Director, Operational Test and Evaluation

FY 2008 Annual Report

December 2008

This report satisfies the provisions of Title 10, United States Code, Section 139. The report summarizes the operational test and evaluation activities (including live fire testing activities) of the Department of Defense during the preceding fiscal year.

Dr. Charles E. McQueary
Director

INTRODUCTION

The President and the Congress have given me the opportunity to serve as Director, Operational Test and Evaluation for these last two and a half years. I have been honored and humbled to serve in this capacity and I thank them. This Introduction reports on what has been accomplished during that time to further the priority goals I first identified in the FY06 report.

The DOT&E goals I will discuss are as follows:

- Improve Suitability
- Enhance operational realism in early tests, including developmental testing
- Provide timely performance information to the warfighter
- Facilitate the allocation of adequate operational testing resources
- Ensure that DOT&E personnel are well trained

One of the chief mechanisms for progress has been to review and renew existing T&E policies. Actions we took include the following: developed new policy with respect to suitability, in particular, reliability; increased manpower authorization in DOT&E to address emerging needs and increased complexity of systems; established contacts within each Combatant Command to ensure the information is available to them from our Annual Reports, our Beyond Low-Rate Initial Production Reports (BLRIPs), and our Early Fielding Reports done in accordance with Sections 231 and 139 of the FY07 National Defense Authorization Act (NDAA); and improved our Action Officer training program.

The following discussion will provide insight into the direction I have set on behalf of the DoD and for this organization.

SETTING NEW T&E POLICY

As a result of congressional direction to review existing policy in light of the many new acquisition strategies and initiatives, the DoD issued a report in July 2007 on needed changes. In December 2007, the Under Secretary of Defense for Acquisition, Technology and Logistics and DOT&E established new T&E policy. The new policy recognized that the fundamental purpose of test and evaluation is to provide knowledge to assist in managing the risks involved in developing, producing, operating, and sustaining systems and capabilities. The new policy also recognizes that T&E measures progress in both system and capability development; that T&E provides knowledge of system capabilities and limitations to both the acquisition community and the user community; and that T&E expertise must be brought to bear at the beginning of the system life cycle to provide earlier learning about the strengths and weaknesses of the system under development.

The following policies were implemented and are now in DoD Instruction 5000.02, which was signed on December 2, 2008:

- T&E expertise must be brought to bear at the beginning of the system life cycle to provide earlier learning about the strengths and weaknesses of the system under development. The goal is early identification of technical, operational, and system deficiencies, so that appropriate and timely corrective actions can be developed prior to fielding the system.
- T&E shall be conducted in an appropriate continuum of live, virtual, and constructive system and operational environments.
- Developmental and operational test activities shall be integrated and seamless throughout the Engineering and Manufacturing Development phase.
- Evaluations shall take into account all available and relevant data and information from contractor and government sources.
- Evaluations shall include a comparison with current mission capabilities using existing data, so that measurable improvements can be determined. If such evaluation is considered costly relative to the benefits gained, the program manager shall propose an alternative evaluation approach. This

evaluation shall make a clear distinction between deficiencies uncovered during testing relative to the approved requirements and recommendations for improvement not directly linked to requirements. A DOT&E approved LFT&E strategy shall guide LFT&E activity.
- Evaluations shall be conducted in the mission context expected at time of fielding, as described in the user's capability document. The MDA shall consider any new validated threat environments that will alter operational effectiveness.
- As technology, software, and threats change, FOT&E shall be considered to assess current mission performance and inform operational users during the development of new capability requirements.

I have asked the Services to begin to collect data on current programs in order to assess if any additional policy changes are necessary.

In July 2008, the Under Secretary of Defense for Acquisition, Technology and Logistics directed the Secretaries of the Military Departments and the Directors of Defense Agencies to establish an acquisition reliability improvement policy to address the problem of inadequate system Reliability, Availability, and Maintainability (RAM). This was a major step to address one of DOT&E's top priorities to which I now turn.

