, the IPO selected an integration contractor and the program entered into the Acquisition and Operations Phase. A key risk reduction activity is the NPOESS Preparatory Project (NPP), which is a joint Integrated Program Office/NASA space flight of selected critical imaging and sounding sensor systems. In 2003, the IPO restructured the program in response to funding constraints. As part of their restructuring, the IPO delayed the Critical Design Review (CDR), NPP, and the first NPOESS launch by up to a year.

TEST & EVALUATION ACTIVITY

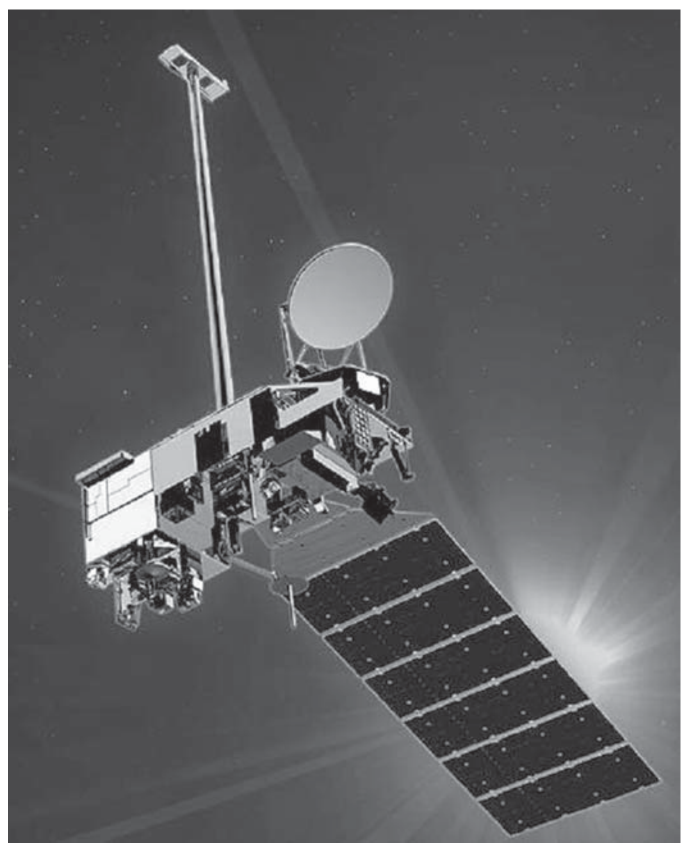
The Air Force Operational Test and Evaluation Center (AFOTEC) completed the first part of an operational assessment and issued an Interim Summary Report in July 2002. This operational assessment is being updated in 2003 with a final report expected in spring 2004.

Test and evaluation and risk reduction activities in 2003 included further definition of roles and responsibilities for a Combined Test Force, and creation of a users' forum to foster dialogue between the IPO and the Services' field terminal offices on field terminal development and testing.

The NPOESS Test Plan Working Group (TPWG) refined the concept of a Tri-Agency Combined Test Force to correspond with the current acquisition strategy and to better define AFOTEC's role in the overall NPOESS operational test concept.

The TPWG reached agreement with the IPO regarding user field terminal testing with NPOESS satellites both in the factory and on-orbit. A plan under development will minimize shortfalls in the contractors' baseline relative to the field terminals. The plan calls for the development of high-rate data (HRD) and low-rate data (LRD) demonstration terminals, a field terminal calibration and validation effort, and a field terminal test bed.

Individual agencies will fund, procure, and manage their own field terminals to satisfy their user needs.



The National Polar-orbiting Operational Environmental Satellite System is making satisfactory progress, but potential issues with Environmental Data Record quality and field terminal acquisition strategies must be resolved prior to the Critical Design Review.

TEST & EVALUATION ASSESSMENT

AFOTEC will be the lead agency for all operational test and evaluation events, but will combine efforts with other Service operational test agencies, NOAA, and NASA during multi-Service OT&E (MOT&E) to make the most efficient use of expertise and resources.

NPOESS is making satisfactory progress, but potential issues with Environmental Data Record (EDR) quality and field terminal acquisition strategies must be resolved prior to CDR. Furthermore, there is schedule risk with the planned 2006 NPP flight, and the impact on risk reduction of any delays or changes to NPP must be reassessed at CDR.

EDR quality is directly tied to algorithm and sensor performance, and to quality control. Algorithm performance has been identified as a leading risk to EDR quality. Three key sensors that represent major advances over legacy sensors each face a tight development schedule and technical challenges. Quality control of the data processing string in the Interface Data Processor Segment must ensure that erroneous data is properly filtered and that operators are alerted whenever error conditions arise.

Any lack of synchronization between the NPOESS program and the Services' field terminal acquisition programs would put two key test events at risk. The first is a combined developmental test/operational test event, which AFOTEC will conduct in FY06 to verify interoperability by connecting at least one of each type of field terminal directly to the satellite in the factory. The second event is MOT&E, the primary system-wide operational test, scheduled for late FY11. The IPO has been hosting field terminal user meetings and they are starting to recognize the need for integrating the individual Service field terminal programs with the overall NPOESS acquisition. DOT&E is concerned that more progress has not been made in developing a Field Terminal Closure Plan to aid in synchronizing and tracking NPOESS and terminal programs to ensure test events stay on schedule.

NPP, with a planned launch in October 2006, is the primary risk reduction flight for NPOESS. It will carry three key NPOESS sensors and generate 93 percent of the NPOESS data volume. There is significant risk in the schedule delivery of the three sensors for the NPP launch. Furthermore, the command, control, and communications segment for NPP is substantially different from that planned for NPOESS, resulting in reduced risk mitigation from the NPP ground segment.

NAVSTAR Global Positioning System (GPS)

The NAVSTAR Global Positioning System (GPS) is an Air Force-managed joint Service program that provides highly accurate, real-time, all-weather, passive, common-reference grid position and time information to military and civilian users worldwide. It consists of three segments: space, control, and user equipment (UE). The control segment consists of a master control station; four ground antennas; a pre-launch capability station; and five geographically dispersed monitoring stations, and it monitors satellite downlink signals and uploads corrections to diminish errors broadcast to users. The user segment consists of numerous types of GPS receivers that use satellite downlink signals to determine position, velocity, and precise time. These receivers are hosted on a multitude of platforms.

The space segment consists of a nominal 24-satellite constellation in semi-synchronous orbit. The Air Force Space Command has launched three blocks of NAVSATR GPS satellites:

- Block I satellites (Developmental) – 11 satellites were launched from 1982 through 1992. Satellite 7 experienced launch failure and was not usable.
- Block II/IIA – 9 Block II satellites were launched between 1986 and 1990; 19 Block IIA versions were launched between 1990 and 1997. Improvements included radiation-hardened electronics, greatly increased navigation message data storage capacity, and selective availability and anti-spoof modes for more signal security.
- Block IIR – 9 satellites have been launched between 1997 and March 2003. Block IIR satellites gained inter-satellite ranging capabilities, increased satellite autonomy and radiation hardness, and more launch responsiveness, with the ability to be launched into any required GPS orbit with 60 days notice. There are 12 additional Block IIR launches planned, with as many as eight of those being the modernized or Block IIR-M version.

Future planned NAVSTAR GPS satellite blocks include:

- Block IIR-M — The first Block IIR-M satellite launch is planned for late FY04. The IIR-M capabilities include developmental military-use-only M-code on the L1 and L2 signals and a civil code on the L2 signal.
- Block IIF – also under development, with the first launch planned for mid-FY06. The Block IIF satellites are functionally equivalent to the IIR/IIR-M satellites and pave the way towards operational M-code after IOT&E in 2010. Block IIF will also add a new separate signal for civilian use, designated L5. This variant will also have increased, adjustable signal power.

The Air Force Operational Test and Evaluation Center conducted an operational assessment of the first Block IIR satellite in late 1997. Although the this satellite met all navigation and timing requirements, the report detailed a significant problem with the improved cross-link capabilities. The program office has incorporated an interim fix for the problem on the second and third IIR satellites, and they are applying a more robust resolution to the remaining Block IIR/IIR-M satellite family. Active UE programs include continuing Miniaturized Airborne GPS Receiver 2000 platform installations in FY03 and beyond;

Delays in developing and testing the GPS Operational Control System are DOT&E's chief concerns. Control segment software development continues to be a moderate to high-risk area with an ambitious schedule.

Defense Advanced GPS Receiver deliveries beginning in FY03; and M-code receiver deliveries beginning in FY10. All receivers produced after FY02 are to have the Selective Availability Anti- Spoofing module capability installed.

TEST & EVALUATION ACTIVITY

FY03 activity included continued test planning meetings and combined developmental/operational testing (DT/OT) of GPS Modernization backward compatibility with legacy user equipment.

Future testing includes a series of combined DT/OT events and operational assessments in support of the development and fielding of the new operational control system, the launch of the first IIR-M and IIF satellites, and M-code fielding.

The next round of IOT&E will occur when 24 operational Block IIR-M and Block IIF satellites are on-orbit and control segment software Version 6 is declared operational.

IOT&E will be a system-wide test of the space and control segments. Legacy and modernized (M-code capable) UE and is scheduled to take place in FY10.

TEST & EVALUATION ASSESSMENT

Ground testing and on-orbit tests continue to indicate that the proposed solution to the Block IIR cross-link problem is being resolved satisfactorily. However, it is still too early to report a final determination of the effectiveness and suitability of the entire series of IIR satellites.

Delays in developing and testing the GPS Operational Control System are DOT&E's chief concerns. Control segment software development continues to be a moderate to high-risk area with an ambitious schedule. There is little time for regression testing in between software builds, and some significant capabilities will not be tested until the first operational build is released. Adequate operational flavor must be added to this contractor-led testing throughout the test program to increase robustness and mitigate risk.

The November 2001 Test and Evaluation Master Plan and associated test planning documents are being revised by the GPS test community to accommodate the introduction of variable satellite signal power settings and increases in signal strength. The proposed test approach to be incorporated into a new version of the GPS Test and Evaluation Master Plan calls for extensive DT/OT to ensure early and adequate insight into the new capabilities planned for inclusion into the GPS mission (i.e., control segment software and M-code functionality, second and third civil signals, and signal protection for U.S. and allied forces). DOT&E feels that fielding the new operational control system and M-code availability warrant not just combined DT/OT, but dedicated operational assessments.

DOT&E continues to advocate the testing of new and legacy GPS receivers as early in the program as possible. These receivers must be integrated into representative platforms (e.g., ships, aircraft, and land vehicles) and tested in operational environments. Development of M-code-capable UE lags behind the development of the space and control segments, and this may induce delays in testing the Block IIR-M and IIF systems, along with the attendant M-code and civil signal capabilities. Before that time, backward compatibility will be tested using legacy receivers and initial M-code performance will be tested using prototype receivers.

RQ-4A Global Hawk Unmanned Aerial Vehicle (UAV)

The Global Hawk Unmanned Aerial Vehicle (UAV) system is a theater commander's asset designed to satisfy surveillance and reconnaissance shortfalls. The Global Hawk UAV is to provide high-resolution synthetic aperture radar (SAR) and electro-optical/infrared (EO/IR) imagery at long-range with long loiter times over target areas. Signals intelligence (SIGINT) capability is also being developed. Potential Global Hawk UAV missions cover the spectrum of intelligence collection capabilities to support joint combatant forces in worldwide peace, crisis, and wartime operations.

The Global Hawk UAV program began as an advanced concept technology demonstration in 1995 under the Defense Advanced Research Projects Agency management and, in October 1998, transitioned to the Air Force systems program office at Wright-Patterson Air Force Base, Ohio. The program Milestone II decision in March 2001 approved entry into engineering and manufacturing development as well as low-rate initial production. Subsequent acquisition decisions in March 2002 and December 2002 have re-baselined the program, adopting a spiral acquisition approach and increasing the number of low-rate initial production air vehicles from six to nineteen. The September 2000 Operational Requirements Document was updated to reflect the new program, and it was approved in October 2002 by the Joint Requirements Oversight Council.

The Global Hawk UAV system comprises an air vehicle component with air vehicles, sensor payloads, avionics, and data links; a ground segment with a launch and recovery element (LRE); a mission control element (MCE) with embedded ground communications equipment; a support element; and trained personnel.

The Global Hawk UAV is optimized for high altitude, long range and endurance; it is to be capable of providing 28 hours of endurance while carrying 3,000 pounds of payload and operating at 65,000 feet mean sea level. The integrated sensor suite consists of SAR, EO, and IR sensors. Each of the sensors provides wide area search imagery and a high-resolution spot mode. The radar also has a ground moving target indicator mode. A limited initial SIGINT capability will be incorporated prior to the IOT&E in FY06, while a more capable system in development will be integrated in production aircraft in the years that follow. The Global Hawk UAV is intended to operate autonomously using a satellite data link (either Ku or UHF) to send sensor data from the aircraft to the MCE. The common data link can also be used for direct down-link of imagery when the UAV is operating within line-of-sight of users with compatible ground stations.

The ground segment consists of the MCE for mission planning, command and control, and image processing and dissemination; the LRE for controlling launch and recovery; and associated ground support equipment. By having separable elements in the ground segment, the MCE and the LRE can operate in geographically separate locations, and the MCE can be deployed with the supported command's primary exploitation site. Both ground segments are contained in military shelters with external antennas for line-of-sight and satellite communications with the air vehicles.

The Global Hawk UAV system comprises an air vehicle component with air vehicles, sensor payloads, avionics, and data links.

TEST & EVALUATION ACTIVITY

An updated Test and Evaluation Master Plan (TEMP) was approved by DOT&E in March 2003 to support the new spiral acquisition. The TEMP outlines a set of test phases with increasing scopes, tied to technology integration and a defined set of the

Operational Requirements Documents. Two mission-level dedicated operational tests are scheduled to precede the Defense Acquisition Board-level review: an FY04 operational assessment (OA) prior to an in-process review, and an FY06 IOT&E prior to the full-rate production decision. An FOT&E and a second IOT&E follow for the full-SIGINT and Multi-platform – Radar Technology Insertion Program configurations, respectively. Phases of developmental test/operational test (DT/OT) are scheduled between dedicated OT&E phases. These DT/OT phases are systems-level evaluations that support yearly Configuration Control Board decisions on technology integration into production lots, as well as entry into OT&E.

During FY03, no operational testing was conducted. One Global Hawk was deployed to support Operation Iraqi Freedom, flying 16 combat missions March 8 - May 2, 2003. Combined Test Force activities at Edwards Air Force Base, California, consisted of developmental testing to support Operation Iraqi Freedom, pilot training support, technical order validation and verification, support for a U.S.-German demonstration of a European Aeronautic Defence and Space (EADS) Company SIGINT sensor, delivery and checkout flight of two new air vehicles, and initial Spiral 1 developmental testing.

Another ACTD air vehicle, AV-7, was delivered in February 2003. After a period of modifications and check flights, Global Hawk Advanced Synthetic Aperture Radar System Improvement Program (AIP) radar data was first collected in August 2003. Spiral 1 capabilities are to be incorporated and tested on AV-7 to support development, Configuration Control Board decisions, and entry into the FY04 OA. Spiral 1 capabilities include a new mission management computer and a sensor processing computer. The new systems are PowerPC-based to address diminishing manufacturing source issues with the current systems and provide greater computing power, and a more robust, open architecture. While the existing mission management software was ported, the decision was made to use the AIP software developed for the U-2, which runs on PowerPC. Spiral 1 also includes improved communications and equipment designed to meet the Global Air Traffic Management requirement and provide the ability to fly in all classes of airspace.

TEST & EVALUATION ASSESSMENT

This past year, flight testing continued to compete with operations for both test and development resources. Limited engineering and manufacturing development flight testing has occurred to date. The first sensor flight of AV-7, which was anticipated in January 2003, took place in August. Because of issues discovered with the AIP spot mode (image quality and target geo-accuracy), the program has decided to develop a hybrid version of the SAR processing software, porting the ACTD spot modes to the new hardware and combining them with the AIP wide-area modes.

EO/IR testing has lagged the radar because of a lack of availability of test items. Spiral 1 EO/IR units were accelerated and delivered in ACTD configuration to support Operation Enduring Freedom. The upgrade of these EO/IR units to Spiral 1 configuration was delayed because the units were dedicated to operations. As a result, delivery of the first Spiral 1 configuration EO/IR unit is not expected until the end of 2004, limiting test time prior to the OA.

The schedule to reach the OA in the late summer 2004 is challenging. Besides development testing, Global Hawk activities include several demonstrations prior to then, as well as the effort to stand up the squadron at Beale Air Force Base, California, and maintain operational readiness. The demonstrations include two overseas deployments: the German EADS SIGINT demonstration and a Pacific Command forward-operating location demonstration.

RQ/MQ-1 and MQ-9 Predator Unmanned Aerial Vehicle (UAV) System

Two Predator Unmanned Aerial Vehicle (UAV) systems are on oversight: the RQ/MQ-1 Predator and the follow-on MQ-9, which is commonly referred to as Predator B.

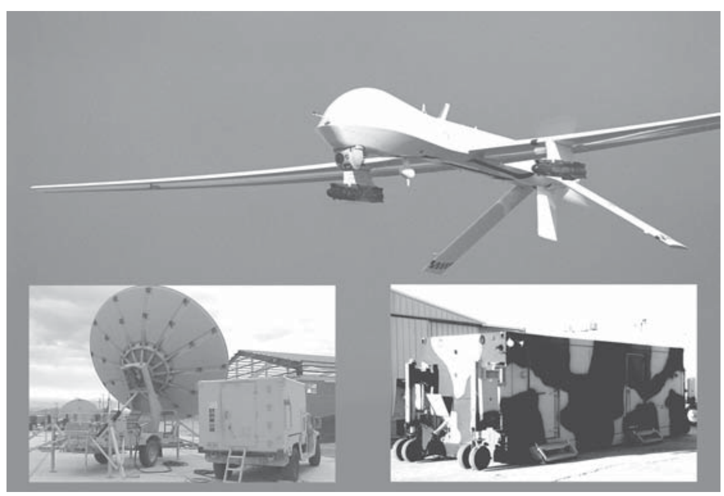
The RQ/MQ-1 Predator is a medium altitude UAV intended to provide reconnaissance, surveillance, and target acquisition support to a theater as well as a limited strike capability. Originally designated RQ-1, the designation was changed to MQ-1, acknowledging the system's multi-role capability after the integration of the Hellfire missile and multi-spectral targeting sensor, which includes a laser designator.

MQ-9 is intended to fly higher and faster, provide more power, and carry larger payloads than the original Predator system. It is also intended to provide a more robust airframe, using a conventional turbo-prop engine and redundant avionics. MQ-9 will be used primarily in an armed reconnaissance ("hunter-killer") role and will perform reconnaissance, surveillance, and target acquisition (RSTA) as a secondary role. The hunter-killer mission requires the system to find, identify, and kill targets. The combination of Intelligence, Surveillance, and Reconnaissance (ISR) capability and the ability to engage with on-board weapons or coordinate off-board strike assets is intended to increase the probability of detecting and successfully negating time sensitive targets. Two prototypes, designated YMQ-9, have flown, but cannot carry the size payload the Air Force is seeking. The third air vehicle delivered (also given the YMQ designation) will have an increased gross takeoff weight and increased payload capacity, more thrust, and triple redundant avionics. YMQ-9 uses a ground station common with the MQ-1.

The ground station provides command and control of the air vehicle through pilot stations where the air vehicle is flown using stick and rudder control. The ground station also provides for mission planning, communications, and imagery dissemination.

The RQ-1 Predator IOT&E took place in October 2000. The system under test was the baseline ISR system. During Kosovo operations in 1999, a few Predators were equipped with a laser designator for designating targets for laser-guided weapons released by another platform. In 2001, developmental flights demonstrated the ability to launch the AGM-114 Hellfire missile from Predator. Since then, the capability has been employed operationally and funding was provided to incorporate the strike capability into production.

The planned pace of MQ-9 acquisition has slowed since 2002 when a Pathfinder designation and spiral development and fielding were considered by the Air Force. The current Air Force strategy anticipates a more deliberate acquisition with several years of System Design and Development (SDD) followed by an IOT&E in 2007 and a full-rate production decision in 2008. An MQ-9 Interim Requirements Document (IRD) was approved by ACC in May 2002. The May 2002 IRD supported the spiral development and fielding of systems with phased increases in sensor and weapons capability. A new requirements document, a Capabilities Description Document (CDD), is currently in draft.



Originally designated RQ-1, the designation was changed to MQ-1, acknowledging the system's multirole capability after the integration of the Hellfire missile and multispectral targeting sensor, which includes a laser designator.

TEST & EVALUATION ACTIVITY

Detachment 4 of the 53rd Test and Evaluation Group continues to support RQ-1/MQ-1 Block upgrades. Testing conducted in the past year includes testing of Block 20 ground station upgrades and remote split operations concept where a launch and recovery control element separate from the ground control station is used.

The first two prototype Predator B vehicles have flown over 300 hours at altitudes up to 50,000 feet during contractor testing intended to assess basic flying qualities. Some initial integration and functionality flights of the Lynx Synthetic Aperture Radar have also taken place. First flight of the third vehicle is expected in October 2003.