GOALS IN PRIORITY ORDER

1. Improve Suitability. To address the goal of making the IOT&E a means of confirming performance, rather than revealing new failure modes, DOT&E has worked to help identify failure modes and their operational impacts early in the design and development process. During 2007, DOT&E concluded that the key issue is inadequate system reliability, which is a key component of suitability. Contributors to reliability problems include: poor definition of reliability requirements, ignoring reliability in the Request for Proposal (RFP) and in contracting, and poor tracking of reliability growth during system development. Many of these problems occur long before the IOT&E, in program formulation, and in contractor and developmental testing. Added impetus to improve suitability came from a valuable Defense Science Board (DSB) Task Force effort in 2007, the final report for which was published in June 2008. One action of particular importance, stemming from that report, was the Under Secretary's July memo, mentioned above. In particular it directed new Service and agency policy to implement RAM practices that include the following:

- Ensure effective collaboration between the requirements and acquisition communities in the establishment of RAM requirements that balance funding and schedule while ensuring system suitability and effectiveness in the anticipated operating environment.
- Ensure development contracts and acquisition plans evaluate RAM during system design.
- Evaluate the maturation of RAM through each phase of the acquisition life cycle.
- Evaluate the appropriate use of contract incentives to achieve RAM objectives.

To aid the Services and agencies in this effort, the DoD developed the following:

- RAM Cost (RAM-C) Manual to guide the development of the requirements for the established Suitability/Sustainability Key Performance Parameter and its Key System Attributes. The RAM-C Manual will provide a consistent picture of sustainment operations so both designers and testers can better perform their functions. The cost aspect of the manual is important because the DoD has made ownership cost a key system attribute. (Operation and Support Costs account for 60-70 percent of the total ownership costs.)
- Contracting language to ensure that contractors are aware of the importance the government places on reliability and total ownership costs.

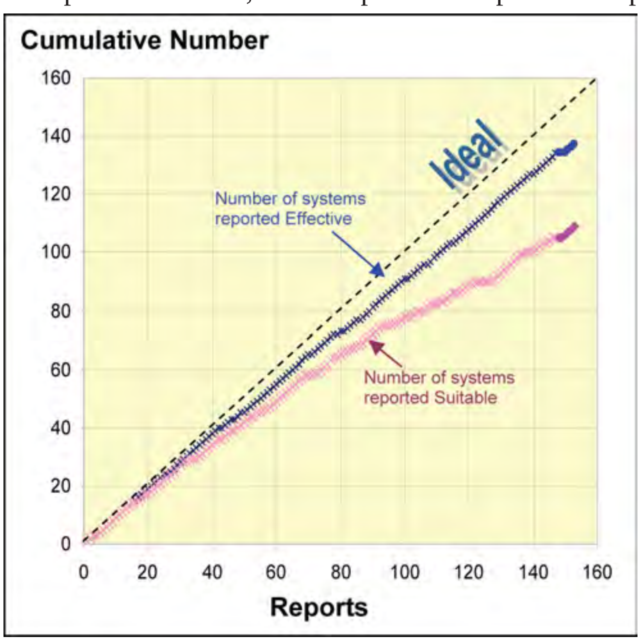
- RAM planning and evaluation tools first to assess the adequacy of the RAM program proposed and then to monitor the progress in achieving program objectives. In addition, we have sponsored the development of tools to estimate the investment in reliability that is needed and the return on investment possible in terms of the reduction of total life cycle cost. These tools include algorithms to estimate how much to spend on reliability.
- Workforce/Expertise initiatives to bring back government expertise that was lost when the importance of RAM began to be discounted. This includes refocusing the Defense Acquisition University on RAM training. For DOT&E's part in this effort, we have allocated four of the new positions we have been authorized to work with programs during the requirements definition process as part of the Joint Staff's Functional Capabilities Boards and will address RAM as part of that early influence effort. In addition, we are sponsoring training for OSD staff.

As mentioned before, a fundamental precept of the new T&E policies is that expertise must be brought to bear at the beginning of the system life cycle to provide earlier learning. Operational perspective and operational stresses can help find failure modes early in development when correction is easiest. A key to accomplish this is to make progress toward Integrated T&E, where the operational perspective is incorporated into all activity as early as possible. This is now policy, but one of the challenges remaining is to convert that policy into meaningful practical application.

In a separate action, DOT&E joined an effort to define best practices for reliability programs. Last year's report addressed how vital that effort was. Once agreed upon and codified, reliability program standards can logically appear in both RFPs and in contracts. Industry played a key partnership role in this effort. The standard, GEIA-STD-0009 has been approved, and on November 13, 2008, was American National Standards Institute certified. I see industry's increased commitment to address system reliability and suitability as evidence of growing momentum for improvement.

In summary, I remain convinced that each step in the development process can and should be used to improve suitability. While DOT&E is clearly engaged in the final operational testing of systems, we have teamed with DoD and industry partners to forge improvements in earlier steps.

As a practical matter, these steps make improvement possible, yet the results may be some time in coming. This year, we provided eight BLRIPs. Of those, two of eight (25 percent) were not suitable for combat compared to 50 percent the year before. Some improvement might therefore be inferred, but it will be a while before a definite trend of improvement can be established. In what should become an annual reporting metric, the chart from last year's annual report has been updated with the data from FY08 (in bold) and shows improvement in the slope of the curve, which, in the ideal case would be a 45-degree slope.



2. Enhance operational realism in early tests, including developmental testing. The Defense Science Board (DSB) Task Force mentioned earlier examined the need to reinvigorate developmental test and evaluation. The final report of the Task Force concluded that the problems in reliability can be corrected only by re-instituting a disciplined Systems Engineering process during design and development. The DSB suggested, as many others have, that integrating developmental and operational testing could help. Many of the DSB recommendations are now policy. Successful implementation of the policies will create more realistic and operationally-representative conditions in early testing, especially in developmental testing. Realistic stresses and loads will lead to earlier discovery of failure modes. Early operational insight and assessments can influence system design and reduce surprises in IOT&E.

As a metric of our progress toward achieving this goal, DOT&E was to provide operational insights gained prior to preliminary and critical design reviews and acquisition decision points. The chart below provides a 2008 baseline against which future progress can be measured.

METRIC	OF ALL RELEVANT PROGRAMS (FY08)	OF THOSE WITH MILESTONE THIS YEAR (FY08)	OF THOSE WITH MILESTONE NEXT YEAR (FY09)
The fraction of T&E Strategies and T&E Master Plans that test technology in relevant operational environments, including realistic threat environments, before Milestone B.	0.36	1 of 2 programs with Milestone A in FY08	Expect 4 of 4 programs with Milestone A in FY09
The fraction of programs that have a DOT&E letter report at Milestone B that assesses effectiveness, suitability, and survivability in a relevant operational environment.	0.02	0 of 7 programs with Milestone B in FY08	Expect 12 of 12 programs with Milestone B in FY09

I should emphasize that these low numbers over all programs indicate that the DoD only recently concluded that earlier OT&E involvement in the development cycle is necessary. The low percentages are metrics that are a baseline to track improvement as we move forward.

3. Provide timely performance information to the warfighters. Congress stimulated progress on this priority by requiring Early Fielding Reports when a system is committed to operations before a full-rate production decision. In FY08, DOT&E delivered three such reports in compliance with this particular part of Section 231 of the FY07 NDAA. Our goal was to provide timely and accurate assessments for fielding decisions and to make joint warfighters and commanders aware of system capabilities and limitations to performance and mission accomplishment. The DOT&E goal is that this information will be available for all systems that enter the field, fleet, or battle space.

We have established a classified website for these assessments (http://www.dote.osd.smil.mil/assess/) to make available DOT&E Annual Reports, BLRIP Reports, and Early Fielding Reports to the Combatant Commanders and others who have proper access.