TEST & EVALUATION ASSESSMENT

An Air Force High Performance Team met in 2003 to establish MQ-1 requirements. A draft Capabilities Description Document is now is coordination. An updated Test and Evaluation Master Plan is expected.

No operational testing of MQ-9 has occurred to date. Work to draft a Test and Evaluation Master Plan has begun based on the current draft requirements and acquisition strategy to support a Milestone B review in early 2004.

Small Diameter Bomb (SDB)

The Small Diameter Bomb (SDB), produced by The Boeing Company for the Air Force, is a 250-pound class, air-launched weapon using deployable wings to achieve standoff range. Guidance is provided by inertial navigation and enhanced with a near-precision navigation solution against fixed and stationary targets. Near-precision navigation is obtained through a differential Global Positioning System (GPS) signal transmitted through the launch platform prior to weapon release. The SDB system will possess a GPS anti-jam and anti-spoof capability. The SDB warhead is a combined penetrator design with blast/fragmentation capability. The warhead uses the same explosive fill as on the Joint Air-to-Surface Stand-off Missile. Fuzing of the warhead is initiated by contact, reaching a preset height above the intended target, or by achieving a specified delay after initial warhead penetration. The SDB is employed from a four-place carriage mounted to the aircraft. Initial integration of the SDB is with the F-15E. Follow-on integration may occur with the F/A-22, F-35, UCAV, F-16 (Block 30/40/50), F-117, A-10, MQ-9, B-1, B-2, and the B-52. The SDB will initially be designed to attack fixed and stationary (but relocatable) targets. An additional SDB increment is also under consideration for development to conduct attack against specified moving targets with possible further development to conduct an autonomous attack of moving targets. However, only the capability to attack fixed and stationary (but relocatable) targets is funded.

The SDB entered System Design and Development (SDD) on October 17, 2003. Testing in this phase is anticipated to conclude in late FY05 with IOT&E to conclude in late FY06.

TEST & EVALUATION ACTIVITY

Pre-Milestone B test and evaluation activities consisted of contractor sled and arena tests to characterize warhead lethality, as well as limited flight tests to evaluate weapon accuracy, carriage performance, and the performance of the differential GPS system. Ground tests have also been conducted of the weapon, carriage, container system, and weapon components to evaluate system performance under anticipated field, environmental, and aerodynamic stress.

TEST & EVALUATION ASSESSMENT

Early ground tests have identified several anomalies in the SDB design. This early identification provided more time for component redesign. Free-flight testing through FY03 consisted of nonproduction representative, inert weapons with surveyed coordinates against fixed targets. Although testing was conducted in a non-GPS jamming environment, SDB free-flight performance now demonstrates the ability to meet accuracy requirements. To confirm SDB effectiveness and suitability against the required target set (i.e., fixed and stationary (but relocatable) targets), the Air Force will conduct operational free-flight testing of production representative, live weapons in a GPS-jammed environment utilizing coordinates derived by national-level and third-party systems expected to be used in combat (e.g., overhead imagery, JSTARS, Special Operations Forces, Predator).

Free-flight testing through FY03 consisted of nonproduction representative, inert weapons with surveyed coordinates against fixed targets.

Space-Based Infrared System (SBIRS)

The Spaced-Based Infrared System (SBIRS) replaces the current Defense Support Program (DSP). SBIRS improves support to theater Combat Commanders, U.S. deployed forces, and allies by providing better data quality and timeliness in four mission areas: missile warning, missile defense, technical intelligence, and battlespace characterization.

SBIRS is being acquired in two increments. Increment 1, which attained Initial Operational Capability in December 2001, consolidated DSP and Attack and Launch Early Reporting to Theater ground stations into a single continental U.S. Mission Control Station (MCS). Increment 1 operates with DSP satellite data. Increment 2 develops software and hardware to operate SBIRS satellites. SBIRS includes two hosted payloads in Highly Elliptical Orbit (HEO), first available in early 2004, and four satellites in Geosynchronous (GEO) orbit, with first delivery in 2006. A fifth GEO satellite will be procured as a replenishment/spare.

The SBIRS Increments 1 and 2 entered the Engineering and Manufacturing Development phase following a Milestone II Defense Acquisition Board review in October 1996. In 2002, the Air Force restructured the program due to schedule and cost overruns. In the restructure, the Air Force delayed the launch of the first GEO satellites from 2004 to 2006, and rescheduled incremental deliveries of the ground segment to better align with the delayed satellite schedule.

TEST & EVALUATION ACTIVITY

The Air Force Test and Evaluation Center conducted an Operational Utility Evaluation in Dec 2001 to support certification of the Increment 1 Interim Mission Control Station Backup (IMCSB-1). The IMCSB-1 operates with DSP satellites, and provides an interim backup capability to the MCS until a full MCS backup is developed. The IMCSB-1 was rated effective and suitable, but problems were noted with maintainability and software maturity.

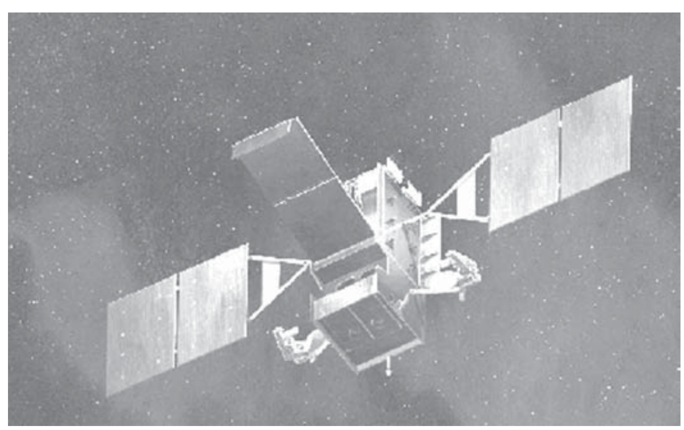
The 2003 test and evaluation activity involved identification and resolution of HEO problems, test tool development, and revision of test plans to realign them with the revised program schedule and content.

Test tool development focused on threat scenario simulations and test message injectors. Tactical scenarios will first be needed for 2005 testing of DSP-capable Mobile Multi-Mission Processors, scheduled to replace the Army's Joint Tactical Ground Station. Testing of GEO-capable mission processing beyond 2006 will require a new simulation tool and message injector, called Simulation Over Recorded Data, which is being developed to augment observed targets of opportunity and to simulate large missile attacks.

Test planning focused on development of a new Test and Evaluation Master Plan (TEMP) and test strategy to reflect the current program baseline following several restructures since the approved June 1998 TEMP.

TEST & EVALUATION ASSESSMENT

Under the current baseline, SBIRS Increment 2 is being delivered in several evolutionary phases, called "effectivities." The test strategy is being revised to support these effectivities. The precise content, capabilities, and requirements for each of these effectivities, however, are still being defined. The overall test strategy will not be adequate until each of the effectivities is defined to a testable level, and a revised TEMP incorporating effectivities testing is submitted.



DOT&E remains concerned with ongoing software maturity problems, concurrency between space and ground segment development, and the operational impact of any further delays to satellite delivery.

The HEO problems, as reported by the Program Office, involved a series of design deficiencies in the HEO payload, including a High Voltage Power Supply in the

Common Gyro Reference Assembly and an inadequately developed design to control payload electromagnetic interference. Resolution of these problems required extensive rework and parts fabrication, leading to a six-month Acquisition Program Baseline breach of the HEO payload delivery and message certification dates.

DOT&E remains concerned with ongoing software maturity problems, concurrency between space and ground segment development, and the operational impact of any further delays to satellite delivery.

Space-Based Radar (SBR)

The Space-Based Radar (SBR) system is a planned constellation of satellites that can be tasked in near real-time to provide a rapid response to real-time continental U.S. or theater requirements. Moving Target Indicator (MTI) data and Synthetic Aperture Radar (SAR) imagery will be transmitted directly, or via relay satellites, to appropriate ground receiving stations. Users of such information include air expeditionary forces, Army objective forces, Naval forces, intelligence components, and Homeland Security networks. Fuzed with data from current MTI systems, SBR will improve near real-time targeting and situational awareness.

The Secretary of Defense appointed the Secretary of the Air Force as the DoD Executive Agent for Space in 2002. The Air Force is acquiring SBR under new DoD National Security Space Policy directives tailored for space programs. SBR is in the initial phase of development, and passed its first Key Decision Point A (KDP-A) to enter Phase A (the Study Phase) in July 2003. The purpose of the Study Phase is to develop concepts and architectures to a sufficient level of maturity to enter the KDP-B Design Phase, expected in FY04. The Study Phase will consist of further concept definition, concept of operations and requirements development, risk reduction, and initial planning to develop a test and evaluation strategy prior to KDP-B. After KDP-B, the program is expected to enter a system pre-acquisition period lasting through a planned KDP-C at the end of FY07, when system acquisition activities will begin.

Thus far, the Program Office has formulated a draft acquisition strategy and awarded key contracts to support ongoing risk reduction activities.

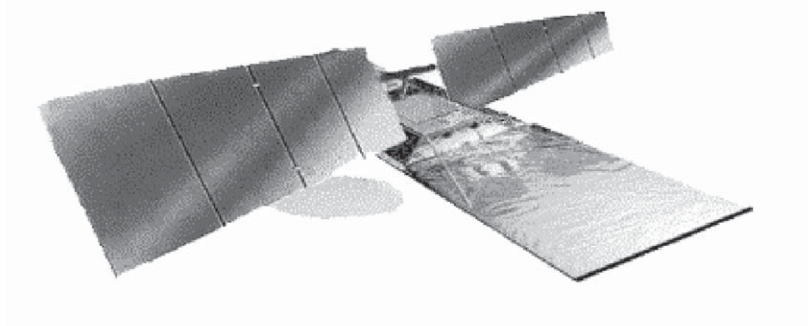
TEST & EVALUATION ACTIVITY

The lead operational test agency, the Air Force Operational Test and Evaluation Center, developed a Necessary Conditions Chart (NCC) during 2002 and 2003, and the Program Office used this as the basis for a test strategy document in support of KDP-A. The NCC is a test planning aid that provides linkages between operational requirements, contract specifications, and mission objectives.

The test strategy document emphasized combined developmental and operational testing in order to maximize testing efficiency. As the test strategy matures, the NCC will serve as a template for the development of critical operational issues, measures of effectiveness, and measures of performance.

TEST & EVALUATION ASSESSMENT

SBR is at an early stage of development, but test and evaluation planning is proceeding at an adequate pace to support an eventual assessment of operational effectiveness and suitability. As the test and evaluation strategy matures, it should focus on mitigation of key risk areas. Generally these areas involve: information management and the capability of the system to manage the very large amounts of data expected; satellite on-board processing capability and reliability needed to “pre-digest” the collected radar data before transmitting to ground; signal processing algorithms in terms of their reliability and capability to present radar derived data for rapid analysis and dissemination; spacecraft technology in terms of power, structural integrity, detection technology, and communications reliability; and system survivability.



The Space-Based Radar is at an early stage of development, but test and evaluation planning is proceeding at an adequate pace.

Unmanned Combat Aerial Vehicle (UCAV) - Air Force

The Air Force initiated the Unmanned Combat Air Vehicle (UCAV) advanced technology demonstration program in 1999 to develop an autonomous, stealthy, unmanned strike aircraft. The aircraft is intended to carry advanced sensors for target acquisition, electronic support measures, and air-to-ground weapons. The Air Force has not yet selected a weapon, but candidates include Joint Direct Attack Munition and the Small Diameter Bomb. Compared to manned attack aircraft, the operational concept of the UCAV is intended to reduce operations and support costs.

The Defense Advanced Research Projects Agency (DARPA) is managing the technical feasibility for a UCAV system to effectively and affordably suppress enemy air defenses, electronic attack, and strike missions. The system design uses a spiral development approach, concurrently developing, producing, testing, and fielding the system in blocks. The current prototype air vehicles, X-45As, will migrate from Block 1 to Block 4 within the current demonstration program.

In December 2002, the OSD Program Decision Memorandum adjusted funding for both Air Force and Navy UCAV development – including the procurement of several air vehicles in the FY07-09 timeframe. The Program Decision Memorandum also directed the Air Force and Navy to initiate a joint program office to manage UCAV development, which was the number one priority of the OSD UAV Planning Task Force. In conjunction with the Joint Program Office, OSD/Program Assessment and Evaluation led a UCAV options study to determine how best to use a variety of UCAVs in the future military force.

In June 2003, OSD established the Joint Systems Management Office for the Joint Unmanned Combat Air Systems, which began operation in October 2003. OSD instructed this joint office to lead a seven-year effort developing technologies for Air Force and Navy UCAVs. The joint office is to also deliver 14 aircraft in 2007 for a two-year operational assessment. During this assessment, DARPA will measure how well various technologies meet the Air Force and Navy requirements, and by 2010, OSD will use DARPA's assessment to decide whether to pursue joint or separate UCAV systems.

TEST & EVALUATION ACTIVITY

To date, test activity has been conducted at NASA Dryden Space Center, California, under a joint DARPA/Air Force/Boeing system demonstration program.

The X-45A's first flight occurred in May 2002. The Block 1 flight demonstrations of basic system functionality were completed in February 2003. A total of 16 flights and nearly 13 flight hours were accomplished. The maximum altitude demonstrated was 35,000 feet and a top speed of 250 knots.

Three weeks of flight-testing the UCAV Block 2 flight systems onboard a T-33 aircraft took place at Eglin Air Force Base, Florida, during March 2003. Both X-45A demonstrator air vehicles underwent upgrades to begin the Block 2 demonstrations, which will include multi-airvehicle coordinated flights.


The maximum altitude demonstrated was 35,000 feet and a top speed of 250 knots.

TEST & EVALUATION ASSESSMENT

DOT&E supports the competitive nature of the operational assessment and the opportunity for side-by-side flight evaluations of the X-45 and the Navy's UCAV-N demonstrator, the X-47A Pegasus. DOT&E plans to work with the operational test agencies to ensure that relevant early operational data are collected to support transition to a formal acquisition program.

Wideband Gapfiller Satellite (WGS)

The Wideband Gapfiller Satellite (WGS) communications system will provide communications to the U.S. warfighters, allies, and coalition partners during all levels of conflict short of nuclear war. It is the next generation wideband component in the DoD's future Military Satellite Communications (MILSATCOM) architecture.

WGS will satisfy military communications needs by providing communications in both the X-band and military Ka-band frequencies. It will combine capabilities onto a single satellite for tactical X-band communications, augment the Global Broadcast Service (GBS) Phase II system, and provide new two-way Ka-band services. The Air Force is introducing this new service to alleviate the spectrum saturation of X-band, and it should greatly increase both the available single-user data rate and total satellite capacity over today's Defense Satellite Communications System (DSCS) III satellites.

The WGS consists of two segments. The Air Force is acquiring the satellite segment under the Federal Acquisition Regulation Part 12 rules for commercial item acquisition. First launch is projected for 2QFY05 with the second and third launches following at approximately six-month intervals. The Army is acquiring the ground control segment and the MILSATCOM Joint Program Office is integrating the WGS and GBS space and ground segments.

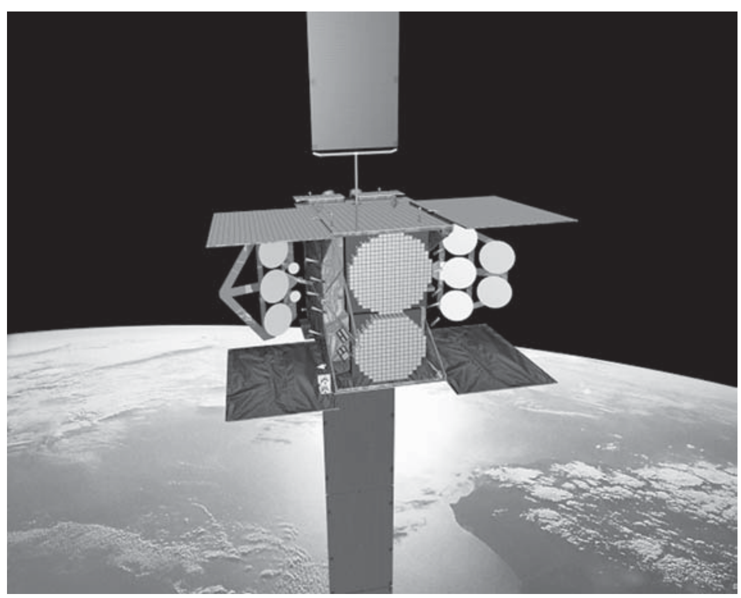
The 2001 Defense Appropriations Act, signed on August 9, 2000, limited funding to two satellites. Subsequently, the Office of the Secretary of Defense issued a Program Decision Memorandum on August 22, 2000, supplementing WGS funding by $272.9M to ensure funding of the complete constellation of three satellites. In December 2003, the OSD directed the acquisition of two additional WGS satellites. The Program Office projects launch of Satellites 4 and 5 in FY09 and FY10, respectively.

The 2001 WGS early operational assessment (EOA) highlighted risk areas posed by complexity of X-band and Ka-band satellite cross-banding; and interoperability and compatibility requirements during the concurrent development of the Gapfiller Satellite Configuration Control Element and the automation upgrades of the Satellite Operations Center and DSCS Operations Center (DSCSOC) networks.

WGS and the Global Broadcast Service (GBS) must also be interoperable and compatible. GBS will structure broadcasts and control the payloads on the ultra-high frequency follow-on satellites. Modified DSCSOCs will control WGS payloads (at X-band and Ka-band), currently only capable of controlling X-band payloads. Interoperability between these two systems must be synergistic and not compete to ensure high-speed access for broadcast users.

The test results and analysis presented at the Critical Design Review (CDR) indicate the design is progressing with no major problems. In addition to the risk areas identified during the EOA, the CDR identified frequency reuse, satellite orbital placement, and launch service availability as additional risk areas.

WGS is projected to provide added capacity using the same bandwidths presently allocated to DSCS and GBS. The added capacity comes through same-frequency reuse over geographically separated beams. This requires a Concept of Operations to ensure that beam allocations for concentrated troop positions do not cause overlap of beams on the same frequency. It also requires that the WGS and



The test results and analysis presented at the Critical Design Review indicate the design is progressing with no major problems.

DSCS satellites be separated sufficiently in their orbits so that the least capable X-band antenna can discriminate between the two satellites.

The Program Office plan for WGS satellite launch is to integrate them on both Delta and Atlas Evolved Expendable Launch Vehicles (EELVs). The first launch will be on Delta and the second on Atlas. Boeing added extra solar panels to their original design, which added weight and changed the class of EELV. The availability of the launch vehicle and an aggressive integration schedule, less than the normal 24 months, are sources of schedule risk.

TEST & EVALUATION ACTIVITY

Test and evaluation planning continued in FY03 for the WGS system.

- The Test and Evaluation Master Plan was updated after the CDR and was approved by DOT&E on March 3, 2003.
- The Air Force Operational Test and Evaluation Center (AFOTEC) completed an EOA of the WGS system September 2000 in support of a combined Milestone II/III review.
- AFOTEC performed an operational assessment based primarily on the CDR data package and briefed DOT&E on May 21, 2003.
- Government developmental and operational test members started observing contractor developmental testing and inter-segment testing in FY03.

TEST & EVALUATION ASSESSMENT

The operational assessment conducted in May 2003 highlighted the following issues:

- Link availability at a five-degree elevation angle is slightly lower than the 99.5 percent Operational Requirements Document requisite, but users say this can be managed through power level management and, therefore, will not be a problem.
- Ka-band reach-back into the Defense Information Systems Network will not be available until this capability is fielded in the DoD Teleports in 2006.
- The new satellite increases operator workload. The Air Force has allocated additional manning, but the Army has not. This will limit system effectiveness until Army staffing issues are resolved.

Overview

In FY86 Congress established the LFT&E program by passage of U.S. Code Title X, Section 2366. The Federal Acquisition Streamlining Act of FY95 moved responsibility for the program to DOT&E. The intent of the LFT&E program is to provide a timely and reasonable assessment of the survivability (vulnerability, susceptibility, and recoverability) and/or lethality of a system with particular attention on the prevention or minimization of user casualties. The LFT&E program requires realistic survivability and lethality testing on platforms and weapons to assure that major systems perform as expected and that combat forces are protected. The law has proven to be both enduring and flexible, permitting test realism to be balanced against cost and practicality.

Survivability and lethality testing generate data that directly supports the evaluation of the operational effectiveness, suitability, and survivability of major defense acquisition programs. Realistic lethality data are generated that, when combined with operational test and evaluation results, support an assessment of operational effectiveness. Realistic platform (e.g., aircraft, ship, armored vehicle) vulnerability data, damage assessment and reparability data, and crew casualty data are generated and analyzed. This analysis, in conjunction with susceptibility data and operational test and evaluation results, supports an evaluation of operational survivability.