In addition, we have established points of contact between DOT&E and each Combatant Command to ensure that joint warfighters and commanders are aware of the system capabilities and limitations, strengths and weaknesses for systems that might be deployed to them. Early fielding does not remove our responsibility to determine whether a system is effective and suitable for combat before the full-rate production decision. So DOT&E will continue to follow the Early Fielding Report with our usual BLRIP when the IOT&E is complete.

4. Facilitate the allocation of adequate operational testing resources. As I reported last year, my analysis of staffing levels indicated that DOT&E needed more resources in the form of experts. DOT&E requested, and was granted by the Deputy Secretary of Defense, an increase in staff level of 22 permanent positions. It will take time to fill these staff positions, but the process is well underway. With this increase, I believe that future Directors will be able to properly support the acquisition process and to respond quickly to Combatant Commanders' requests for support from our Joint Test and Evaluation Program. As noted earlier, four of the 22 positions will be focused on early involvement of T&E in the requirements and program formulation phase with an emphasis on RAM.

While DOT&E's augmentation is significant for its size, workforce augmentation remains a challenge in the Services where there are technical expertise shortfalls in the areas of Systems Engineering and testing.

During its review of test programs, my staff identifies any test-critical resource shortfalls. Test-critical resource shortfalls are those that meet the following two conditions: (1) if not available in time for IOT&E testing, would require DOT&E to declare the IOT&E inadequate, and (2) for which there is not an adequate program to develop the test capability. Only one test-critical resource shortfall has been so categorized and DOT&E has gone on record with the Navy for it: the Navy Multi-Stage Supersonic Target (MSST). The Navy response to DOT&E's memorandum of concern has been positive, leading to a contract award for development of the two-stage advanced anti-ship cruise missile target on August 22, 2008.

One other test-critical resource is worth noting because of its importance to adequate testing. This is the development of an adequate 5th Generation Fighter Target for the Air Force, Navy, and Marine Corps. Currently, the Air Force is using the QF-16 as an interim solution. A DOT&E-sponsored study is underway to determine if the QF-16 is sufficient or if an alternative, affordable solution is appropriate. The results of this study will affect both the F-35 and F-22 programs.

5. Training. To ensure that DOT&E personnel are well trained and prepared to meet the challenges presented by the evolving acquisition and testing environments, DOT&E continues to revamp its in-house training program.

Each DOT&E staff member is required to have an approved program for continued professional development, and the staff member's yearly performance appraisal will depend in part on completing that program. DOT&E now offers, as part of that professional development program, specialized training in RAM.

In another part of its professional development program, 10 DOT&E staff participated in the Deputy Secretary of Defense's Lean Six Sigma "Green Belt" training. Seven earned Green Belts.

EMERGING TEST MISSION AREAS: FORCE PROTECTION EQUIPMENT AND NET-CENTRIC AND SOFTWARE TESTING

Force Protection Testing

Based upon increased congressional interest in personnel body armor and combat helmets, the FY09 NDAA amended Title 10 Section 2366 to give the Secretary of Defense authority to designate programs for oversight pursuant to Section 2366 without restriction. The change mirrors the authority already granted the Director in Section 139 of Title 10 for operational test and evaluation oversight. In FY09, DOT&E will work with the Services to identify those programs that due to their direct contribution to warfighter lethality and survivability, particularly personal body armor and combat helmets, warrant DOT&E oversight under this new provision.

Based on previous legislation, I issued policy on force protection equipment and non-lethal weapons to the Services in 2008, establishing the framework for a collaborative and cooperative environment for the sharing of information and expertise, while meeting my statutory obligations. I believe that implementation of this policy will serve well to ensure that warfighters have the full spectrum of protection and munitions they need to have success on the battlefield of today and tomorrow.

There were two notable examples of DOT&E involvement in force protection programs this year. DOT&E began oversight of Army testing of personnel body armor as a result of a congressional request. This request and subsequent direction by the Secretary to provide oversight was in response to the hearings held by the House Armed Services Committee (HASC) on June 6, 2007. The integrated product team formed to accomplish this task, consisting of DOT&E, Under Secretary of Defense for Acquisition, Technology and Logistics, the Army Test and Evaluation Command, and the program manager for Soldier Equipment, presented a two-phased approach to congressional staff at a November 14, 2007, meeting. Phase 1 consisted of ballistic testing in accordance with the solicitation and supported the Army's source selection process. Phase 2 includes additional ballistic testing to more rigorously characterize the ballistic performance of the plates. During 2008, Phase 1 testing was completed in accordance with test plans approved by my office and was adequate in scope and execution to support the Army's source selection process. The Army has awarded contracts for the production of enhanced small arms protective inserts (ESAPI) and XSAPI (improved ESAPI) plates to support First Article Test and Phase 2 testing. DOT&E submitted an interim report to Congress following the completion of Phase I testing. DOT&E will prepare an independent report to Congress following completion of this effort.

The second example was also a congressionally directed action, stemming from the FY08 NDAA. Congress directed the DoD to conduct a limited field user evaluation and operational assessment of qualified combat helmet pad suspension systems. After coordinating with HASC professional staff, DOT&E requested that the Army and the Marine Corps conduct independent tests. These tests were completed in the summer of 2008 and DOT&E submitted an independent report to Congress.

Net-Centric and Software Testing

As discussed last year, we have continued to work with U.S. Joint Forces Command (USJFCOM) to align joint testing and training roadmaps in the growing mission area of net-centric warfare. While our progress has been limited by major delays encountered by the largest pilot program (Net Enabled Combat Capability (NECC)), the very limited NECC testing accomplished this year underscored the need to test operationally relevant sets of capability in a live, virtual, constructive (L/V/C) continuum. Software updates to the Global Combat Support System-Joint and Defense Travel System programs also leveraged JFCOM's L/V/C capabilities, while the Air Force Operational Test and Evaluation Center conducted the Integrated Strategic Planning and Analysis Network IOT&E in concert with U.S. Strategic Command exercises.

More generally, software intensive systems such as next generation Command and Control systems and Enterprise Resource Programs consistently encounter significant problems that delay successful fielding because they fail to perform as expected in the final stages of testing.

The greatest challenge appears to be the lack of rigorous developmental testing. Too often, developmental testing resembles a feasibility demonstration with developers focusing on demonstrating that their product can work under a single set of circumstances rather than testing to ensure that the product will work under likely operational conditions. As a result, difficulties with data conversion from legacy systems, system interfaces, and the interface with the network "transport layer" are often under-emphasized.

There are three root causes of these problems. First, requirements often are not well defined or not available until the development is nearly completed. This handicaps the developer who should understand, at the beginning of development, the desired performance, the intended operating environment, and the already fielded systems with which it will have to work.

Second, development testing has not always represented a realistic environment. Some developers have assumed, because the DoD has moved to an Internet Protocol (IP), that new systems would work as if they were on the world wide web. This does not recognize the profound differences between the commercial and military situations. In the military, environment applications must span the globe using both satellite and terrestrial links, use extensive cryptography and, ultimately, be obliged to work with users who have comparatively limited bandwidth.

Third, developers are encouraged to focus on small modules of usable software that can be developed in short and defined periods of time (time-certain development). Taken to the extreme, time-certain development can lead to on-time delivery of software that fails to meet user needs and defers addressing the most difficult problems. Such an outcome was seen in the development of the five pilot NECC capability modules.

The path to success for these software intensive systems is remarkably similar to that of complex hardware systems: ensuring clearly articulated requirements by collaboration between the user and developer as mentioned in goal 1; a disciplined systems engineering approach, as mentioned by the DSB; and more realistic developmental testing that reflects the actual operational environment. I am pleased that Secretary Young has emphasized all three points in his reviews of NECC and the Joint Tactical Radio System.