INVESTMENT INITIATIVES

In support of its statutory requirements for system survivability and lethality testing and evaluation, the LFT&E office manages the programs and funding of several initiatives that encompass related efforts. These related efforts include increasing the coordination and integration of the testing and training communities, the testing and evaluation of fielded weapons and platforms, the production of munitions effectiveness manuals for the combatant commanders, and advancing of technologies and methodologies to increase aircraft survivability.

These established programs also provide DOT&E immediate access to test facilities and resources as well as to experts in the various test and evaluation-related communities. This access provides the opportunity to address urgent requirements from combatant commanders and the acquisition community. For example, DOT&E engaged the Joint Live Fire (JLF) program to investigate ground vehicle vulnerability when engineering explosives are stowed externally on a vehicle. This vulnerability was recognized during the conduct of an ongoing LFT&E program and had a potentially significant impact on deployed forces. Under JLF, testing was quickly planned and conducted to characterize the system vulnerability due to externally stowed explosives. Once this testing was completed, field expedient measures were defined that could be employed to reduce the vulnerability. These protective measures were made immediately available to deployed forces. Another example of the capability to respond quickly is the use during Operation Iraqi Freedom (OIF) of the Fast Assessment Strike Tool – Collateral Damage (FAST-CD) methodology developed in part with funding from the Live Fire Testing and Training (LFT&T) program. FAST-CD is a computer-based methodology used by mission planners to evaluate the risk and potential extent of collateral damage associated with the engagement of specific tactical targets. This methodology significantly increased the ability of the operational mission planners to quickly evaluate collateral damage risk and determine weapon assignment. This tool aided the combatant commanders in making target engagement decisions on sensitive high-value targets within the OIF theatre.

These investment initiatives are paying dividends within the test and evaluation and acquisition communities, as well as within the combatant commands. The individual programs and some examples of projects funded during FY03 are highlighted below.

LIVE FIRE TESTING AND TRAINING

The FY97 Defense Appropriation included Congressional funding to investigate alternative uses of simulation and training technology in support of LFT&E. This initiative became the LFT&T Program and has been funded entirely by Congress.

The LFT&T Program fosters the exchange of technology initiatives and uses between the live fire and training communities. The underlying LFT&T Program objectives are to enhance cost-effective testing and training and to improve war-fighting readiness. Since inception, the program has funded 31 projects totaling approximately $33M. Several projects have transitioned to operational sponsors and are already providing benefits to the warfighter. Congress did not fund the LFT&T Program for FY04. Due to the valuable and affordable products generated as a result of this program, DOT&E will attempt to provide internal funding to maintain the program until it can be established within the President's budget.

The LFT&T Program funded eight projects in FY03:

- SPECIAL OPERATIONS FORCES SIGNALS TRAINING AND REHEARSAL SYSTEM (SOFSTARS): This is an initiative that supports the Air Force Special Operations Command (AFSOC). It integrates live, virtual, and constructive simulations and national intelligence capabilities to provide aircrews with a realistic, simulated combat environment for distributed mission operations. SOFSTARS will support a full spectrum of activities to include mission preparation and planning, training, testing, mission rehearsal, and experimentation. SOFSTARS will interface with aircrew training devices, aircraft systems, mission planning/rehearsal tools, and other Services' assets required to provide a seamless AFSOC mission environment. SOFSTARS' capabilities will also be integrated into real-world Special Operations Forces and conventional operations, where applicable, to support ongoing missions.
- PROJECT GRACE: In the summer of 2003, Project Grace provided an opportunity for warfighters to observe and evaluate the MiG-29 as a total weapons system during a German Air Force MiG-29 deployment to the U.S. Currently, the aircraft, weapons, fire control system, and helmet-mounted display are assessed independently and a total weapons system capability is then extrapolated from the results of these independent assessments. The weapon system evaluation made during Project Grace will ensure that future U.S. and allies' tactics, testing, and training are based on complete and accurate knowledge of MiG-29 system capabilities.
- SUPER FAST ASSESSMENT STRIKE TOOL – COLLATERAL DAMAGE (Super FAST-CD): Super FAST-CD improves the FAST-CD tool currently used by combatant commanders and component staff to estimate expected collateral damage in potential target areas. Super FAST-CD will improve the warfighters' ability to conduct time-critical operations by decreasing decision timelines and by allowing warfighters to optimize the selection of precision munitions against targets that are in or near congested or protected zones.
- ADVANCED ROBOTICS TEST BED (ARTB): ARTB is developing a dynamically composable robotic test bed that will provide the capability to analyze tactics and train with unmanned forces in a collaborative environment. This capability will be essential for all Services using unmanned vehicles in their warfighting force structure and operations. With the development of the ARTB, survivability and lethality studies can be conducted on individual platforms, as well as analyses of total system-of-systems' performance.
- OBJECTIVE INDIVIDUAL COMBAT WEAPON (OICW) EMBEDDED SIMULATION, TRAINING, AND INSTRUMENTATION: This project will provide a technology solution to support an embedded capability for the OICW in simulation systems used by the Army Research, Development, and Engineering Command and the Dismounted Battlespace Battle Lab. This capability will assist warfighters in assessing new solutions to their individual combat weaponry and tactics requirements for the future.
- MOVING WEAPONS PLATFORM SIMULATOR (MWEPS): MWEPS will be a system that allows weapons' concepts to be evaluated on a motion-based platform earlier in the design process, reducing the time required for developmental testing. It will also serve as an individual weapons operator training system and will be the baseline system for defining system operator training requirements. The Naval Surface Warfare Center has

already used a prototype version of MWEPS to support the testing of remote-controlled small arms mounts on a motion-based platform, avoiding the expenditure for live ammunition and a target to calibrate the stabilized mount and auto tracker system. The fully developed MWEPS will provide cost avoidance for testing and training applications on a wide variety of air, land, and sea platforms.

- JOINT DISTRIBUTED INTEGRATED TEST AND TRAINING SYSTEM: This project expands Virtual At-Sea Trainer (VAST) technology (developed in an earlier LFT&T project) that scores the performance of Navy weapon systems at sea. This follow-on initiative will demonstrate a virtual, transportable "range" for the end-to-end test and evaluation of extended range weapon systems and will increase training and mission planning capabilities using an enhanced 3-D visualization system for projecting the detailed location of any desired target. The system is being designed to evaluate land, sea or air-launched weapons, as well as providing increased training and mission planning capabilities using an enhanced 3-D visualization system. Because the Navy selected this system as a near-term replacement of the range capabilities at Vieques, DOT&E has accelerated the development of this program.
- MULTIPURPOSE SUPPORTING ARMS TRAINER: This project will apply the latest display technologies, synthetic terrain viewers, and scenario development techniques to the development of a prototype multipurpose terminal control and supporting arms trainer. The trainer will provide a joint, standardized system for instruction in the employment and techniques for communicating requirements for Naval surface fire, tactical air, and field artillery support in expeditionary operations. Each Service currently performs these requirements differently. The Joint Forward Air Controller community estimates that operational and maintenance costs could be reduced by 50 percent by accomplishing close-air support coordination and pilot proficiency training via a synthetic training environment.

JOINT LIVE FIRE PROGRAM

OSD initiated the JLF Program in March 1984 to establish a formal process for the test and evaluation of fielded U.S. systems against realistic threats. This process continues today, taking into account changes in operational scenarios, changes in threat munitions and targets, and the testing of legacy systems. JLF provides a means to gather additional data not collected by acquisition programs. It contributes to survivability and lethality assessments of fielded systems or for upgrade programs that do not qualify as a formal LFT&E program.

The JLF program consists of three groups: Aircraft Systems (JLF/AS), Armor/Anti-Armor (JLF/A/AA), and Sea Systems (JLF/SS). The focus of each of these groups is:

- JLF/AS: Vulnerability of U.S. fixed-wing and rotary-wing aircraft to realistic threats and on the lethality of fielded U.S. weapons/munitions against foreign aircraft.
- JLF/A/AA: Vulnerability of fielded U.S. ground systems (e.g., tanks, armored personnel carriers) to realistic threats and on the lethality of fielded U.S. weapons/munitions against realistic targets.
- JLF/SS: Vulnerability of fielded surface combatants and on the lethality of fielded U.S. weapons/munitions against realistic targets.

In FY03, the JLF/AS program addressed the vulnerability of rotorcraft to rocket propelled grenades, the vulnerability of close-air support aircraft to a new 35mm airburst munition and the vulnerability of the H-60, CH-53, and Predator Unmanned Air Vehicle (UAV) to ballistic threats.

- TRI-SERVICE ROTORCRAFT VULNERABILITY TO ROCKET-PROPELLED GRENADES (RPG): RPGs are multipurpose weapons that are employed against lightly armored targets such as armored personnel carriers, transport trucks, or patrol boats. Due to the low cost and rugged characteristics of these weapons, they are widely used around the world. To demonstrate the lethality of RPG weapons against rotorcraft, a joint Army, Navy, and Air Force effort was initiated to investigate vulnerability of helicopters, demonstrate the lethality of fragment spraying patterns of RPG warheads, and to demonstrate direct impact lethality of the RPG against rotorcraft. During FY03, the Army and Navy completed their planning and target acquisition efforts. Testing during FY04 will include characterization of the RPG fuze function against soft targets and the characterization of the RPG fragment pattern.
- 35MM AIR BURST MUNITION EVALUATION AGAINST CLOSE-AIR SUPPORT AIRCRAFT: This project is evaluating the lethality of the 35mm Advance Hit Efficiency and Destruction round against close-air support aircraft. This munition is a modern, shot-by-shot programmable, highly effective fragmentation threat used as an area air-defense weapon. This munition is a new generation programmable round that is considered a serious threat to U.S. aircraft and ground attack weapon systems.
- TRI-SERVICE H-60 ENGINE NACELLE BALLISTIC FIRE SUPPRESSION: This three-year tri-Service project will evaluate the effectiveness and vulnerabilities of existing H-60 engine nacelle Halon 1301 suppression systems under the changing conditions resulting from combat damage. The testing will also provide opportunities for the evaluation of Halon alternative agents. The data from these tests will be used to reduce ballistic vulnerabilities of nacelle fire suppression system designs.
- CH-53E VULNERABILITY TO ANTI-AIRCRAFT ARTILLERY: There is little combat data and no test data on CH-53E vulnerability to small and medium ballistic munition threats. Any vulnerability reduction features identified in the JLF testing could be included in the new CH-53E service life extension program. Testing will include dynamic ballistic tests of the rotor and drive systems and ballistic testing of the fuel systems.
- PREDATOR WING VULNERABILITY: This test empirically and analytically assesses the ballistic vulnerability of the RQ-1L Predator UAV composite wing to threat ballistic projectiles expected to be encountered during its operational mission. Ballistic munition tests will be conducted on a pair of operational wings for one year.

In FY03 the JLF/A/AA program evaluated the lethality of U.S. munitions against a foreign main battle tank and a foreign missile launcher, evaluated the sensitivity of stowed munitions on ground vehicles, and conducted blast overpressure testing to provide empirical data for an emerging modeling methodology.

- MUNITIONS LETHALITY: Lethality testing was continued against a classified foreign main battle tank. These tests were started in FY01 and will conclude in FY04. The objectives of these tests are to:
  - Assess the lethality of current and developmental U.S. munitions.
  - Acquire empirical data to calibrate current vulnerability methodologies.
  - Update existing JLF and LFT&E databases.
  - Supplement live fire lethality tests and evaluations for the tested munitions.
  - Provide data to assist field commanders in training on how to engage and defeat the tested threat target.

  The results will be incorporated in the JTCG/ME manuals for munitions effectiveness.

- MUNITIONS LETHALITY AGAINST SCUD-B TARGET: Lethality testing of several U.S. munitions against the SCUD-B ballistic missile target continued. Two test events were conducted against chemical warhead surrogates to determine the potential for destroying chemical warheads and the potential hazard posed by release of warhead contents. Data are currently being analyzed and will be used by the JTCG/ME to update joint munitions effectiveness manuals.
- PROPAGATION OF DETONATION OF STOWED BULK DETONATING CORD AND COMPOSITION-4: A vulnerability recently identified during an LFT&E test event of a ground system potentially posed a significant impact to operationally deployed forces. JLF funded an experiment to determine detonation and propagation thresholds for externally stowed engineering explosives (C-4, detonation cord). Additionally, data were generated to indicate the likelihood of detonation propagation between some dissimilar Class V items. Field expedient vulnerability reduction techniques were evaluated and recommended actions were transmitted to the combatant commanders via an Ammunition Information Notice.
- BLAST OVERPRESSURE TESTING IN SUPPORT OF THE BLAST EFFECTS AGAINST MOBILE SYSTEMS (BEAMS) METHODOLOGY: Blast testing against a former Soviet Union STYX missile launcher was conducted to obtain experimental data to aid in the validation efforts of the BEAMS model. Pretest predictions were made using the BEAMS model and served as the basis for establishing the initial standoff distances. Post-shot analyses of the structure and material properties updates are currently being completed in order to revise the BEAMS predictions.

In FY03, the JLF/SS program demonstrated HELLFIRE Missile lethality against an aluminum-hulled Mark III Patrol Boat. Data and damage assessment collected and analyzed will be used by the JTCG/ME to address systems' effectiveness against small boat threats. Also in FY03, JLF/SS began planning for several tests to investigate fire spread in confined enclosures such as below-decks on submarines and surface combatant vessels.

JOINT TECHNICAL COORDINATING GROUP FOR MUNITIONS EFFECTIVENESS (JTCG/ME)

The Joint Logistics Commanders chartered the JTCG/ME over 30 years ago to serve as DoD's focal point for authenticated non-nuclear munitions effectiveness information. The JTCG/ME's efforts include validating, standardizing, and disseminating modeling and simulation methodologies for evaluating the lethality of U.S. munition systems. The JTCG/ME authenticates data and methodology for use in training, systems acquisition, weaponeering, procurement, and combat modeling. Joint munitions effectiveness manuals (JMEMs) are used by the U.S. Armed Forces, NATO, and other allies to plan operational missions, support training and tactics development, and support force-level analyses. The JTCG/ME also develops and standardizes methodologies for the evaluation of munitions effectiveness and maintains databases for target vulnerability, munitions lethality, and weapon system accuracy.

In FY03, the JTCG/ME:

- Enhanced the operational tools and data in the following JMEMs: Air-to-Surface Weaponeering System, including two interim versions in support of Operation Enduring Freedom and Operation Iraqi Freedom; Joint Anti-Air Combat Effectiveness; and Surface-to-Surface Weaponeering Effectiveness System.
- Increased support to the warfighter by distributing products and product updates via the classified Internet with the JTCG/ME Products and Information Access System.
- Continued updating existing databases to incorporate weapons effectiveness and target vulnerability data for 33 new air-to-surface targets and 17 new surface-to-surface targets.
- Continued execution and technical coordination efforts to address target vulnerability data generation for a full spectrum of strike weapons against approximately 50 targets.
- Coordinated with Joint Chiefs of Staff to develop instructions to codify the command requirements data call and prioritization to support the FY04 JTCG/ME program.
- In collaboration with the Defense Intelligence Agency and Service intelligence centers, initiated intelligence collection and production requirements process and conducted review and analysis of intelligence data packages in support of target geometry development.

JOINT AIRCRAFT SURVIVABILITY PROGRAM (JASP)

The Joint Aeronautical Commanders Group established JASP by Charter in January 2003 through the integration of the JTCG on Aircraft Survivability, the Joint Live Fire Aircraft Systems program, the Joint Combat Assessment Team, and the Joint Accreditation Support Activity. The program focuses on establishing aircraft survivability as a design discipline. It develops vulnerability and susceptibility reduction technologies, provides standard accredited models to assess aircraft survivability, supports combat survivability education, collects combat damage data for analysis, and conducts JLF tests on combat aircraft. The JASP is the military's only tri-Service organization solely dedicated to advancing aircraft combat survivability.

In FY03, JASP worked closely with members of the defense acquisition community, as well as the Federal Aviation Administration, the Transportation Security Administration, and National Aeronautics and Space Administration, to identify critical issues regarding aircraft survivability. Accordingly, JASP funded approximately $8.4M for 61 survivability projects and funded approximately $1.5M for nine JLF test projects. JASP projects are grouped in three categories: susceptibility reduction, vulnerability reduction, and survivability assessment.

Examples of these projects are:

- SUSCEPTIBILITY REDUCTION:
  - The UAV Active Acoustic Cancellation project will measure radiation patterns and spectral content of acoustic emissions from push/pull propeller-driven UAVs and will then determine passive and active signature reduction techniques.
  - The Imaging Seeker Aim Point project's objective is to determine how to counter imaging infrared seekers in threat missiles.
  - The Aero Urban Decoy project will develop an inexpensive aero stable flare, safe for deployment in low-altitude environments and capable of protecting low-flying, large, fixed-wing aircraft.

- VULNERABILITY REDUCTION:
  - The Man Portable Air Defense System (MANPADS) Impact Point Assessment project will validate the ability of MANPADS fly-out and endgame modeling to discriminate between adjacent infrared targets and predict hit points.

- The Advanced Survivable Rotorcraft Validation project will enhance the technology base for the design of hardened rotorcraft structures. This project will also validate a low-cost, low-weight MANPADS hit-point biasing concept.
- The Joint Resistance to Ram project characterized inherent hydraulic ram resistance and failure criteria as a function of joint design.

- SURVIVABILITY ASSESSMENT:
  - The Dry Bay Fire Model (DBFM) Enhancements project, together with the JTCG/ME, is developing a standard dry bay fire model and a fuel tank ullage explosion model for stand-alone analysis. The DBFM will provide the framework to enable modeling of physical threat/target interactions that cannot be done within current models such as hydrodynamic ram filling the dry bay, fire pooling and spread, airflow within the dry bay with clutter, and time-dependent damage.
  - The JASP funds the Survivability/Vulnerability Information Analysis Center (SURVIAC) Model and Simulation Accreditation Support Information project to provide a credibility assessment of the survivability and vulnerability models and simulations that are distributed by SURVIAC.

Overview

The Joint Test and Evaluation (JT&E) Program has existed for 30 years and is designed to provide quantitative information for analysis of joint military capabilities and potential options for increasing military effectiveness. The program is complimentary to, but not a part of, the weapons acquisition process. A JT&E test brings together two or more military departments or other components to:

- Assess the interoperability of Service systems in joint operations.
- Evaluate improvements in joint technical and operational concepts.
- Evaluate and validate multi-Service testing methodologies.
- Assess performance of interacting systems under realistic joint operational conditions.
- Provide data from joint field tests and exercises to validate models, simulations, and test beds.

Effective December 9, 2002, DOT&E received responsibility for supervision of the JT&E program. DOT&E is changing the JT&E process to provide results to the warfighter faster. The program will be more agile and respond more quickly to emergent needs and requirements. JT&E will streamline the process and accelerate testing. Improved implementation will provide immediate benefits. Quick Reaction Tests (QRTs) will complement ongoing tests, providing testing and reporting of results in six months or less. OSD directed the first QRT, Joint Survivability (JSURV), in August 2003 to identify systemic deficiencies in tactics, techniques, and procedures (TTP) and materiel used by U.S. forces in Iraq in order to reduce U.S. casualties. JT&E is accelerating testing and shortening test duration. This year, OSD chartered Joint Datalink Information Combat Execution (JDICE) six months early, and testing will take place within the first year of charter. In an effort to implement products early and responsively to its customers, Joint Methodology to assess Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance (C4ISR) Architecture (JMACA) is integrating with its U.S. Joint Forces Command (JFCOM) customer now, during testing, in order to provide interim test results quickly and support an early and smooth transition of test results and products.
The JT&E program identifies realistic, cost-effective, Service-executable solutions to the joint problems facing today's warfghter.

The following JT&E tests participated or contributed this year in Operation Iraqi Freedom (OIF). They applied results from their tests to make real-time improvements to operations.

- Joint Global Positioning System Combat Effectiveness (JGPSCE) field testing discovered potential weapon systems vulnerabilities to global positioning system degradation. The quick-look test results concerning these vulnerabilities provided invaluable and timely information to warfighters during Operation Iraqi Freedom.
- Joint Unmanned Air Vehicles (JUAV) deployed into the U.S. Central Command (CENTCOM) Air Operations Center to assist in unmanned aerial vehicle tactics, techniques, and procedures development.
- Joint Cruise Missile Defense (JCMD) provided hardware and software tools for quick assessment of events from Iraqi missile shots.
- Joint Logistics/Planning Enhancement (JLOG/PE) assisted and is currently working with the CENTCOM J4 staff in improving the process of acquiring and assimilating logistics support.
- Joint Command, Control, Intelligence, Surveillance, and Reconnaissance (JC2ISR) deployed to assist in all phases of time-sensitive targeting.
- Joint Battle Damage Assessment (JBDA) provided four enhancements for implementation to the BDA process during OIF.

In addition, Joint Shipboard Helicopter Integration Process (JSHIP) directly supported Army, Navy, and Air Force warfighters participating in Operation Enduring Freedom (OEF). A cadre of JSHIP members provided products and assistance to the *USS Kitty Hawk* (CTF70) that enabled embarked special operations personnel and aircrews to meld their capabilities with the ship's crew to employ the aircraft carrier as an Afloat Forward Staging Base.
During FY03, the JT&E program selected three planning-phase candidates (from 12 submitted) that will be considered for charter in January 2004.