DOT&E FISCAL YEAR 2008 OVERSIGHT AND REPORTING ACTIVITY

During this year, my office monitored 322 Major Defense Acquisition Programs (MDAPs) and special interest programs. I approved 68 Test and Evaluation Master Plans and Test and Evaluation Strategies, two LFT&E Strategies included in the Test and Evaluation Master Plans, and 86 Operational Test and Evaluation Plans for specific test events.

DOT&E delivered eight BLRIPs and one Live Fire Report to the Secretary of Defense and Congress:

Submission Date	Program Name
October 26, 2007	T-AKE *Lewis & Clark* Class of Auxiliary Dry Cargo Ships
November 1, 2007	Air Force Mission Planning System (MPS) Program Increment II (F-15)
February 1, 2008	Mk 48 Mod 7 Common Broadband Advanced Sonar System (CBASS) Phase I Torpedo
February 14, 2008	Stryker Mobile Gun System (MGS)
March 20, 2008	High Mobility Artillery Rocket System (HIMARS) with the Improved Crew Protection (ICP) Cab*
April 11, 2008	Low Band Transmitter (LBT) System
May 15, 2008	SSGN *Ohio* Class Conversion
August 22, 2008	Joint Chemical Agent Detector (JCAD)
September 15, 2008	USMC UH-1 Upgrades (UH-1Y)

(* Live Fire Testing)

DOT&E also delivered three Early Fielding Reports under the requirements of NDAA for FY07, Section 231:

Submission Date	Program Name
October 26, 2007	XM982 Excalibur Precision Engagement Projectile
April 2, 2008	SSN 774 *Virginia* Class Submarine
May 14, 2008	*San Antonio* Class Amphibious Transport Dock (LPD-17)

In addition to this Annual Report, we testified at four sessions of congressional meetings, provided a separate report on the Missile Defense Agency in February 2008, and responded to over 40 requests for briefings to congressional staff members.

CONCLUSION

I am proud of the significant progress made in each of the DOT&E goals as discussed above and I greatly appreciate the support we have had from the Under Secretary of Defense for Acquisition, Technology and Logistics. I am also aware that the work of continuous process improvement is never finished. Continuity of purpose and sustained emphasis is essential to institutionalizing the lasting change needed to equip our forces with systems that work when needed.

It has been an honor and a privilege for me during these last two and a half years to have been part of an organization that is "key to weapons that work." With that in mind, I am pleased to present the 2008 Annual Report that follows.

Dr. Charles E. McQueary
Director

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DOT&E Activity and Oversight

DOT&E Activity and Oversight

Activity Summary

DOT&E activity for FY08 involved oversight of 322 programs, including 47 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 FY08 included approval of 68 Test and Evaluation Master Plans (TEMPs) / Test and Evaluation Strategies, as well as 86 Operational Test Plans, and two Live Fire Test and Evaluation (LFT&E) Strategies for inclusion in the TEMPs. In FY08, DOT&E prepared 13 reports for the Secretary of Defense and Congress that included eight Beyond Low-Rate Initial Production Reports, one LFT&E Report, three Early Fielding Reports, and one assessment on the Ballistic Missile Defense System (BMDS).

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 / STRATEGIES APPROVED

Acoustic Rapid Commericial Off-the-Shelf (COTS) Insertion (A-RCI) Sonar System - Revision B

AN/ALR-69A Radar Warning Receiver - Revision 1.11

AN/BYG-1 Combat Control System - Revision 4

AN/USC-61(C) Digital Modular Radio

AN/WLD-1(V)1 Remote Mine-hunting System - Revision C, Change 1

Anniston Chemical Agent Disposal Facility, Chemical Demilitarization Program

B-1 Fully Integrated Data Link (FIDL) Milestone C Update

B-52 Radar Modernization Program

Ballistic Missile Defense System (BMDS) Integrated Master Test Plan

Ballistic Missile Defense System (BMDS) Strategic Plan for Testing, Blocks 10 and 12+ (SPfT)