- Joint Urban Fires and Effects will increase the ability of the Joint Force Commander (JFC) to conduct urban fires (lethal, non lethal, other) and assess effects relative to the desired operational effect.
- Joint Space Control Operation will make the JFC's combat planning and execution more lethal through improved command and control (C2) and space control negation joint tactics, techniques, and procedures (JTTPs).
- Joint Integration and Interoperability of Special Operations will focus on improving the joint planning, rehearsal, and execution within the unique special operations mission areas of direct action and special reconnaissance to ensure enhanced integration, interoperability, and collaboration with special operations forces.

A JT&E senior-level board will convene in January 2004 to decide which of these proposed tests will be chartered and proceed to testing. As part of the re-engineering effort, the evaluation periods for these three were shortened by six months to ensure prompt attention to their issues.

The following pages provide additional information on current JT&E test activities and the products they are providing to the warfighter.

Joint Battle Damage Assessment (JBDA)

Joint Battle Damage Assessment (JBDA) is a four-year JT&E chartered in August 2000 to study and enhance the joint force battle damage assessment (BDA) process. During Operation Desert Storm, joint force BDA requirements exceeded the available intelligence collection capabilities. The DoD Final Report to Congress, Conduct of the Persian Gulf War, 1992, stated, "The BDA process was difficult, especially for re-strike decisions." The report recommended the establishment of effective BDA doctrine and organization, and it identified a critical need to develop a BDA process for maneuver forces. A lack of trained BDA analysts exacerbated the situation.

Operations Desert Fox and Allied Force revealed that, while some advances had been made in BDA since Operation Desert Storm, the need remained for further improvement. The training for BDA analysts was still lacking, and the processes and procedures for conducting both fixed and mobile target BDA needed revisions to promote more timely and accurate BDA to meet the commander's decision cycle.

OSD directed the JBDA Joint Feasibility Study (JFS) in FY99 to address these recurring shortcomings. The Army was designated as the lead Service and the Army Intelligence Center and School is the sponsoring command. OSD chartered JBDA as a JT&E in FY00.

TEST AND EVALUATION ACTIVITY

During FY03, JBDA established the baseline joint BDA process by analyzing the data and anecdotal observations gathered during the U.S. Forces, Korea (USFK) exercise Ulchi Focus Lens 2002. JBDA completed the baseline data analysis and then developed and fielded doctrine, organization, training, materiel, leadership, personnel, and facilities (DOTMLP-F) test products that address the problems identified in the baseline BDA process. JBDA evaluated the DOTMLP-F test products in exercise Ulchi Focus Lens 2003. During FY04, JBDA will analyze this data and issue the final joint test report.

During Operation Enduring Freedom and Operation Iraqi Freedom, JBDA deployed observers to the Headquarters, U.S. Central Command, in Tampa, Florida, and the National Military Joint Intelligence Center at the Pentagon in Washington, D.C., to observe the as-is BDA process. JBDA rotated observers after several weeks to ensure continued presence at both locations throughout the sustained operations. These observations served to reinforce the findings of the baseline joint BDA process and focus the development of DOTMLP-F products for deployment with USFK.

The Joint Battle Damage Assessment is developing and testing procedures to improve the accuracy and timeliness of battle damage assessment support at key points in the JFC's decision-making cycle.

From January to July 2003, JBDA also supported the Joint Task Force - Horn of Africa with an intelligence officer in sustained operations to promote political stability in the region, deny safe haven to terrorists, and provide valuable insight on BDA in counter-terrorist operations.

TEST AND EVALUATION ASSESSMENT

JBDA will facilitate operational decision making for the JFC by improving the accuracy and timeliness of BDA. JBDA is developing and testing procedures to improve the accuracy and timeliness of BDA support at key points in the JFC's decision-making cycle. JBDA's focus is BDA reporting. After evaluating BDA processes, procedures, training, manpower, and command and control system interoperability, JBDA will develop and test proposed fixes and report them to combatant commanders and the Services. JBDA will provide the warfighter with C4I enhancements institutionalized in the USFK Advanced Deep Operations Coordination System. The USFK Joint BDA Guide (developed by JBDA) will be rewritten as the Commander's Handbook for Joint BDA and posted on the Joint Electronic Library. Additionally, JBDA will send BDA training CDs to the combatant commands for use in training permanent and augmentation BDA analysts.

Joint Command and Control, Intelligence, Surveillance, and Reconnaissance (JC2ISR)

The JC2ISR JT&E was chartered to improve joint operations by providing recommendations to enhance joint C2ISR tactics, techniques, and procedures (TTP); operational concepts; training; and systems. JC2ISR will enhance joint warfighter ability to utilize diverse national, theater, and tactical collection sensors and dynamically focus them to identify, locate, track, and engage high-value, mobile surface targets. Recommendations resulting from the JC2ISR JT&E will significantly improve the JFC's ability to integrate assigned organic and higher echelon platforms and sensors in a coordinated (cross-cued) and cooperative (simultaneous) collection strategy. Results will provide decision-makers with significantly improved C2ISR tasking, processing, exploitation, and dissemination (TPED) to support time-critical targeting, and will be applicable to all joint warfighters.

The Joint Task Force (JTF) and supporting components' ability to manage resources to detect, identify, locate, track, and engage high-value mobile surface targets is limited by current joint C2ISR processes. Recent military operations (Operations Desert Storm, Desert Fox, Allied Force, Enduring Freedom, and Iraqi Freedom) confirm our inability to employ ISR collection assets to consistently locate, identify, and attack fleeting mobile targets. In many cases, enemy mobile targets are vulnerable for a shorter period of time than it takes to engage them using current procedures. A major contributor to this limitation lies in shortfalls in the joint C2ISR TPED system that supports dynamic time-sensitive targeting (TST) operations. Lessons learned from these military operations have identified a requirement for highly discriminate targeting information that avoids collateral or unintended damage despite poor weather and adversary countermeasures.

OSD chartered the JC2ISR JT&E in FY00 to employ multi-Service and other DoD Agency support, personnel, and equipment to investigate, evaluate, and make recommendations to improve the operational effectiveness of joint C2ISR. Specifically, the JC2ISR JT&E will test and evaluate the JTF and Components' ability to dynamically task and re-task ISR collection platforms and sensors, and their ability to process, exploit, and disseminate combat information to support TST. The JC2ISR JT&E will baseline current C2ISR processes used to prosecute TSTs; identify ISR platform and sensor tasking, processing, exploitation, and dissemination deficiencies; and identify opportunities for joint C2ISR improvements.

JC2ISR executed its first mini-test during JTF Exercise 01-3, conducted August 6-19, 2001. During Mini-Test 1, JC2ISR assisted Second Fleet personnel with the development of the Time Critical Strike Tactical Memorandum.

TEST & EVALUATION ACTIVITY

During FY03, the JC2ISR JT&E conducted and published test reports for Mini-Test 2 and for the first of two major field tests. The JC2ISR JT&E conducted Mini-Test 2 during the JTF Exercise 03-1 training exercise, October 28-November 6, 2002. JTF Exercise 03-1 was a Chairman, Joint Chiefs of Staff-approved, U.S. Joint Forces Command (JFCOM) scheduled, combined and joint field training exercise employing Army, Navy, Marine Corps, Air Force, Special Operations Forces (SOF), and NATO forces in a littoral environment. Field Test 1 employed Army, Navy, Air Force, SOF, and allied forces in a littoral environment in conjunction with the Joint Combat Identification Evaluation Team (JCIET) 2002 exercise in April 2002. The JC2ISR JT&E used Mini-Test 2 and Field Test 1 results primarily to define the joint C2ISR baseline, recommend improvements, and identify enhancements to improve joint C2ISR TPED/Task Process Post Use (TPPU) capabilities against TSTs during Field Test 2, to be conducted in conjunction with Combined JTF Exercise 04-2 in June 2004.

The Joint Command and Control, Intelligence, Surveillance and Reconaissance Joint Test and Evaluation conducted Mini-Test 2 during the JTF Exercise 03-1 training exercise, October 28-November 6, 2002.

Combined JTF Exercise 04-2 will employ Army, Navy, Air Force, SOF, and allied forces in a littoral environment in a joint field training exercise. JFCOM has identified the JC2ISR JT&E as the office of primary responsibility for TST data collection, analysis, and reporting for Combined JTF Exercise 04-2 requiring multi-Service and Agency coordination. FT2 will incorporate Distributed Common Ground/Surface System (DCGS) Family of Systems (FOS) representatives to see if an interoperable and integrated DCGS FOS can enhance TST operations. JC2ISR is striving to incorporate intelligence processes training to ensure a viable test architecture to conduct joint TPED/TPPU.

The JC2ISR JT&E supported other test events in FY03 with subject matter experts, data collectors, and software; using these events as risk reduction exercises to collect systems sample data and observe select TST activities to support JC2ISR Field Test 2 test requirements. Risk reduction exercises included JCIET Exercise 2003 in August 2003 and the JGPSCE JT&E mini-test in September 2003.

The JC2ISR JT&E also deployed several personnel in direct support of Operation Iraqi Freedom: four to the U.S. Central Command Joint Intelligence Center at MacDill Air Force Base, Florida; one as a member of the Predator unmanned aerial vehicle exploitation team at Beale Air Force Base, California; two to U.S. Army, Central Command, Riyadh, Saudi Arabia; and one to Central Command Air Forces Prince Sultan Air Base, Saudi Arabia.

In addition, the JC2ISR JT&E continued active participation in the Air Land Sea Application Center effort to draft TST multi-Service TTP documents.

TEST & EVALUATION ASSESSMENT

JC2ISR JT&E results will support the development of numerous products for the Joint Staff, combatant commands, Services, national agencies, and other JT&E efforts. For example, JC2ISR results prompted the JT&E to develop an ISR/TST operations integration process model as a tool to effectively evaluate joint C2ISR improvements in TST prosecution. In general, JC2ISR test products will provide warfighters with a baseline effectiveness evaluation of current C2ISR capabilities and limitations, and will quantify the effects of specific C2ISR enhancements to improve the TST mission area. The Services and combatant commanders continue to support the JT&E. Resources and planning are on track to successfully complete scheduled testing.

JC2ISR will improve the operational capability of warfighters to employ joint ISR collection assets to conduct time-sensitive targeting. The JC2ISR JT&E is developing products that will enable warfighters to more effectively attack TSTs by improving their use of C2ISR equipment, their joint TTP, and their collection management training.

Joint Cruise Missile Defense (JCMD)

The Joint Cruise Missile Defense (JCMD) JT&E was chartered to employ multi-Service and other DoD agency support, personnel, and equipment to investigate and evaluate the operational effectiveness of joint operations against land attack cruise missiles (LACMs).

JCMD will provide crucial information on near-term LACM defense capabilities and inputs to support future architecture, technologies, and operational concepts. The basic JCMD test approach integrates a series of field tests and simulations in three phases to answer the program issues. Phase 0 was the risk-reduction effort and ensured the program was prepared to collect and assess the Joint Integrated Air Defense System (JIADS) LACM capabilities. Phase 1 was focused on assessing the JIADS current (FY02) capabilities identifying potential problem areas and enhancements. Phase 2 will evaluate the value of identified enhancements and provide the combatant commanders with both an assessment of the near-term (FY04) capabilities as well as recommendations for further areas of improvement.

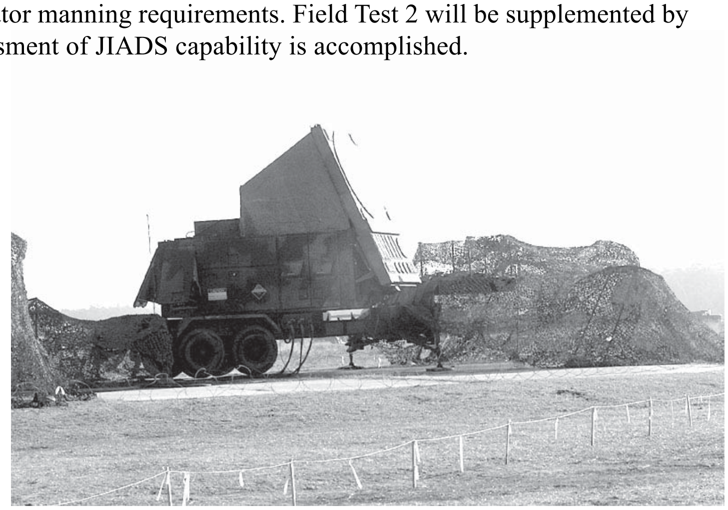
TEST & EVALUATION ACTIVITY

JCMD Phase 1 activities took place in FY02. Field Test 1 occurred as part of the U.S. Joint Forces Command (JFCOM) Joint Combat Identification Evaluation Team event April 8-26, 2002, in Gulfport, Mississippi. Field Test 1 assessed the current JIADS cruise missile defense capability in a live test environment using operational forces and an operationally representative scenario. JCMD flew BQM-74E (unmanned drones) and BD-5J (manned micro jets) to represent the current land attack cruise missile threat. More than 25 sorties were flown over land and sea, simulating surface and air launched land attack cruise missile profiles.

JCMD's second Phase 1 test in FY02 was a simulation evaluation of the JIADS. JCMD executed Simulation Test 1 from September 9-20, 2002, at the Boeing Virtual Warfare Center, St. Louis, Missouri, and the Aegis Training and Readiness Center, Dahlgren, Virginia. Operator-in-the-Loop systems in the evaluation included the Joint Air Operations Center, Tactical Air Operations Center, Patriot, Airborne Warning and Control System, F-15C, Air Battle Management Operations Center, and Aegis Command Information Center.

The JCMD team is currently planning Phase 2 of its integrated test schedule, the enhanced JIADS capability assessment. JCMD's enhanced phase of testing begins with Simulation Test 2, followed by Field Test 2 to be conducted in conjunction with Combined JTF Exercise 04-2. Simulation Test 2 requires extensive integration testing of the widely distributed simulation architecture JCMD is developing. This architecture provides a foundation for many follow-on customers including Service and Joint organizations. The Simulation Test 2 Mid-Planning Conference, held September 8-19, 2003, also provided the setting for a General Officer Steering Committee (GOSC) meeting and gave the GOSC members the opportunity to view the extensive simulation capability, receive an update of JCMD activities, and gain an understanding of open issues such as simulation operator manning requirements. Field Test 2 will be supplemented by specific system tests to ensure a comprehensive assessment of JIADS capability is accomplished.

The program is also continuing its efforts to support other non-dedicated test events and continue to develop Warfighter support products that will meet future training, testing, and experimentation requirements. JCMD is preparing to support the JFCOM and First Air Force Area Cruise Missile Defense System Military Utility Assessment of the Joint Based Expeditionary Connectivity Center. JCMD conducted this test in August 2003 in Oceana, Virginia. This event included the debut of the upgraded Small Manned Aerial Radar Target-Model 1 (SMART-1), a new cruise missile surrogate. The SMART-1 is now equipped with a sophisticated flight following system that allows for low-level night flight profiles with improved communications and flight characteristics.



Joint Cruise Missile Defense will enhance the capability of U.S. Joint Integrated Air Defense System to defeat a cruise missile attack.

TEST & EVALUATION ASSESSMENT

JCMD will enhance the capability of U.S. JIADS to defeat a cruise missile attack. After evaluating baseline JIADS capabilities and procedures to meet cruise missile defense mission area requirements, JCMD will quantify the effects of procedural and hardware enhancements to JIADS in a cruise missile defense role and make recommendations to combatant commanders and the Services. JCMD products will provide warfighters with a baseline effectiveness evaluation of current JIADS capabilities and procedures to meet the requirements of the JCMD mission area. Once this has been accomplished, the JCMD JT&E will report the effects of concept of operations and TTP changes as well as command and control, sensor, and shooter system enhancements to the JIADS in a cruise missile defense role.

Joint Datalink Information Combat Execution (JDICE)

The Joint Datalink Information Combat Execution (JDICE) JT&E was chartered to improve the warfighter's battlespace situational awareness by developing, testing, evaluating, and institutionalizing joint tactics, techniques, and procedures (JTTPs) that provide critical mission information across multi-platform, fielded, tactical air and ground data links. The JT&E will specifically determine whether the expanded application of Link-16 will improve deconfliction and tactical targeting processes. JT&E will accomplish this end by employing multi-Service and other DoD Agency support, personnel, and equipment, which shall be completed by April 30, 2006. JDICE is committed to getting information to the warfighter as soon as possible, and test results will be disseminated as appropriate.

The Air Force Air Warfare Center nominated JDICE as a Joint Test, and OSD directed a JDICE Joint Feasibility Study (JFS) in September 2002. The JDICE JFS concluded that a JDICE JT&E was necessary and feasible. OSD chartered JDICE in April 2003. JDICE is the first effort to be chartered as a test case for shortening the timeline and delivering products to the warfighter under the DOT&E re-engineering effort for the JT&E program.

TEST & EVALUATION ACTIVITY

The JDICE test concept is based on empirical testing during three live mini-tests and a field test using current joint warfighters, their fielded systems, and realistic targets. JDICE selected each mini-test arena as a direct result of Joint Warfighter Advisory Group inputs. They identified that the most important mini-test (Mini-Test A) as the Army Forces/ Marine Forces. Simply stated, the objective of Mini-Test A is to provide a vehicle for data collection to supporting a filtered, single-source, best integrated ground picture for theater missile defense and close air support. Mini-Test A is planned to use the Joint National Training Capabilities (JNTC) venues.

JDICE identified the second mini-test (Mini-Test B) for Special Operations Forces (SOF). The objective of Mini- Test B is to protect Special Operation Forces (SOF) from fratricide while optimizing appropriate SOF-derived critical mission information to Link-16 players. Information sources are very different between the Mini-Tests A and B as is information flow and where relevant information stops.

JDICE has identified Mini-Test C as a National Assets venue, which was the first test conducted to flow directly into scheduled Navy and Air Force JTTP conferences covering Space, Command and Control (C2), and Fighter mission areas. The objective of Mini-Test C was to provide the best possible real-time threat picture to tactical level shooters. The desired outcome of Mini-Test C was to place actionable critical mission information on tactical level warfighting platform displays – information which currently exists at operational levels, but not at the tactical level. Mini-Test C was conducted at Nellis Air Force Base, Nevada, from October 27 - November 7, 2003. Immediate feedback from the JDICE JT&E was enable new and proven JTTPs to be rapidly disseminated to joint warfighters and the Services. In addition, operational constraints or limitations discovered during the JT&E will serve as a foundation to evolve the role of Link-16 in modern warfighting C2, and potentially influence ongoing and future machine-to-machine acquisition strategy.

The field test will provide a vehicle for data collection to determine if the simultaneous integration of information gathered from the three previous mini-tests provides an improvement in the tactical deconfliction and targeting processes, without saturating the Link 16 network architecture. The field test is planned to use a JNTC venue that provides the most realistic operational environment possible.

The Joint Datalink Information Combat Execution test concept is based on empirical testing during three live mini-tests and a field test using current joint warfighters, their fielded systems, and realistic targets.

TEST & EVALUATION ASSESSMENT

Based upon the emerging JDICE Mini-Test C results, the JT&E will rapidly develop, document, and disseminate conclusions and recommendations regarding enhancements to Joint Data Link architecture, associated JTTPs, concept of operations, and processes. Specific emphasis will be placed on the rapid production of a quick look report and the presentation of these results at Service-level tactics, techniques, and procedures conferences. The JT&E specifically addresses non-materiel solutions and the development of JTTPs to transfer critical, actionable information to the joint user. Test products will include the JTTPs to take correlated machine-to-machine nationally-collected data and use a man-to-machine interface to distribute specific actionable data via the Link 16 network to the tactical level shooter. When complete, JDICE will present solutions to documented shortfalls in tactical datalink information exchange capabilities across sensor, C2, and "shooter" datalink-capable networks.

Joint Global Positioning System Combat Effectiveness (JGPSCE)

The JGPSCE JT&E was chartered to evaluate the impact of electronic warfare (EW) targeted against global positioning system (GPS) receivers in joint operations. GPS provides highly accurate, real time, passive, common-reference grid position and time information to military and civilian users worldwide. GPS enables the military forces to determine their position, velocity, and time. Knowledge of the exact position and time is essential to reconnaissance and intelligence missions. GPS will: enhance command and control and coordinate battle tactics and support; engage in strategic and tactical warfare; maneuver efficiently on the battlefield; provide accurate and timely fire support; and facilitate combat service support operations. OSD chartered JGPSCE in July 1999.

The JGPSCE JT&E is conducting field test events representing three types of combat operations: small scale contingency; limited engagement; and major theater war. Each field test addresses a specific combatant command's theater of interest using: current tactics, training, and procedures; approved doctrine; actual concepts of operation; and "real" scenarios and threat laydowns.

Each field test is designed to provide key information for warfighters to use in operational decision-making. The field tests employ open air GPS jamming representing the real-world threat to evaluate the impact of GPS EW and electromagnetic interference (EMI) by comparing baseline performance to performance with EW and EMI present. Mitigation techniques and procedures developed during test planning are also employed and evaluated during field testing to assess the ability of troops and commanders to continue operations in a GPS degraded or denied environment. JGPSCE publishes Quick Look Reports to the Services and the combatant commands immediately after each test event.

Phase 1 testing consisted of two live test events, GYPSY ALPHA and GYPSY BRAVO, at the tactical level of warfare. These tests focused on GPS EW and EMI vulnerabilities and mitigations for few-on-few engagements during small-scale contingencies. Each live test in Phase l concentrated on portions of the sensor-to-shooter architecture. The GYPSY ALPHA field test, October and November 2000, exercised ground forces supplemented by limited airborne forces. The GYPSY BRAVO field test was executed in two parts, January 2002 and July 2002, exercising airborne platforms delivering precision guided munitions.

Phase 2 testing consisted of one live test event, GYPSY CHARLIE, to evaluate the tactical and operational-level mission performance of integrated system-of-systems during limited engagement operations.

Phase 3 testing consists of a single test, GYPSY DELTA, which will evaluate integrated tactical- and operational-level systems with warfighters performing missions during a major theater of war scenario.

Global Positioning Systems Combat Effectiveness executed the GYPSY CHARLIE field test at Nellis Air Force Base, Nevada, in September 2003. GYPSY CHARLIE consisted of over 450 participants from 25 units, flying 240 sorties over ten nights.

TEST & EVALUATION ACTIVITY

JGPSCE completed the GYPSY CHARLIE field test in FY03, began planning for GYPSY DELTA, and conducted numerous briefings and presentations.

- JGPSCE briefed the GYPSY BRAVO results to Deputy Secretary of Defense, the Chairman and Joint Chiefs, the Service Operations Deputies, three combatant commands, the Secretary of the Air Force, Under Secretary of Defense(Acquisition, Technology, & Logistics), and DOT&E. These briefings increased awareness of systems vulnerability to GPS degradation.

- JGPSCE published GYPSY BRAVO Quick Look Reports as well as vulnerability assessment reports for each system executed in the GYPSY BRAVO field test.
- JGPSCE executed the GYPSY CHARLIE field test at Nellis Air Force Base, Nevada, in September 2003. GYPSY CHARLIE consisted of over 450 participants from 25 units, flying 240 sorties over ten nights. GYPSY CHARLIE included six adjunct test activities including two aircraft from the Federal Aviation Administration flying 16 sorties.
- JGPSCE completed work on its GPS Vulnerability Test Methodology. The execution of the GYPSY CHARLIE field test validated the JGPSCE developed methodology.

The JGPSCE Joint Test Team received the Joint Meritorious Unit Award on August 1, 2003, for its contribution to Operation Iraqi Freedom.

TEST & EVALUATION ASSESSMENT

JGPSCE continues to provide rapid feedback to the warfighter community through quick-look reports and briefings. The GYPSY BRAVO test results significantly enhanced vulnerability awareness with the DoD senior leadership. Central Command conducted additional training and briefed numerous deploying units, and the Navy circulated updates to operational crews. The Air Force dedicated resources to conduct additional testing, correct system vulnerabilities, and provide enhanced crew awareness. When complete, JGPSCE will have quantitatively and qualitatively measured and assessed the impacts of the loss of GPS on joint operations, measured and assessed mitigation methods to limit mission impacts, and developed test methodologies to characterize GPS vulnerabilities in future acquisition and integration programs.

Joint Logistics Planning Enhancements (JLOG/PE)

The JLOG/PE JT was chartered to identify and develop enhancements to joint logistic sustainment planning and management processes. Recent operations, such as Operation Iraqi Freedom, as well as joint exercises, have demonstrated the need for improvements in both the exchange of logistics information between the Service components and the JFC, and in the joint logistics planning and management processes to aid the JFC J4 assessment of the sustainment of in-theater forces. Taken together, these define a requirement for more timely and accurate logistics information.

The Developmental Test Command of the Army Test and Evaluation Command (ATEC) developed a JT&E nomination called Joint Versatile Information System On-line. OSD directed this nomination as a Joint Feasibility Study, and the name was subsequently changed to Joint Logistics Planning Enhancements (JLOG/PE) to better communicate the functional focus of this test.

TEST & EVALUATION ACTIVITY

During FY02–03, JLOG/PE conducted program-level test planning, held planning conferences, and prepared for its first test activity, Test A.1, in September 2003.

The JLOG/PE Joint Warfighter Advisory Group Conference, March 25-26, 2003, brought representatives from a wide range of joint and Service testing activities. Members of the JLOG/PE JT&E provided an overview of the JLOG/PE JT&E test strategy and also presented a briefing on joint logistics sustainment planning and management processes and on process mapping efforts. They also reviewed, in detail, the JLOG/PE T&E concept.

The JLOG/PE Technical Advisory Group (TAG) met June 24-25, 2003, with the purpose of soliciting Service input on the JLOG/PE test concept and test planning activities. The TAG included representatives from Air Force Operational Test and Evaluation Center, ATEC, Joint Interoperability Test Command, Marine Corps Operational Test and Evaluation Activity, and Navy Operational Test and Evaluation Force.

The JLOG/PE Risk Reduction Event conducted July 7-11, 2003, at the Joint Warfighting Center, Suffolk, Virginia, demonstrated that the data required for the JLOG/PE test strategy can be collected. The Risk Reduction Event was conducted in conjunction with the Unified Endeavor 03-2 Database Test 3. Its focus was to confirm JLOG/PE's ability to capture the data necessary to enable reconstruction and replay of key portions of the joint exercise for use during subsequent testing. The Risk Reduction Event followed the same general outline as actual test execution, but employed a narrower focus in that only data aimed at enabling reconstruction and replay was collected. Data was collected using a combination of manual and automated means. The Joint Theater Level Simulation (JTLS) startex database, JTLS checkpoint files, Global Command and Control System reconstruction data, screen captures, and e-mail traffic were collected.

Following data collection at the database test, JLOG/PE returned to home station and reconstructed (for playback) a selected portion of the database test in the JLOG/PE analysis lab. Successful accomplishment of this task validated JLOG/PE's ability to execute a complete and successful test during and following a joint exercise.

Joint Logistics Planning Enhancements testing will assess current joint logistics sustainment planning and management processes, identify deficiencies, develop enhancements to correct the deficiencies, test the enhancements, and report the results.

The JLOG/PE JT&E has prepared a plan to ensure that its evaluation results are released as interim reports to the warfighters as early as practical. The JLOG/PE Test Product Implementation Plan details the strategy for test product release and follow-through to the end user.

TEST & EVALUATION ASSESSMENT

JLOG/PE testing will assess current joint logistics sustainment planning and management processes, identify deficiencies, develop enhancements to correct the deficiencies, test the enhancements, and report the results. These joint logistics sustainment planning and management process enhancements will improve warfighter capabilities. Results will manifest themselves in more agile forces that are able to proactively assess operational logistics requirements; improved preparedness of units being committed to operations; faster, more informed decisions; improved measurements of success; accelerated operational timetables; reduced risk; and the projection of more capable forces requiring fewer resources. The JLOG/PE JT&E will provide that level of utility in terms of process, best practices, analysis, and understanding as usable test products.

Joint Methodology to Assess C4ISR Architecture (JMACA)

The JMACA JT&E was chartered to provide tools to identify and reduce the problems resulting from lack of information about the interoperability characteristics of Joint Task Force (JTF) Command, Control, Communications, and Computers, Intelligence, Surveillance, and Reconnaissance (C4ISR) architectures. Unknown interoperability deficiencies can affect the internal operations of the JTF with reduced speed of command, security vulnerabilities, unplanned resource expenditures due to the need for troubleshooting and reconfiguration, an excessive logistics train, and deployment of redundant systems. These unknown interoperability deficiencies can also affect the mission accomplishment of the JTF by causing a reactive posture, force loss, reduction of operating tempo, and loss of windows of opportunity.

The Navy and U.S. Joint Forces Command (JFCOM) nominated Joint C4ISR Outcome-Based Integrated Architecture Assessment (JCOBIAA) as a Joint Feasibility Study (JFS) to address these problems, and OSD directed a JCOBIAA JFS in July 2000. The JCOBIAA JFS team concluded that a JCOBIAA JT&E was both necessary and feasible. OSD chartered a JT&E in October 2001 and renamed the program Joint Methodology to Assess C4ISR Architecture (JMACA). The Navy is the lead Service. The JMACA JT&E will conclude in June 2006.

The JMACA JT&E problem statement reads: “The JTF commander has insufficient means to rapidly identify deficiencies and solutions within the C4ISR architecture.” The purpose of the JMACA JT&E is to enhance and validate an integrated C4ISR architecture assessment methodology, known as the JMACA Methodology. JMACA will test the JMACA Methodology utilizing JTF C4ISR architectures derived from a series of scheduled events, escalating in realism and complexity.

TEST & EVALUATION ACTIVITY

During FY03, JMACA planned, conducted, and reported on a mini-test and on JMACA Methodology Validation Test 1.

JMACA conducted a two-phase mini-test from December 2-13, 2002.

Phase 1. December 2-6, 2002, JMACA JT&E Tools Lab, Suffolk, Virginia. The JMACA test team evaluated the JMACA Methodology analytical toolset by employing the sequential steps of the JMACA Methodology to evaluate a JTF architecture scaled to a combat search and rescue scenario. This phase demonstrated the Architecture Identification (Step 0), Data Mining (Step 1), Risk Assessment (Step 2), and Fine-Grain Analysis (Step 3) steps of the JMACA Methodology.

Phase 2. December 9-13, 2002, Space and Naval Warfare Systems System Center, Charleston, South Carolina; Communications Electronics Command (CECOM), Fort Monmouth, New Jersey; and Electronic Systems Center, Hanscom Air Force Base, Massachusetts. JMACA conducted a distributed testbed demonstration using five notional connectivity capabilities of the selected testbed venues to perform the End-to-End Testing (Step 4) of the JMACA Methodology. JMACA conducted an additional testbed connectivity excursion between Tactical Training Group, Atlantic and CECOM on January 9, 2003.

The Joint Methodology to Assess C4ISR Architecture test team evaluated the JMACA Methodology analytical tool set by employing the sequential steps of the JMACA Methodology to evaluate a Joint Task Force architecture scaled to a combat search and rescue scenario.

JMACA conducted Validation Test 1 from August 18, to September 26, 2003, in two phases.

Phase 1. August 18-27, 2003, JMACA JT&E Tools Lab, Suffolk, Virginia. Trained Service representatives evaluated the JMACA Methodology analytical toolset by employing its sequential steps to evaluate a C4ISR architecture utilized during Operation Iraqi Freedom. This phase exercised the Architecture Identification (Step 0), Data Mining (Step 1), Risk Assessment (Step 2), Fine-Grain Analysis (Step 3), and Operational Analysis (Step 5) steps of the JMACA Methodology.

Phase 2. September 15-26, 2003, Joint Interoperability Test Command, Fort Huachuca, Arizona. JMACA exercised End-to-End Testing (Step 4) using select equipment strings identified by the JMACA Methodology during Phase 1.

TEST & EVALUATION ASSESSMENT

JMACA successfully accomplished the primary objectives of its mini-test and compiled and detailed the analysis and results in the JMACA Mini-Test Lessons Learned Report. These accomplishments include:

- Rehearsal of the Architecture Identification (Step 0), Data Mining (Step 1), Risk Assessment (Step 2), and Fine-Grain Analysis (Step 3) steps of the JMACA Methodology using a mission-specific JTF C4ISR architecture.
- Demonstration of distributed testbed connectivity, with test design, configuration, and execution performing collaboratively between multiple supporting testbed facilities.
- Rehearsal of functional thread testing (including instrumentation and data collection) to evaluate and refine, as necessary, JMACA test data collection techniques and methods. The specific areas that JMACA addressed include manual data collection techniques, automated data collection techniques, accuracy of collected data, and sufficiency of collected data.
- Rehearsal of the End-to-End Testing (Step 4) step of the JMACA Methodology.

The primary objective of Validation Test 1 was to facilitate the collection of data necessary to answer Test Issue 1, "How well does the JMACA Methodology support the assessment of a JTF C4ISR architecture?" Based on preliminary analysis and observations, this objective was successfully accomplished. The JMACA Validation Test 1 Quicklook Report outlines these findings. Detailed test results, data, and analysis of both primary and secondary objectives may be found in the Validation Test 1 Activity Report, due for release in December 2003.

The JMACA JT&E has begun transition of the JMACA Methodology and associated processes, analysis procedures, and key personnel into the JFCOM Joint Battle Management Command and Control (JBMC2) Systems Engineering Division. This transition enhances the JBMC2 Systems Engineering Division's ability to support JFCOM's responsibilities as directed by Management Initiative Directive 912, and lays the groundwork for an early and efficient transition of JMACA JT&E results to the warfighter. A transition plan and memorandum of agreement between JMACA and JBMC2 are currently under development.

When complete, JMACA will provide tools to assist warfighters in making informed decisions about C4ISR architecture capabilities when organizing a JTF. JMACA will provide the JFC with a set of tools to assess the JTF integrated C4ISR architecture. These tools, designated as the JMACA Methodology, will be timely, supportable, adaptable, and easily integrated.

Joint Shipboard Helicopter Integration Process (JSHIP)

The JSHIP JT&E was chartered to develop and facilitate a process to integrate multi-Service rotorcraft, aircrews, and embarked units with aviation-capable Navy ships. JSHIP conducted flight tests, critical measurements, engineering analyses, and simulations to provide recommended changes to joint tactics, techniques, and procedures; training syllabi; and rotorcraft/ship designs that will enhance safe, rotorcraft/ship interoperability. Army, Air Force, and Special Operations Forces helicopters were the primary focus for testing, however, National Guard assets were available and used for some at-sea testing. The test products delivered by the JSHIP program have already proven indispensable to the warfighters and were routinely used during recent operations in Afghanistan and Iraq.

OSD chartered the JSHIP JT&E in July 1998 following the completion and acceptance of a Joint Feasibility Study directed in June 1997. All Services and combatant commands were designated as participants, with the Navy as the lead service and executive agent for the program. JSHIP conducted 11 separate Dedicated at Sea Tests, testing seven classes of ships (CV, CVN, LHA, LHD, LSD, LPD, FFG) and eight Models of Aircraft (AH-64A/D, U/MH-60A/L, A/MH-6J, CH-47D, MH-53J, HH-60G, OH-58D, S/HH-60F/H) in a specific set of combinations. These tests spanned 64 steaming days and approximately 1200 flight hours. JSHIP also lead the development and verification of the Dynamic Interface Modeling and Simulation System (DIMSS). DIMSS was a joint development with the NASA Ames Vertical Motion Simulator group to perfect a simulation for use as an engineering tool for safely developing and expanding helicopter launch and recovery wind-over-deck (WOD) flight envelopes aboard Navy ships.

TEST & EVALUATION ACTIVITY

In addition to providing ongoing and continuing support to warfighters involved in Operation Enduring Freedom (OEF) and Operation Iraqi Freedom (OIF), JSHIP continued to create new test products and improve those already fielded. Highlights of previous testing included:

- A JSHIP cadre provided products and assistance to the *USS Kitty Hawk* (CTF70) that enabled embarked special operations personnel and aircrews to employ the aircraft carrier as an Afloat Forward Staging Base during OEF.
- JSHIP personnel deployed to the European Command Area of Responsibility to assist Army, Europe aviation units in creating a Maritime Interdiction Operations capability to train to operational standards for OEF.
- JSHIP evaluated multi-aircraft operations onboard the *USS Cleveland* (LPD 7), including AH-64A Apache, CH-47D Chinook, and UH-60L Blackhawk helicopters. This test expanded helicopter launch and recovery WOD flight envelopes, and addressed compatibility, procedures, and training issues.
- JSHIP evaluated multi-aircraft operations aboard the *USS Peleliu* (LHA 5). Army and Air Force test assets included OH-58D, UH-60L, CH-47D, AH-64D and HH-60G helicopters. This test addressed ordnance and helicopter WOD envelope expansion, as well as compatibility, procedures, and training issues.
- JSHIP completed the first-ever H-60 similarity study, a total analysis of all DoD H-60 helicopters with regards to land-based and shipboard performance criteria. Following this study, the H-64 and H-47 similarity studies were also completed.
- JSHIP developed and obtained all-Service approval for a new Joint Deck Landing Qualification Memorandum of Understanding (MOU). This MOU was signed by the Army, Navy, and Air Force in January, 2002.

Joint Shipboard Helicopter Inegration Process has increased the joint operational flexibility and readiness

TEST & EVALUATION ASSESSMENT

JSHIP testing has made contributions to warfighters in four categories.

- **General.** The Joint Shipboard Helicopter Integration Planning Guidance and Procedures Document was the main product developed for the warfighter, and it also benefits the testing and acquisition communities. It encompasses procedures, planning, tactics, techniques, test methods, and training. Additionally, JSHIP has developed an interactive web site and web-based CD reference and training program for embarked units and ship's company. JSHIP distributed the CD to combatant commands and aviation units that were selected for joint helicopter shipboard missions.
- **Procedures and Training.** JSHIP's test products include safety, training, and procedural guidance to enhance the warfighter's capabilities to conduct joint ship/helicopter operations. These test products include Pilot Deployment Handbooks, Embarked Unit and Ship's Company Deployment Planning Guides, Checklists, and Simulator Training Programs.
- **Compatibility.** Test products include development of an interactive Electromagnetic Vulnerability (EMV) database which allows the warfighter to assess the impact of EMV on joint operations, including restrictions to aircraft and ships. In addition, compatibility test products provide expanded WOD operational aircraft takeoff and recovery flight envelopes and tie-down and aircraft deck spotting guides for non-Navy helicopters.
- **DIMSS.** JSHIP used this modeling and simulation effort as both an engineering T&E tool and a training device. It supports at-sea helicopter flight testing with the potential to develop helicopter launch/recovery WOD envelopes via simulation. JSHIP incorporated DIMSS into flight trainers supporting the Army's 101st Airborne Division (Air Assault) at Ft. Campbell, Kentucky. Additionally, DIMSS has become a key element of the Army's UH-60 improvement program called Lift Shipboard Integration Program.

JSHIP has increased the joint operational flexibility and readiness of helicopters operating onboard Navy ships. JSHIP developed a process for certification and integration of Army and Air Force helicopters on-board Navy ships to assist JFCs in conducting effective, efficient, and safe joint shipboard operations.

Joint Survivability Quick Reaction Test (JSURV QRT)

The Joint Survivability (JSURV) Quick Reaction Test (QRT) was directed by DOT&E to investigate possible causes of casualty-producing incidents sustained by U.S. forces occupying Iraq after Operation Iraqi Freedom (OIF). Once these causes are identified, JSURV will recommend improvements to tactics, techniques, and procedures (TTP) and materiel, then assist in fielding those recommendations to reduce U.S. casualties in the OIF theater of operations.

The casualties being suffered by U.S. forces occupying Iraq may be preventable and may indicate deficiencies in the protection offered by certain vehicles; deficiencies in TTP in the employment of equipment; or a combination of both. The JSURV QRT will be executed in four parallel, overlapping phases:

- **Phase One.** Data Gathering. JSURV will identify and characterize the circumstances of incidents in which personnel become casualties while in ground vehicles. The focus of this effort is on both friendly and enemy characteristics.
- **Phase Two.** Problem Definition. JSURV will assess the results of data gathering and subsequent analysis to identify doctrinal (i.e., TTP) and hardware shortcomings, then conduct trend analysis to identify systemic deficiencies. The end result will be a compilation of shortcomings — doctrinal, hardware, or a combination — against which mitigating solutions may be applied.
- **Phase Three.** Identify and Demonstrate Solutions. JSURV will identify proposed TTP and materiel solutions to mitigate the casualty-producing shortcomings. Depending upon the nature of the proposed solution, some "prove out" of individual solutions may be required to ensure the viability of proposed solutions before exporting them to the OIF theater of operations for implementation.
- **Phase Four.** Closedown. Following accomplishment of its assigned tasks, the JSURV QRT will close down or transition to continuing efforts, as directed.

TEST AND EVALUATION ACTIVITY

Phases One and Two, Data Gathering and Problem Definition. JSURV has built a database to track OIF incidents related to the objectives of the QRT. The database is fed by U.S. Central Command (CENTCOM) Significant Activities (SIGACT) reports since May 1, 2003, and can be updated in real time. The information contained in the database will allow JSURV to make observations about enemy TTP and friendly vulnerabilities, and make recommendations for friendly TTP and materiel solutions.

- **CENTCOM Database.** On September 7, 2003, CENTCOM granted JSURV access to their SIGACT database which catalogues over 400 incidents related to the JSURV problem statement. JSURV has made a preliminary analysis of the incidents, developed trends for the attacks, and characterized the enemy TTP and operational profile in conjunction with the Army Training and Doctrine Command (TRADOC) G2 and the Department of the Army G2.
- **Coordination with Center for Army Lessons Learned (CALL).** On September 8, 2003, JSURV began coordination with CALL. JSURV has been invited to the CALL Initial Impressions Report Workshop scheduled for October 13-17, 2003. CALL teams that have recently returned from the OIF theater of operations will be debriefed, including a team that dealt specifically with the JSURV problem statement. This data will assist JSURV in developing and refining TTPs and identifying near-term materiel solutions.