Broad Area Maritime Surveillance Unmanned Aircraft System

C-130 Avionics Modernization Program

C-130J

Capstone Enterprise Air Warfare Ship Self-Defense

Combatant Commanders Integrated Command and Control System (CCIC2S) - Version 1.4

Common Submarine Radio Room - Revision 3

Cooperative Engagement Capability - Revision 4

Defense Integrated Military Human Resources System - Revision 3.0.10

Defense Travel System - Version 2

Distributed Common Ground System - Army (DCGS-A)

Distributed Common Ground System - Army (DCGS-A) Milestone C (V3.1 System)

Distributed Common Ground System - Marine Corps

E-2D Advanced Hawkeye - Revision A

EA-18G - Revision C

EA-6B Improved Capability (ICAP) III - Revision C

Evolved SeaSparrow Missile (ESSM)

Expeditionary Fighting Vehicle

F/A-18 APG-79 Active Electronically Scanned Array (AESA)

FA-18/EA-18 Mission Planning Environment - Annex F

General Fund Enterprise Business System (GFEBS) - Army - Release 1.2

Global Combat Support System - Army - Version 1.5

Global Combat Support System for Combatant Command/Joint Task Forces (GCSS-CC/JTF) - Version 7.0

Global Hawk High Altitude Endurance Unmanned Aerial System, RQ-4

Global Positioning System (GPS) III

Ground Soldier Ensemble

Guided Multiple Launch Rocket System - Unitary (GMLRS-U)

H-1 Upgrades Program - Revision C

Identification Friend or Foe Mode 5 - Revision A

Integrated Strategic Planning and Analysis Network (ISPAN) - Version 6.18

Intelligent Munitions System (IMS) Increment 1

Joint High Speed Vessel

Joint Light Tactical Vehicle

Joint Mission Planning System - Maritime Mission Planning Environment (MPE) - Annex ‘N’ for Navy Legacy Helicopters

Joint Precision Approach and Landing System Increment 1A

KC-X - Version 2.1.2

Maritime Prepositioning Force (Future) Mobile Launching Platform

Miniature Air Launched Decoy (MALD) ADM-160B and Miniature Air Launched Decoy - Jammer (MALD-J) ADM-160C

TEST AND EVALUATION MASTER PLANS / STRATEGIES APPROVED

Mission Planning Systems - Annex F, Increment III Representative Platform - F-16 M4.2+

Mobile Users Objective System (MUOS)

MQ-9 Hunter Killer Reaper Unmanned Aerial System

Multi-functional Information Distribution System - Low Volume Terminal - Annex C, Revision A

National Polar Orbiting Operational Environmental Satellite System (NPOESS)

Net-Centric Enterprise Services Milestone C - Version 1.2

Net-Enabled Command Capability Increment 1 Capstone - Version 1.0

Ohio Class SSGN Conversion Program - Revision A, Change 2

Ship Self-Defense System (SSDS) - Revision B

Ship-to-Shore Connector

Space-Based Surveillance System (SBSS)

Spider XM7 Network Command Munition Change Document

Stryker Mobile Gun System (MGS)

Stryker Nuclear, Biological, and Chemical Reconnaissance Vehicle - Revision 5

Surface Electronic Warfare Improvement Program (SEWIP) Block 1B - Change 1

T-6 Avionics Upgrade Project (AUP) - Annex I, to the Joint Primary Aircraft Training System (JPATS) Milestone III

T-AKE Dry Cargo/Ammunition Ship Program

Theater Medical Information Program - JT&E Master Plan

Tomahawk Weapon System - Revision E

UH-60M Upgrade

Warfighter Information Network - Tactical (WIN-T) Increment 1

OPERATIONAL TEST PLANS APPROVED

AC-130U Link 16

Acoustic Rapid Commercial Off-the-Shelf (COTS) Insertion (A-RCI) Sonar System Phase III and IV Follow-on OT&E (OT-C-06)