Phase Three, Identify and Demonstrate Solutions.

- **TTP Development.** Initial analysis has indicated the potential for improved TTP to mitigate enemy actions. CALL has agreed to let JSURV take the lead on developing a TTP to address the problem statement. Close coordination with CALL and the Services is under way, and an initial draft will be ready in December 2003.
- **Materiel solutions.** JSURV is working with Army Materiel Command; Army Research Lab; Army Research, Development, and Engineering Command; TRADOC Systems Manager for Tactical Wheeled Vehicles; and the Product Management Office - Tactical Vehicles to identify available short-term fixes for rapid fielding to the forces in Iraq. In October 2003, JSURV will conduct testing to analyze the ballistic protection provided by on-

hand kits with armored doors, undersides, and innovative rocket-propelled grenade (RPG)-catching screens for High Mobility Multipurpose Wheeled Vehicles and other light vehicles at Aberdeen Proving Ground, Maryland. JSURV attended the Technology Workshop for the Identification and Defeat of Improvised Explosive Devices at the Navy Explosive Ordnance Detachment - Technology Division in Indianhead, Maryland, and further expanded the JSURV technical assessments by identifying potential electronic warfare (EW) and electronic countermeasures (ECM) tools to support early detection or pre-detonation of threats. These EW and ECM tools are available from the Counter-Mine Division of the Army Communications-Electronics Command, the Directed Energy Directorate of the Air Force Research Lab, and the Naval Research Lab.

TEST AND EVALUATION ASSESSMENT

JSURV is the first QRT under the DOT&E initiative to re-engineer JT&E processes for faster results to the warfighter. JSURV will use T&E methodology to identify systemic deficiencies in TTP and materiel used by U.S. forces in Iraq, then will identify improvements and assist in fielding those improvements to reduce U.S. casualties in the OIF theater of operations. JSURV is scheduled for completion in November 2003.

Joint Unmanned Aerial Vehicle in Time-Sensitive Operations (JUAV-TSO)

The JUAV-TSO JT&E was chartered to employ multi-Service and other DoD Agency personnel, support, and equipment to develop and document joint tactics, techniques, and procedures (JTTPs) for current and proposed tactical unmanned aerial vehicles (UAVs). Previously, UAVs were primarily used for intelligence, surveillance, and reconnaissance missions. Conflicts such as Desert Storm in the Persian Gulf and Operations Allied Force in the Balkans, Enduring Freedom in Afghanistan, and Iraqi Freedom in Iraq have shown that the Services have expanded UAV use to include tactical employment during dynamic, time-sensitive operations.

OSD directed a U.S. Navy-nominated Joint Unmanned Aerial Vehicle in Time-Sensitive Operations (JUAV-TSO) Feasibility Study on July 11, 2000, to identify improvements to JTTPs for the employment of UAVs by joint warfighters performing time-sensitive missions. OSD chartered the JUAV-TSO JT&E in October 2001 with the Navy as the lead Service and the Army, Marine Corps, and Air Force as participating Services. JUAV testing employs fixed- and rotary-wing air interdiction, artillery fire support, close air support (CAS), and personnel recovery within three command and control (C2) architectures. These architectures place weapon engagement decisions at various C2 nodes throughout JUAV-planned test events. The JUAV JT&E completion date is September 2005.

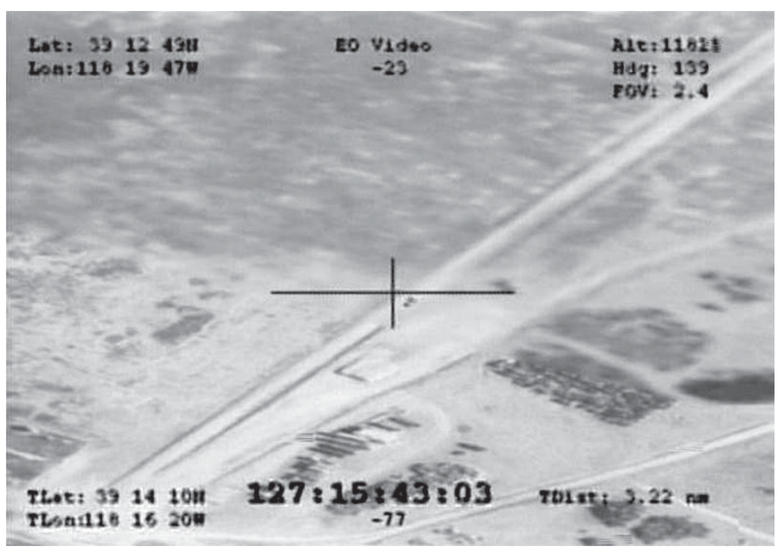
TEST & EVALUATION ACTIVITY

The JUAV JT&E conducted a virtual rehearsal, a mini-test, and one field test during FY03. The JT&E coordinated with U.S.-based organizations and developed a working relationship with international contacts to support test activities.

Planning. The JUAV Legacy Product Implementation and Transition Plan was completed and signed on December 6, 2002. The plan coordinates the transition of JUAV legacy products from JUAV custody to the most appropriate organizations.

- The JUAV Mini-Test Detailed Test Plan (DTP) was signed on May 30, 2003. The mini-test was conducted June 30 through July 2, 2003, and was effective, not only for collecting data on the close air support fire support mission area, but also for JUAV test team members to address issues related to a "full-scale" test transition.
- The JUAV Field Test 1 DTP was completed and signed on July 15, 2003. Field Test 1 was conducted August 6-14, 2003. It was held in conjunction with the Naval Surface and Air Warfare Center–sponsored Desert Rescue XI combat search and rescue (CSAR) training event. JUAV analysts collected, analyzed, and reported the CSAR mission area data from Field Test 1.
- On July 17, 2003, JUAV submitted the Outline Test Plan for Field Test 2 to the Army's Test Schedule and Review Committee for review.

Virtual Rehearsals. Virtual Rehearsal 3, November 18-22, 2002, was conducted at the Integrated Battlespace Arena (IBAR), Naval Air Weapons Station China Lake, California. It consisted of simulated air interdiction and fire support (CAS and artillery) missions in preparation for the JUAV mini-test. JUAV test team members evaluated data collection for CAS and artillery fire support and furthered data collector training. Personal Digital Assistants were exercised and refined during data collection and proved to be a valuable tool for JUAV data collection for future test events. Virtual Rehearsal 3 was a multi-Service and multi-National rehearsal event with participants from the United Kingdom and Canada, as well as the Army, Navy, Air Force, and Marine Corps.



Joint Unmanned Aerial Vehicle will improve the employment of unmanned aerial vehicles by warfighters performing time-sensitive air interdiction, fire support, and personnel recovery missions.

UAV Operations and Test Events. JUAV military members deployed in FY03 to support Operation Iraqi Freedom. They gained valuable insights on current Service-specific UAV tactics, techniques, and procedures and presented their findings to the JUAV test team members upon their return. Their experiences significantly and positively impacted the JUAV testing process.

FY03 Test Events. The first event was the JUAV mini-test, June 30 -July 2, 2003, at Naval Air Station, Fallon, Nevada. The mini-test focused on the CAS fire support mission area. The test event was not only useful for CAS data collection, analyzing, and reporting, but also served as the catalyst for the "virtual rehearsal to live testing" transition. The second event was Field Test 1/Desert Rescue XI, August 6-14, 2003, at Naval Air Station Fallon. Field Test 1 involved all branches of Service. JUAV teamed with the Joint Unmanned Aerial Vehicle Experimentation Program (JUEP) from the United Kingdom. JUEP brought an "Eagle" UAV to participate in the test event. The test focused on the CSAR mission area.

Due to numerous real-world taskings, JUAV was unable to procure the use of a U.S. UAV for the JUAV mini-test and Field Test 1. However, JUAV contracted to use an Israeli-made Hermes 450 UAV for both tests, and JUEP brought the European Aeronautic Defense and Space Company Eagle UAV to support Field Test 1.

TEST & EVALUATION ASSESSMENT

JUAV JT&E products completed during FY03 include the Virtual Rehearsal 3 Summary Report, JUAV Mini-Test Final Report, and JUAV Field Test 1 Quick-Look Report. A Joint Unmanned Air Vehicles Joint Test and Evaluation A Virtual Rehearsal paper was submitted to the American Institute of Aeronautics and Astronautics "Unmanned Unlimited" Systems, Technologies, and Operations-Aerospace, Land, and Sea Conference and Workshop Exhibit for publication and presentation at a date and location to be determined. Test products are also anticipated in many of the doctrine, organization, training, materiel, leadership, personnel, and facilities categories.

JUAV will improve the employment of unmanned aerial vehicles by warfighters performing time-sensitive air interdiction, fire support, and personnel recovery missions. When complete, JUAV will develop joint, platform-independent tactics, techniques, and procedures for UAV employment that move away from the Service-centric documents that are currently available. These tactics, techniques, and procedures will improve UAV employment in time-sensitive operations, with emphasis on air interdiction, fire support, and personnel recovery missions.

Information Assurance and Interoperability Evaluations During Combatant Command and Service Exercises

The FY03 Appropriations bill directed that the Combatant Commands (COCOMs) and Services conduct operationally realistic information assurance (IA) and interoperability evaluations during major exercises. The bill directed the Service Operational Test Agencies (OTA's), the Service Information Warfare Centers, and the National Security Agency (NSA) to assist in the planning, conduct, and evaluations of these exercises. DOT&E's responsibility consists of providing annual updates on DoD's progress based on results of the exercise evaluations and acquisition. The FY03 bill provided DOT&E $7.6M to initiate this effort and DoD was directed to fund this effort in future budget submissions.

DOT&E's initial steps have been focused on identifying exercise opportunities (see table), joining with those who plan and execute these exercises, and working to enhance the operational realism and relevance of Red Team events during planned exercises. These activities will set the stage for both the IA and interoperability evaluations in the future.

Although this is the initial year of this effort, there are many positive comments. This effort has been well received across DoD. Soon after the FY03 Appropriations bill was finalized, DOT&E partnered to implement this language with the Joint Staff and the Assistant Secretary of Defense for Command, Control, and Communications (now Network Integration and Information). Each of these offices issued a memorandum to respective communities soliciting full support for this initiative. Three workshops have been held to identify exercise opportunities, develop concepts of operations, and form teams to plan and execute the evaluations. Each workshop was well attended by representatives from the COCOMs and other organizations identified in the language of the bill.

With all of these activities and communications, there has been a perceptible increase in the awareness of IA issues by senior leaders, including significant interest in conducting more realistic evaluations in the exercise environment. Furthermore, the OTAs are reporting that their involvement in this effort is enhancing the support of acquisition programs.

There are many ongoing efforts that are individually focused for the improvement or examination of some portion of DoD's IA posture. NSA's extensive Blue and Red Team Programs are very active with most of the COCOMs; Blue Team events are detailed vulnerability assessments performed generally in an administrative environment and in advance of an exercise, while Red Team events are overlaid on exercises to examine the performance of operational networks when subjected to information operations attacks. The relationships between NSA teams and the COCOMs have proven extremely beneficial to this initiative and will be instrumental to future efforts and IA improvements.

The Service Information Warfare Centers also have active Blue and Red Teams. These teams focus on tactical and operational events and systems, and support Service exercises and other operations. Their expertise complements that of the NSA, and there are frequent events where NSA and Service teams partner to leverage each other's capabilities and share best practices. There are existing databases of vulnerability assessment results that have been collected by NSA and the Defense Information Systems Agency. These databases are undergoing review for relevant lessons learned and metrics to help establish the current IA performance baseline.

The Service OTAs and the Joint Interoperability Test Command (JITC) routinely perform IA and interoperability evaluations on acquisition programs in accordance with DOT&E policy. Both are well acquainted with the operational challenges and rapidly evolving threats. Their efforts are instrumental in raising the IA posture and interoperability of fielded systems (to a limited extent, they examine significant upgrades to fielded systems).

In this fiscal year, teams led by the OTAs have postured for improved Red Teaming via the following activities:

- Observation of exercises that have (or offer future opportunity for) Red Teaming.
- Development of IA and interoperability metrics that are observable in the exercise environment, meaningful to the warfighter, and suitable for performing baseline assessments and trend analyses.
- Development of an evaluation plan template and an exercise planning checklist to bring appropriate levels of analytical rigor to exercises.

- Participation in FY04 exercise conferences to improve the synchronization and relevance of Red Teaming with the exercise objectives.

In FY04, the OTAs will assemble teams with the proper expertise to plan, execute, collect data, analyze, and report the results of exercises. They will endeavor to optimize the realism of the Red Team events, the utility of the evaluation and feedback, and the overall benefits to the warfighter for a given exercise cycle. The following is a sample of the OTA cycle:

- Actively participate in all exercise planning conferences beginning with the Concept Development Conference. Early involvement by the OTA teams will result in greater likelihood that the exercise scenario will be synchronized with realistic Red Team events and given access to data collection.
- Conduct an administrative Blue Team evaluation approximately six months prior to the exercise, providing feedback to the exercise authority for remedial actions in advance of the exercise; special focus will be paid to ensure prior issues have been resolved.
- Assist the exercise authority in acquiring any needed training.
- Design a comprehensive Red Team scenario that provides multi-echelon stress with multilevel threats across the spectrum of information operations; this approach will improve the warfighter's appreciation for the rapidly evolving threat and solidify their training and capabilities in all aspects of "protect, detect, and react."
- Execute the Red Team events safely, legally, and consistent with the exercise objectives.
- Capture relevant IA and interoperability data, analyze results, and develop a baseline to support future trend analyses.
- Provide quick-look feedback to the exercise authority and participants, and support after-action reviews.
- Identify problems that require external solutions and provide appropriate results to developers and sponsors who will construct solutions and prioritize efforts.
- Update databases, compare performances with rolling baseline, and perform trend analysis. All results will be provided to DOT&E.
- Participate in the NSA Vulnerability Trends Forum. This forum brings together those organizations involved in vulnerability assessments and system research and development, and fosters sharing of the latest assessment results, vulnerability concerns, and IA products.
- Begin the cycle again

The NSA and the Service Information Warfare Centers have been actively developing a training and certification program to support the above activities and the expansion of required resources. Their efforts will support the planning process and the selection and introduction of the appropriate Red Team threat into all facets of the exercise. The Defense Intelligence Agency has also been very supportive of this effort by standing up the Joint Information Operations (IO) Threat Working Group and committing to providing a comprehensive IO Threat Capabilities Assessment update every six months. This assessment will be critical to proper portrayal of the IO threat not only for the exercises associated with this effort, but also in all of the formal OT&E for DoD's acquisition programs.

The OTA teams received a bulk of the funding provided in FY03, as they will every year. The OTAs are expected to assemble the appropriate teams and contract out for those capabilities that they do not have in-house (e.g., Red Teams). DoD programmed $156M for continuation of this effort through FY09, with $18M planned for FY04. Based on current projections and planned levels of effort, these funding levels appear to be adequate. However, the response from exercise authorities has been positive, and additional resources may be required to provide the full support outlined above to more than 20 exercises. The plans for FY04 include four exercises with active Blue and Red Teams and associated support, and 18 additional exercises with lesser efforts. These exercises are identified in the table, as are the lead OTAs and supporting OTAs. Most of these exercises are expected to have full Blue and Red Team events in FY05.

Information Assurance and Interoperability Exercise Events FY04			
COCOM	**Exercise**	**OTA Lead**	**OTA Support**
CENTCOM	Internal Look 05 Prep	ATEC	N/A
EUCOM	Agile Response 04	ATEC	OPTEVFOR
	Austere Challenge 04	ATEC	JITC, AFOTEC
JFCOM	United Endeavor 04 (JNTC)	OPTEVFOR	JITC, ATEC
	CJTF Exercise 04-02	JITC	OPTEVFOR
NORTHCOM	United Defense 04	ATEC	JITC, MCOTEA
	Salt Lake Shake 04	ATEC	JITC
	Determined Promise 04	ATEC	JITC, MCOTEA, OPTEVFOR
	Joint Warrior Interoperability Demonstration 04	JITC	ATEC
PACOM	Terminal Fury 04	OPTEVFOR	JITC, ATEC
	RSOI 04 (PACOM HQ)	OPTEVFOR	ATEC, AFOTEC
	RSOI 04 (U.S. Forces Korea)	OPTEVFOR	ATEC
	Ulchi Focus Lens	OPTEVFOR	ATEC
	Cobra Gold	OPTEVFOR	
SOUTHCOM	Fuertas Defensas 04	ATEC	JITC, MCOTEA
SOCOM	TBD	JITC	N/A
STRATCOM	Global Guardian 04	JITC	AFOTEC
	Austere Challenge 04	JITC	ATEC
	Amalgam Virgo 04	JITC	ATEC
TRANSCOM	Turbo Challenge 04	JITC	AFOTEC
Joint / Service	JNTC Horizontal One 04	MCOTEA	AFOTEC, ATEC
	Asynchronous Warfare Initiative (AWI)	OPTEVFOR	JITC
	Marine Expeditionary Force Exercise 04	MCOTEA	N/A

CENTCOM	Central Command
EUCOM	European Command
JFCOM	Joint Forces Command
NORTHCOM	Northern Command
PACOM	Pacific Command
SOUTHCOM	Southern Command
SOCOM	Special Operations Command
STRATCOM	U.S. Strategic Command

TRANSCOM U.S.	Transportation Command
JITC	Joint Interoperability Test Command
JNTC	Joint National Training Capability
ATEC	Army Test and Evaluation Command
MCOTEA	Marine Corps Operational Test and Evaluation Agency
OPTEVFOR	Operational Test and Evaluation Force

The Army and Navy OTAs have been extensively involved in the planning effort for U.S. European Command's "Agile Response 04 (AR04)" and U.S. Pacific Command's "Terminal Fury 04 (TF04)." The lessons learned from these two exercises will set precedents for future exercises, and inform the efforts of other teams. The first to execute will be TF04 in December 2003. TF04 is an annual Pacific Command exercise focused on both headquarters and deployed forces. The primary objective in TF04 will be the integration of the Standing Joint Force Headquarters into the operational scenario. IA events have been planned to support and integrate with the exercise scenario, support the exercise objectives, and permit assessment and analysis of the PACOM network security. The next exercise will be AR04, which will provide both training and operational rehearsal to EUCOM and NATO forces preparing for contingency support to the Athens Olympics. Integration of the Standing Joint Force Headquarters is also a major goal of this exercise, and IA events have been planned and coordinated to support the scenario. Final planning for this exercise will take place by the end of 2003, and the exercise will execute in March 04.

DOT&E has increased the focus on IA as an evaluation issue for systems on the OT&E oversight list. The DOT&E policy for IA evaluations that was implemented in 1999 remains in effect. A dozen programs were identified in FY03 for an expanded review of the adequacy of IA evaluation planning and to confirm appropriate IA OT&E metrics were in use. This effort included review of Test and Evaluation Master Plans, Test Plans, and Defense Information Technology Security and Accreditation Process documentation. The OTA's are performing similarly expanded efforts on selected acquisition programs and both DOT&E and OTA efforts to heighten IA awareness in acquisition program planning will continue in FY04. In addition, DOT&E IA policy is being revised to reflect the latest information in IA practices and metrics and will also address the evaluation of legacy systems during COCOM and Service exercises.

There are many ongoing activities focused on improving DoD's IA and interoperability posture. The OTA-led effort described in the preceding pages will assist in integrating and finding synergy among these efforts. Still, more must be done to deliver and maintain systems that are interoperable and information assured. The push to field emerging capabilities and commercial technologies, combined with the rapidly growing IO threat, will be a constant source of friction with the Department's information superiority goals, but one that can be best met with the fully engaged organizations involved in this effort.

Overview

This past year, the DoD T&E community has continued its efforts to refine the T&E infrastructure for the future. This T&E infrastructure must be both efficient in its use of available resources and adaptive to the test needs of advanced technology weapon systems and transformational joint warfighting concepts.

TRANSFORMING T&E TO MEET FUTURE CHALLENGES

Establishing an effective strategic planning process for T&E resources is an important first step in ensuring the prerequisite T&E capabilities are in place to support the acquisition of transformational warfighting systems. Such a process will help focus scarce T&E investment resources towards the most critical needs. A long-term, comprehensive plan that identifies and addresses future needs is essential to true transformation of T&E capabilities. The recent establishment of the DoD Test and Resource Management Center (DTRMC) is a step toward this end.

The National Defense Authorization Act for FY03 called for the establishment of DTRMC. The DTRMC reports directly to the Under Secretary of Defense for Acquisition, Technology, and Logistics and has the following responsibilities: review and provide oversight of DoD budgets for T&E facilities and resources; biennially, prepare a strategic plan for DoD T&E resources; certify proposed budgets for T&E activities; and administer the Central Test and Evaluation Investment Program (CTEIP) and the Test and Evaluation/Science and Technology (T&E/S&T) Program. The DTRMC has two major interrelated functions, to develop and maintain a strategic plan for T&E and to certify the adequacy of T&E resources.

Congressional direction requires a strategic plan every two years that covers the next ten-year period. The plan is to be based on a comprehensive review of DoD T&E requirements and the adequacy of T&E facilities and resources to meet these requirements. DoD will use the DOT&E annual report, the DoD Science and Technology strategic plan, Service planning documents, and task forces comprised of Service/Agency acquisition and T&E staffs. The plan will include the following:

- An assessment of DoD T&E requirements for the period covered by the plan that identifies performance measures associated with the successful achievement of T&E objectives, assesses the T&E facilities and resources needed to meet such requirements and satisfy such performance measures, and assesses the current state of DoD T&E facilities and resources.
- An itemization of acquisitions, upgrades, and improvements necessary to ensure that DoD T&E facilities and resources are adequate to meet such requirements and satisfy such performance measures. This itemization will include an assessment of the budgetary resources necessary to implement such acquisitions, upgrades, and improvements.

Although the first T&E strategic plan prepared by interim personnel will not be a comprehensive strategic plan, subsequent plans will provide the necessary level of detail to guide DoD's T&E resource investment decisions.

The long-term goal of budget certification is to assess how well the budgeted resources comply with the strategic plan. The FY05 budget certification will be limited to complying with the congressional direction to reverse the trend of increasing test costs to customers of the Major Range and Test Facility Base (MRTFB). The objective is to charge customers only for direct test costs. The certification will also assess progress towards satisfying needs identified in the FY03 Test Resource Master Plan (TRMP) prepared by the Services.

In October 2002 at the direction of the Secretary of Defense, DOT&E led a study to identify future T&E infrastructure investments required to adequately test weapon systems both currently under development and likely to emerge from new technologies. In preparing that study, DOT&E conducted workshops to identify needed T&E capabilities that ensure adequate and affordable testing into the future. The product of this effort was a draft T&E Modernization Plan. This plan was subsequently integrated with the existing Service TRMP as a baseline for the development by the DTRMC of the DoD T&E Strategic Plan.

The modernization planning effort noted that existing T&E capabilities would not be adequate to support future weapon system development and identified a number of T&E capability shortfalls. Among others, shortfalls were identified in the following areas:

- Interoperable test and training ranges.
- Common joint test instrumentation.
- Interoperability testing - Upgraded distributed test beds and increased emphasis on testing of system-of-systems and command, control, communications, computers, intelligence, surveillance, and reconnaissance (C4ISR) capabilities are needed.
- Size of test ranges - Current T&E ranges are not large enough to test the greater reach of weapon systems under development. The maneuver areas used to test new joint operational concepts also require expanded range space.
- Test facilities for urban warfare.
- Shallow water (littoral) test capability.
- Space range - A T&E capability to test space systems in orbit is needed.
- Wind tunnels - Future aircraft will encounter technical challenges that require improved wind tunnel test capability.
- Threat representation - Realistic threat representations for all warfare areas, to include improved targets are needed.
- Capability to test hypersonic systems throughout their flight regimes.
- Capabilities for testing directed energy weapons.
- Test data management, processing, and analysis.

One of the principal requirements for the transformed military is that it must be a cohesive joint force. From inception, weapon systems must be developed and tested in a joint context, not in the "Service-centric" manner of the past. Over the past year, a number of steps have been taken to improve the links between T&E and the joint operational community. DOT&E is closely following the development of the Joint National Training Capability (JNTC). Testing, training, and experimentation all share some common requirements, to include the need for a robust simulated combat environment, accurate instrumentation to determine "ground truth," and similar analytic approaches to understanding what took place and why. The approach JNTC is taking to link training ranges and training capabilities in a persistent distributed network should also be adapted for T&E.

DOT&E continues to develop a relationship with U.S. Joint Forces Command (JFCOM). During the past year there was a major expansion of the Memorandum of Agreement (MOA) between the two organizations. Among the expanded activities will be:

- Development of requirements for test and training ranges and facilities to support joint training and experimentation.
- Coordination of test and training range improvements needed to support joint training and experimentation.

- Planning for future joint exercises and experiments and execution of current events to ensure optimum utilization of existing capability.
- Reviewing, shaping, and scoping Joint T&E (JT&E) nominations to focus the initiatives on solving joint warfighting deficiencies in tactics, techniques, and procedures.

JFCOM and DOT&E personnel are engaged in re-engineering JT&E and future partnerships.

DOT&E continues to make major strides towards test and training range integration and interoperability. DOT&E leveraged the JFCOM Joint Combat Identification Exercise in August to demonstrate a prototype of the Test and Training Enabling Architecture (TENA). TENA is a set of architectures designed to enable interoperability among various range facilities, instrumentation, and simulations in a quick, cost-efficient manner. Currently, range systems tend to be non-interoperable, “stovepipe” systems. Validation of TENA as the JNTC architecture is planned for January 2004 in a Western Range Complex Training Event.

The process of thoroughly examining and restructuring T&E policies, processes, and capabilities in order to ensure DoD meets the challenges of transforming the U.S. military is vital. DoD must keep what works, discard what does not, and remain flexible in adapting to new requirements. There must be a corporate approach to policies, processes, and investment priorities in order to accomplish this.

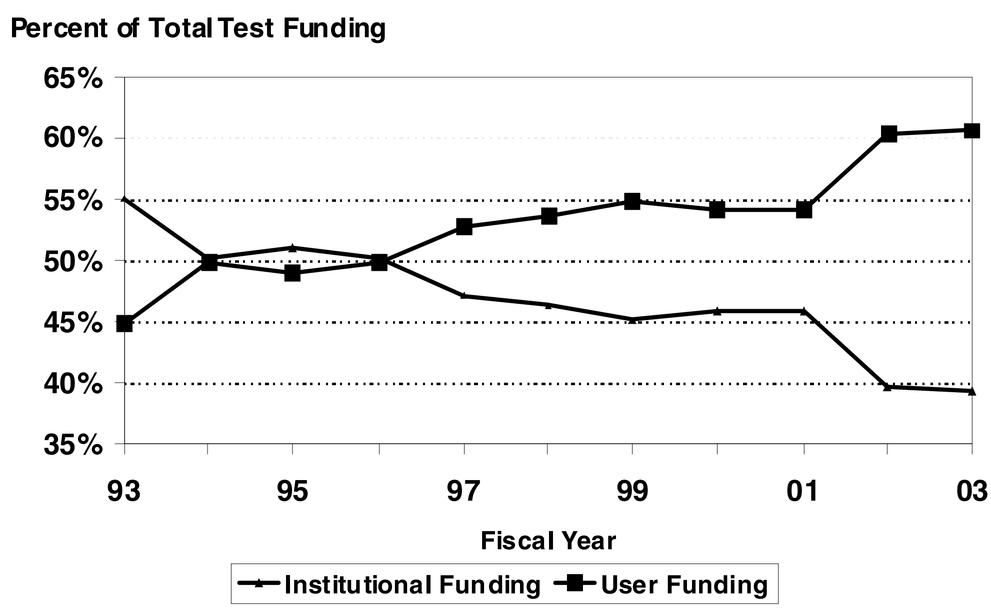
DoD is transforming to meet the dynamic operational requirements of the war on terrorism and future high-technology conflict. This transformation is not limited to new hardware and technological innovation. It also involves transforming T&E capabilities. The future T&E infrastructure should comprise a comprehensive suite of joint, interoperable capabilities that provide a spectrum of opportunities to test new technologies, improved platforms, and innovative tactics and training methods.

Issues in the T&E Infrastructure

CONSISTENCY OF FUNDING AND CHARGE POLICIES.
The costs borne by the test customer at different ranges influences the adequacy of testing. DoD policy calls for customers to pay for the direct costs associated with testing while the range or center parent organization pays for sustaining the test facility's availability. DoD implemented this uniform-charge policy to ensure that decisions about where and when to test would be based on program technical requirements rather than differences in cost.

Recently, the DoD Inspector General examined MRTFB funding and concluded that ranges were not funded in a uniform and consistent manner. As a result, DoD lacks the comparable budget data needed to make informed decisions about the funding levels necessary to adequately maintain test facilities. Furthermore, Program Managers may lack the relevant information necessary to make informed test decisions for their programs.

Between FY93 and FY03, the portion of MRTFB funding borne by test customers increased from 45 percent to over 60 percent. This shift resulted from the failure of institutional funding for the MRTFB to compete successfully with other demands in the Service programming and budgeting processes. This shift in costs to the customers may contribute to a reduction in developmental testing.

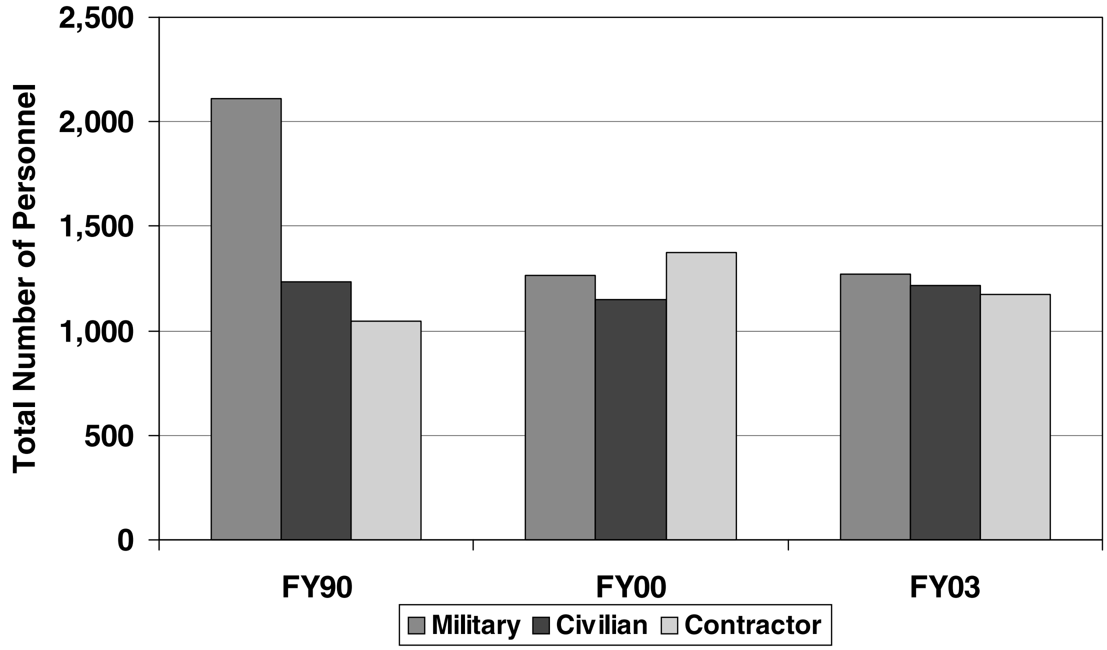


Between FY93 and FY03, the portion of MRTFB funding borne by test customers increased from 45 percent to over 60 percent.

Congress addressed the funding policy in the FY03 Defense Authorization, noting that there had been a significant shift in cost to users over the past decade. Congress directed that this trend be reversed by FY06, and specified the categories of cost that should be paid by users and the funding that should be included in the institutional operating budgets for the MRTFB. The DTRMC is evaluating the extent to which the additional costs to users are consistent with the categories directed by Congress. Those that are not consistent will be corrected by FY06.

UNDERMANNED OPERATIONAL TEST AGENCIES (OTA)
The adequacy of the OTA workforce to deal effectively with its workload has been of considerable concern since 1999 when a demographic analysis revealed a steady decline in both military and government civilian personnel since 1990. From 1990 through 1999, the military component of the OTA workforce declined by 38 percent, while the government

civilian component declined by 8 percent. The combined military-civilian decrease was 28 percent. While this decline has leveled off in the last several years, increasing demands on the OTA workforce indicate that the current manning levels and workforce composition may be inadequate to meet future operational testing needs.



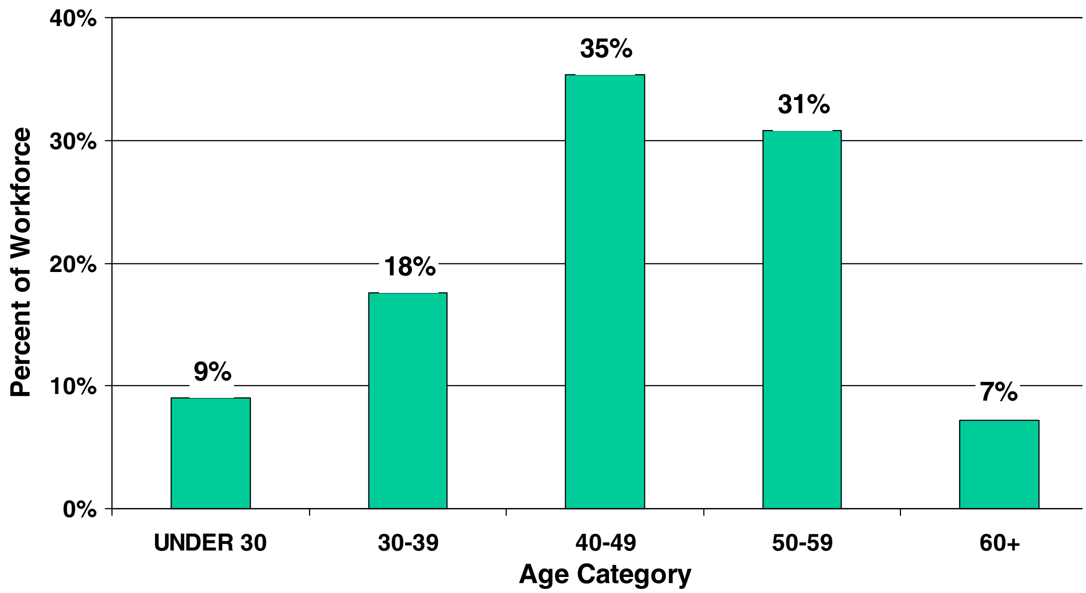
The adequacy of the Operational Test Agency workforce to deal effectively with its workload has been of considerable concern since 1999 when a demographic analysis revealed a steady decline in both military and government civilian personnel since 1990.

Proper sizing and composition of the OTA workforce is critical to the successful testing of weapon systems at a time when workload is increasing due to the confluence of several factors, such as evolutionary acquisition practices, early involvement in the system development process, the Integrated Product Team (IPT) approach to system development, increased complexity of the weapon system development and testing process, and increase of emphasis on joint interoperability tests.

The introduction of the evolutionary acquisition strategy resulted in a significant increase in workload for the test community. In the traditional development process, program activity rose as the program proceeded from concept development to full-scale development and operational testing, and then ebbed as the program transitioned to production and deployment. The evolutionary acquisition process serves to keep the programs continuously "active" at (or near) peak activity levels for prolonged periods as successive increments are developed and tested.

Emphasis on early involvement in the development process by the operational test community, in order to influence the design of systems early in the development process, has also added to the workload. This approach requires that OT&E personnel be active participants in acquisition programs from their inception.

In addition, the acquisition community has adopted an IPT approach that requires OT&E personnel to participate in team meetings regularly throughout the acquisition process. Only by being actively involved in these IPTs on a regular basis can OT&E representatives be effective in influencing design and testing issues.



Only about 9 percent of the MRTFB workforce are under 30 years of age, and only 27 percent are under 40, clearly illustrating the fact that younger professionals are not being infused into the workforce.

Finally, the increased complexity of the weapon system development and testing process brought about by such factors as the emphasis on interoperability and joint architectures also added to the workload. Individual systems are also more complex and difficult to test, largely due to being increasingly software intensive.

Another concern is the aging of the OTA civilian workforce. Presently, over 90 percent of that workforce are older than 40 years of age and nearly 60 percent are older than 50, reflecting the minimal infusion of young technical professionals. It is estimated that within five years 40 percent of the GS-7 to GS-15 civilian workforce will be retirement-eligible. However, the number of civilian personnel (Engineers and Professional) in DoD has increased, both in absolute terms and as a percentage of the civilian workforce. Timely action is needed to ensure that the civilian workforce at the OTAs is maintained.

Diminished military presence in the OTA workforce must also be addressed. This component of the OT&E workforce is essential for interacting with operational forces during the planning and conduct of operational testing, as well as during the development process.

THE MRTFB WORKFORCE

The MRTFB workforce, both civilian and military, has also declined since 1990. Although the rate of decline has decreased during the last several years, the civilian portion of the T&E workforce located at MRTFB installations is now approximately 35 percent less and the military component about 49 percent less than in 1990. Overcoming these losses will necessitate additional investment in training of our T&E workforce, streamlining T&E business processes, and modernizing test procedures and technologies.

The insufficient number of personnel at test sites limits the flexibility of facility managers and reduces the capacity of facilities to meet the needs of their customers. Range Commanders are faced with the need to hire more contractor personnel for core T&E expertise. Although quantifying future workloads is difficult, the T&E community is likely to face an increase in demand over the next ten years. Simultaneous implementation of several generations of technology will drive future workload increases for the T&E workforce. Improvements to existing systems must continue to be made as long as our warfighters depend on them. The development and testing of the next generation of systems will significantly increase the workload.

As the MRTFB government workforce grows smaller, its civilian component has grown in seniority. Action must be taken to introduce new professionals into the workforce, particularly in the science and engineering disciplines. Only about 7 percent of the MRTFB workforce (excluding the Base Operation Support and other non-T&E personnel part of the overall MRTFB workforce) are under 30 years of age, and only 22 percent are under 40, again illustrating the fact that new professionals are not being infused into the workforce. Approximately 43 percent of this workforce are over 50 and are approaching retirement.

DoD must continue to aggressively experiment with and develop new approaches to workforce management, recruiting, and retention if DoD is to succeed in attracting newer, technologically-current cadre of T&E professionals.

CLOSURE OF NASA WIND TUNNELS

Historically, DoD and the National Aeronautics and Space Administration (NASA) have operated complementary wind tunnel test facilities in the United States. Under this arrangement, DoD has relied on NASA facilities for specific types of testing during the development of aerospace systems. Due to increased pressure on its budget, NASA has decided to implement a full-cost recovery policy at many of its major test facilities. NASA's test facilities are now expected to recover from their customers the full costs of operations, including overhead and general and administrative costs. As a result, a number of unique national facilities that have limited but critical workload are now scheduled for closure.

Of immediate concern is NASA's closure of the largest wind tunnels in the world, the 80 x 120-foot and the 40 x 80-foot tunnels at the Ames Research Center in California. These wind tunnels are unique in that they are used to test very large-scale models and full-scale aircraft. They have been important to the development of rotorcraft, the development of Vertical/Short Take-off and Landing aircraft, the testing of high-lift transport and commercial aircraft, and the development of very large ducted and unducted fan propulsion systems. NASA is also closing the 12-foot Pressure Tunnel at the Ames Research Center. This facility is important in the design of aircraft in certain critical flight regimes. NASA ceased to operate these three tunnels in FY03. If insufficient contracts for their use are let in FY04, these tunnels will be closed permanently. In the interim, NASA has already announced that it is terminating the contractor personnel who operate these tunnels while reassigning an equal number of its own personnel.

While the possible closures of NASA's unique subsonic wind tunnels pose the most immediate threat to DoD ability to test and field new systems, there is a larger problem in that NASA's full-cost recovery policy applies to all of its test facilities. If other test facilities do not generate enough business to cover their costs, NASA will close them as well. This includes transonic, supersonic, and hypersonic wind tunnels and propulsion facilities, as well as specialized facilities for acoustic testing, spin testing, flutter testing, and icing testing. DOT&E will continue to work on this issue to reduce the risk to DoD aerospace acquisition programs.

INADEQUATE AERIAL TARGETS AND SELF DEFENSE TEST SHIP (SDTS)

DOT&E is concerned about the availability, reliability, and overall threat fidelity of DoD aerial targets. Over the past year, testing has been delayed or not completed due to the absence or unreliability of the available aerial targets. Furthermore, the venerable QF-4 drone will reach the end of its useful life as a target in 2010, yet no funding has been identified by the Services to replace this target and satisfy a tri-Service T&E requirement. In addition, there are emerging threats for which no adequate targets currently exist. No funding has been identified to develop or acquire adequate targets to represent these threats. As a result, the performance gap between the threats and the targets available to represent them during operational testing is growing larger. DoD's capability to conduct OT&E under realistic threat conditions depends upon this trend being reversed.

Safe, operationally realistic testing of Navy short-range air defense systems requires an unmanned, remotely controlled SDTS. The SDTS used for the past 10 years is beyond repair and a replacement hull awaits conversion to an SDTS. The SDTS is a critical T&E asset for the operational testing of the Ship Self Defense System Mark 2, the Rolling Airframe Missile, the Evolved Seasparrow Missile, LPD 17, Littoral Combat Sysytem, DD(X), and CVN 21. As a matter of priority, the Navy needs to resource the SDTS and install the relevant air defense systems for testing.

RANGE ENCROACHMENT

Encroachment refers to the cumulative result of outside influences that inhibit normal military testing and training. It includes urban sprawl near military areas; loss of frequency spectrum; restrictions on using air, land, and sea space; and migration of endangered species to ranges. A steady increase in encroachment has serious consequences and threatens the use of DoD's test and training ranges.

Last year, the Administration submitted to Congress an eight-provision legislative package, the Readiness and Range Preservation Initiative. Congress enacted three of those provisions as part of the National Defense Authorization Act for FY03. Two of the enacted provisions allow DoD range installations to cooperate more effectively with state and local governments, as well as private entities. One plans for the growth of surrounding test and training ranges by allowing compatible land use that preserves habitat for imperiled species and the other ensures developments are compatible with test and training activities. Under the third provision, the Congress provided DoD with a regulatory exemption under the Migratory Bird Treaty Act (MBTA) for the incidental taking of migratory birds during military readiness activities. This action by the Congress provided welcome relief to serious readiness concerns raised by recent judicial extensions of the MBTA.

Last year, Congress did not act on the other five legislative provisions in the Readiness and Range Preservation Initiative. These five proposals remain essential to range sustainment. The five provisions, resubmitted in FY03, reaffirm the principle that military land, marine areas, and airspace exist to ensure military preparedness while ensuring that DoD remains fully committed to its stewardship responsibilities. The remaining provisions are:

- **Endangered Species Act.** Authorize use of Integrated Natural Resources Management Plans in appropriate circumstances as a substitute for critical habitat designations.

- **Marine Mammal Protection Act.** Reform obsolete and unscientific elements of the Act, such as the definition of "harassment," and add a national security exemption to the statute.

- **Clean Air Act.** Modestly extend the allowable time for military readiness activities such as beddown of new weapons systems to comply with the Act. Also, provide additional flexibility by ensuring emissions from military training and testing are consistent with state implementation plans under the Clean Air Act.

- **Resource Conservation and Recovery Act (RECRA) and the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA).** Limit regulation of munitions use on operational ranges under the CERCLA and the RECRA if those munitions and their associated constituents remain there, and only while the range remains operational.

This year's legislative proposals also include some clarifications and modifications based on events since 2002. Of the five, the Endangered Species Act and the Clean Air Act provisions are unchanged.

RADIO FREQUENCY SPECTRUM

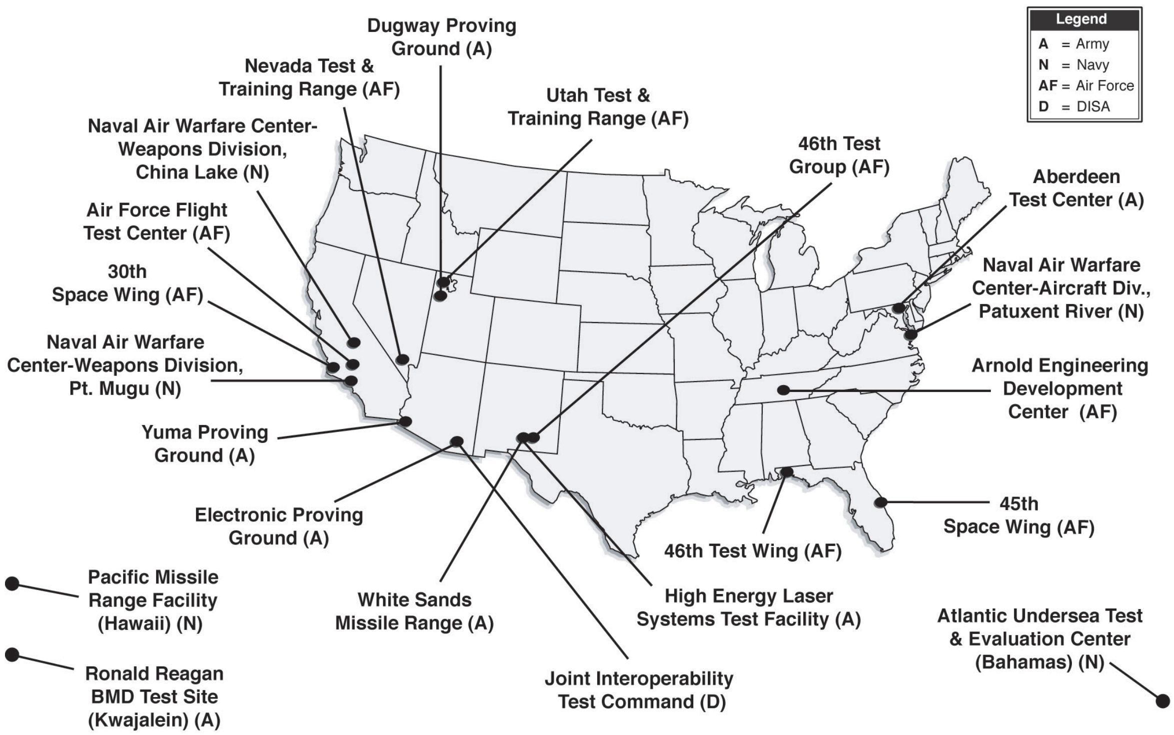
The testing of modern defense systems relies heavily on the use of the radio frequency (RF) spectrum. RF telemetry systems are used to track test participants, control targets, ensure public safety, and transmit instrumentation data. Technology advances being incorporated into weapon designs require higher telemetry data rates and, consequently, substantially more spectrum. DOT&E has sponsored a number of initiatives to ensure that currently available spectrum is used as efficiently as possible and that additional spectrum is made available to support testing. Equipment to support a waveform that is twice as efficient as the legacy telemetry waveform is now operational, while development of an even more efficient waveform is continuing. DOT&E is also investigating the application of modern communications networking techniques to telemetry. Additionally, the Inter-range Frequency Deconfliction System has been developed to coordinate the use of spectrum among the test ranges.

More efficient use of currently available frequency spectrum is only a partial solution to the problem. To support future weapons development, additional RF spectrum will be needed, as well as updating instrumentation, telemetry, and tracking systems. In order to ensure that these needs are satisfied and acknowledged internationally, DOT&E has worked to ensure that an initiative to identify additional spectrum to support aeronautical flight test telemetry was placed on the agenda of the 2007 World Radiocommunication Conference (WRC). As a result of these efforts, and with the support of DoD, other government departments, and industry, this agenda item was confirmed at the 2003 WRC as an item for the 2007 WRC. DOT&E has also sponsored an investigation into the use of telemetry at higher frequencies than are currently used.

Progress in the Last Year

THE MRTFB CONTINUES TO SUPPORT MOST DEVELOPMENTAL TESTING

Most developmental testing within DoD is conducted at MRTFB locations. These sites, operated by 30,000 military, civilian government, and contractor personnel, range from wind tunnels and electronics integration test facilities to DoD's largest open-air, land, and sea test ranges. The function of the test infrastructure remained relatively unchanged since the MRTFB's founding in 1974: "The MRTFB is a national asset that shall be sized, operated, and maintained primarily for DoD T&E support missions."[1] While these major test facilities and ranges provide the majority of the developmental test capabilities we need today, there is a continuous need for investment. Funds must be available for upgrades to existing capabilities and for the introduction of new capabilities to test future weapon systems.



These sites, operated by 30,000 military, civilian government, and contractor personnel, range from wind tunnels and electronics integration test facilities to DoD's largest open-air, land, and sea test ranges.

T&E INVESTMENT PROGRAMS ARE IMPROVING AND EXTENDING CURRENT CAPABILITIES

Sustaining current capabilities and improving test technology are the focus of existing T&E investment programs. The Service and Defense Agency investment and modernization (I&M) programs along with the OSD Central Test and Evaluation Investment Program (CTEIP) program upgrade existing capabilities, but have inadequate resources to develop the new capabilities required by emerging weapons technologies. Several of the Service ranges have identified a significant list of unfunded requirements needed in order to fully test upcoming systems.

I&M programs fund modernization of existing test facilities and the acquisition of new capabilities to meet test needs. Each Military Service pursues an I&M strategy that often focuses on test assets that are Service-unique with little multi-Service utility. Service I&M funding has been relatively constant in recent years.

[1] DoD Directive 3200.11, "Major Range and Test Facility Base (MRTFB)," May 1, 2002.

In FY03, the Army I&M program completed at Kwajalein Atoll the remote operation of instrumentation, radar modernization, and the Range Safety Control Center upgrade. These projects will reduce on-island staffing and inter-island transportation and should improve data management and mission response times. Dugway Proving Ground has initiated a Joint Test Infrastructure project by using a DoD-wide chemical-biological (CB) testing infrastructure survey to provide a roadmap for undertaking tasks within the CB area. Projects at White Sands Missile Ranges are investigating the options for replacing film with high-speed digital imaging, thereby reducing the time and expense of processing film, while reducing test turn-around time.

In FY03, the Navy's I&M program completed the upgrade program for its FPS-16 radars at Naval Air Warfare Center Weapons Division locations and the installation of the manned Flight Simulator at the Naval Air Warfare Center Aircraft Division. The Navy completed the first two phases of the Off-board Advanced System Stimulus (OASYS) at the Atlantic Undersea Test and Evaluation Center (AUTEC). The first phase provided for integrated test and evaluation of undersea warfare combat and sensor systems in a dynamic multi-mission environment. Phase two, using the AUTEC Sonobuoy Simulation/Stimulation System, provides the capability to test and validate performance of Navy multi-mission platforms, systems, and vehicles. Phase 3 will focus on the AUTEC Mine Field Proxy System.

The Air Force's I&M investments completed in FY03 include the Electronic Combat Integrated Test facility and the Global Air Traffic Management Test Facility at Edwards Air Force Base (AFB), California. The Air Force Electronic Warfare Evaluation System completed various simulator threat upgrades, including integrated air defense, and hardware-in-the-loop upgrades. The Air Force completed an upgrade of the High Speed Test Track facility at Holloman AFB, New Mexico. It conducted a hypersonic test, wherein the test sled obtained a velocity of 9,465 feet per second (or 6,553 miles per hour) in delivering a 192-pound payload into a target. Other Air Force I&M projects underway include the Open-Air hardware-in-the-loop facility, which includes a 300-foot, free-standing platform, with a 3-axis flight motion simulator and a Multispectral Missile Engagement Hardware-in-the-Loop Simulator, including a multi-channel infrared projector with the ability to simulate extended targets and flares at the 46th Test Wing. The major I&M project at Arnold Engineering and Development Center (AEDC), Tennessee, are the Propulsion Wind Tunnel (PWT) upgrades. These upgrades have the potential of reducing (by at least 30 percent) the cost of testing in the wind tunnels at AEDC.

The Missile Defense Agency (MDA) uses MRTFB facilities and is funding upgrades at the Pacific Missile Range Facility, Ronald Reagan Ballistic Missile Defense Test Site, Wake Island, and White Sands Missile Range. In addition, MDA is funding test activity at Kodiak, Vandenberg AFB, and Holloman AFB. MDA is also developing a test infrastructure for a wide range of airborne sensor programs, including the High-Altitude Observatory II Aircraft and the Wide-body Airborne Sensor Platform using a DC-10 aircraft. Also, MDA is investing in the Mobile Extended Range Telemetry and Safety System, a standard integrated system that collects telemetry and provides flight safety over the extended Pacific range of interest to MDA.

CTEIP is an OSD-managed program established to develop T&E capabilities normally considered beyond a single Service's area of responsibility. Its objectives include applying state-of-the-art technology to correct deficiencies in T&E capabilities and improve the efficiency of the test process; improving interoperability and interconnectivity among test facilities and ranges; developing, validating, and integrating modeling and simulation with open-air testing; and developing mobile test instrumentation as an alternative to fixed facilities. One portion of CTEIP, the Resource Enhancement Project (REP), provides quick-reaction, near-term solutions to test shortfalls in support of ongoing operational test programs. REP funding is appropriate when the timeframe from definition of need through critical test dates does not allow sufficient time in the budget cycle to fund the required capability through normal Service processes.

One of the key elements of CTEIP is its partnership with the Services. CTEIP develops and demonstrates new test capabilities, which allows the Services to focus on the procurement and sustainability of critical resources. Such partnering enables CTEIP to exploit breakthrough technologies that create realistic test conditions required to evaluate and enhance the development of next generation warfighting systems.

New test capabilities being developed by CTEIP include:

- **Spectral Efficient Technology Development.** The Advanced Range Telemetry project has developed a spectral-efficient technology that improves the reliability, utility, and availability of aeronautical telemetry spectrum for use in T&E.
- **Signature Characterization Capability.** The Tri-Service Signature Measurement and Database System project developed an instrumentation capability that characterized the detailed spatial, spectral, and temporal signatures of aircraft, missiles, ground vehicles, ships, undersea vehicles, and their countermeasures in realistic environments.
- **Test and Training Enabling Architecture.** The Foundation Initiative 2010 project is developing and validating the TENA to enable cost-effective interoperability among ranges, facilities, and simulations to support testing weapon systems and training warfighters.
- **High-Intensity RF Sources for Aircraft Vulnerability Testing.** The Electromagnetic Environmental Effects Generating System project is developing a test capability for use in the Air Combat Environment Test and Evaluation Facility, Patuxent River, Maryland, that will assess the actual performance of a full-scale, fixed- or rotary-winged aircraft completely immersed in a high-intensity RF environment.
- **Realistic Live Fire Testing.** The Weapon Set-to-Hit Threat Target, developed under the REP, will provide an unmanned, reusable, cost-effective target for conducting set-to-hit testing of Mark 54, Mark 48 Advanced Capability, and future torpedoes.
- **CB Test Instrumentation.** The Biological Warfare Referee Instrumentation Towers project, being conducted under the REP, is providing mobile instrumentation for ground truth measurement for operational test and evaluation, exercise support, and training activities at operationally realistic test and training sites. The Contamination Avoidance Detector Test Suite will develop a suite of new test methodology and instrumentation to dynamically challenge and evaluate current and developmental CB detector systems over the entire range of expected conditions of use.
- **Time Space Position Information Instrumentation.** The Enhanced Range Application Program will develop the next-generation range data system that will address major deficiencies in current systems, including incompatibility of range data and acquisition reduction systems, inefficient use of radio frequency spectrum, and inadequate interoperability.

The T&E/S&T Program develops or adapts emerging technologies for test applications in order to enable test technologies to pace evolving weapons technology. T&E/S&T investments will transition to test capability investment programs to support emerging weapon system development. The Test Technology Area Plan, a detailed roadmap for the overall T&E/S&T program, was published in July 2003.

The T&E/S&T efforts underway during FY03 continue to address technological issues in three critical areas:

- **Hypersonic Test.** The objective in this area is to develop technologies that can provide the ability to adequately test and evaluate vehicles, propulsion systems, and integrated systems at or above Mach 5 to meet National Aerospace Initiative demonstration schedules and future hypersonic systems T&E needs.
- **Spectrum Efficient Technology.** The objective in this area is to develop technologies that increase usage efficiency in current spectrum allocations and investigate technical and economic challenges related to future usage of an augmented Super High Frequency telemetry band.
- **Multi-Spectral Test.** The objective in this area is to make technologies available for test and evaluation of sensor probability of target detection, multi-spectral data extraction, and mission scenario analysis. Model data

produced from this focus area will augment open-air and facility-based testing with real-time, realistic multi-spectral simulation and stimulation of systems and battlefield personnel in all types of environments including water, desert, forest, rural, and urban terrains under varying meteorological conditions.

In addition, DoD initiated efforts in two new focus areas:

- **Embedded Instrumentation.** The objective is to enable development of non-intrusive embedded instrumentation technologies that provide performance data in support of continuous T&E and life-cycle data requirements.
- **Directed Energy.** The objective is to develop the test technologies required to create a Directed Energy T&E infrastructure capable of supporting future systems test requirements.

DOT&E ACTIVITIES CONTINUE TO CONTRIBUTE TO THE TRANSFORMATION OF T&E

DOT&E's Threat System Office (TSO) provides test resource analyses on the availability, capabilities, and limitations of threat representations used for T&E. In addition, the TSO advises DOT&E on the adequacy of service-funded threat system investments that support weapon system acquisition and T&E.

Through the TSO, DOT&E is investing in projects to enhance threat representation in T&E. Projects of particular interest are:

- **Multi-spectral Test Capabilities.** The infrared/ultra-violet end-to-end test requirement study will develop a tri-Service functional design requirement for threat simulators that support testing of aircraft missile warning and infrared countermeasures systems.
- **Real-Time Casualty Assessments (RTCA) Instrumentation.** The infrared Man-Portable Air Defense Systems Methodology Assessment project integrates the existing infrared missile fly-out model at the Threat-Signal-Processor-in-the-Loop facility with a fuse model and an Army Material System Analysis Agency approved model for damage assessment. Overall, this simulation addresses the need for an RTCA tool to provide adequate operational testing of Army aviation systems.

Additionally, through TSO, DOT&E is sponsoring a number of threat target projects to provide realistic, threat-representative targets for test and evaluation. Projects of particular interest are:

- **Diesel-electric submarine target.** The Mobile Acoustic Source project develops a mobile diesel electric submarine simulator with highly robust acoustic and dynamic characteristics for use in high-risk, open-ocean, and shallow water environments.
- **Anti-ship cruise missile.** A project studied the performance and feasibility of two candidate target systems (Hawk missile mated with Tomahawk and Standard Missile mated with Tomahawk) that could possibly meet the Threat "D" target requirement. Wind tunnel testing on both candidate systems proceeded in FY03.
- **Sub-scale aerial targets.** Numerous projects are currently active that seek to improve the flexibility and economy of the sub-scale aerial target inventory.

DOT&E's Center for Countermeasures provides independent precision guided weapon (PGW) countermeasures/counter-countermeasures (CM/CCM) analysis, testing, and evaluation for the entire DoD community, supported by a knowledge base of over 500 developmental and operational tests of U.S. and foreign PGWs and CM systems. Over the past year, CCM tested, analyzed, or otherwise supported over 30 U.S. and foreign PGW systems or components in a countermeasure environment, as well as other countermeasure and threat warning systems.

To improve the DoD's business practices, DOT&E has been contributing to the success of the Business Initiative Council (BIC)'sT&E Process Functional Board initiatives. The BIC's mission is to improve the efficiency of DoD business operations by identifying and implementing business initiatives that create savings to be reallocated to higher priority efforts. Among the T&E process initiatives being pursued are:

- **Common Flight Clearance Process.** This initiative is to develop and implement a Common Flight Clearance Process by incorporating the latest Information Technology advancements to reduce clearance turnaround time.
- **Common Range Scheduling Tool.** This initiative is to develop and implement a web-based schedule display tool capable of integrating and displaying schedule information that will enhance coordination and communications across multiple sites.
- **Embedded Instrumentation (EI) for Diagnostics, Prognostics, Testing and Training.** This initiative resulted in DoD regulatory guidance to ensure that EI is included in system trade-off studies and design analyses.
- **Common Test and Training Range Architecture Policy.** This initiative is to establish or change appropriate DoD Polices/Directives so that test and training range systems will comply with the TENA where it makes technical and fiscal sense. Potential benefits are a significant increase in test and training system interoperability, a capability to efficiently design and execute multi-range test and training events, a decrease in costs to conduct testing and training, and easy reuse of test and training software.
- **Test and Evaluation Master Plan (TEMP) Preparation and Approval Process Improvement.** This is a new initiative to examine the TEMP preparation and approval process and to recommend improvements.

DOT&E continues to work with the international T&E community and has developed new Test and Evaluation Program Cooperation Agreements with Canada, France, and Australia. These agreements include a “Reciprocal Use of Test Facilities” clause that allows access to ranges and facilities at direct cost, and a “Cooperative Test and Evaluation” clause that allows for cooperative activities where the cost of testing is shared.

The Canada/U.S. Test and Evaluation Program (CANUSTEP), the longest standing of these agreements, was renegotiated and signed in September 2002. The original CANUSTEP agreement was signed in 1993. CANUSTEP served as the model for the agreements with France and Australia. It is anticipated that these agreements will open the doors for U.S. ranges by establishing new international customers. Areas of cooperation also include the exchange of test technologies, information and data exchanges, and project equipment transfers. DoD is currently negotiating similar agreements with the Netherlands and the United Kingdom.

Another international program for DOT&E focuses on International Test Operation Procedures. This program is managed by an International T&E Steering Committee and results in mutually agreed upon, technical test procedures. By using these test procedures, partner nations can accept each other’s testing without need to retest, thereby reducing acquisition costs. This program continues to grow, with procedures for several new technical areas currently being developed.

DOT&E also publishes biennially an International Test Facilities and Ranges Capability Summary. The 2001 edition included input from eleven nations. Two additional nations have been invited to contribute to the 2003 edition.

INDEX OF PROGRAMS

INDEX OF PROGRAMS

INDEX OF PROGRAMS

INDEX OF PROGRAMS

DOT&E Activity
and Oversight

DoD Programs

Army Programs

Navy Programs

Air Force Programs

Live Fire Test and Evaluation

Joint Test & Evaluation

Information Assurance

Systems and Test Resources

Index

www.dote.osd.mil