AGM-88E Advanced Anti-Radiation Guided Missile Operational Assessment

Airborne Signals Intelligence Payload (ASIP) Operational Assessment

Airborne Warning and Control System 40/45 Operational Assessment

Amphibious Assault Ship Replacement Operational Test (OT)-B1

AN/BYG-1 Combat Control System Follow-on OT&E

AV-8B H5.0 Operational Flight Program and Joint Mission Planning System - Maritime (JMPS-M)

B-52 Radar Modernization Mode Set 1 IOT&E

Baseline IV Tactical Tomahawk Weapon System (TTWS)

Black Hawk UH-60M Limuted User Test

C-130 Avionics Modernization Program Operational Assessment

C-130J ALR-56M Follow-on OT&E

C-130J Block 6.0 Force Development Evaluation Plan

C-17 Formation Flight System Force Development Evaluation Plan

C-17 Traffic Collision Avoidance System Overlay for Large Formations Force Development Evaluation Plan

C-5 Avionics Modernization Program Block Cycle Change 2007

C-5 Reliability Enhancement and Re-Engineering Program Operational Assessment-3

Combatant Commanders Integrated Command and Control System (CCIC2S) CPS3 Force Development Evaluation Plan

CV-22 Osprey Cold Weather Evaluation Operational Test-IIIC

DDG 1000 *Zumwalt* Class Destroyer Operational Test-B1

DDG 51 Class Aegis Guided Missile Destroyer Flight IIA Follow-on OT&E (OT-IIIJ)

Deliberate and Crisis Action Planning and Execution Segments (DCAPES) Version 4.1.0.0 Force Development Evaluation Plan

Deployable Joint Command and Control (DJC2) Multi-Service OT&E

Digital Modular Radio (DMR) Program IOT&E

DoD Teleport System Generation One, Follow-on OT&E III Plan

DoD Teleport System Generation Two, Phase One, Multi-Service OT&E

Dry Cargo/Ammunition Ship (T-AKE) Operational Test-IIIA

E-2D Advanced Hawkeye Operational Test-B1

EA-18G Airborne Electronic Attack Aircraft IOT&E

EA-18G Airborne Electronic Attack Aircraft Integrated Test-C1

Expeditionary Fighting Vehicle (EFV) Waterborne Directional Stability Developmental Test/Operational Test Plan

F/A-18E/F System Configuration Set H4E

F/A-18E/F Active Electronically Scanned Array Radar Test Plan

FA-18E/F Software Qualification Testing (Integrated Test-IIIG) System Configuration Set H5E

FA-18E/F Software Qualification Testing (Integrated Test-IIIG) System Configuration Set H5E Addendum A

Family of Advanced Beyond Line-of-Sight Terminals (FAB-T) Increment 1 Operational Assessment-1

Family of Medium Tactical Vehicles 10-Ton Dump Truck Limited User Test Event Design Plan

Future Aircraft Carrier (CVN-21) Program Operational Test-B2

Global Combat Support System - Joint Global Version 4.1.1 Release

Global Combat Support System - Joint Status of Resources and Training System (SORTS) Version 4.1.1 Strategic Server Enclave

Global Hawk High Altitude Endurance Unmanned Aerial System, RQ-4 Block 20 Operational Assessment

Global Hawk High Altitude Endurance Unmanned Aerial System, RQ-4 Multi-Platform Radar Technology Insertion Program Operational Assessment

Increased Capability (ICAP) III Block 3 Airborne Electronic Attack Aircraft

Integrated Strategic Planning and Analysis Network (ISPAN) Block 1 IOT&E

Integrated Strategic Planning and Analysis Network (ISPAN) Block 1 IOT&E Changes

Integrated Strategic Planning and Analysis Network (ISPAN) Operational Utility Evaluation Plan

Joint Biological Point Detection System (JBPDS) Limited User Test Memorandum Test Plan (MTP)

Joint Biological Point Detection System Whole System Live Agent Test Record Test Event Design Plan

Joint Biological Standoff Detection System

Joint Mission Planning System B-1 Mission Planning Environment (MPE) IOT&E Plan

Joint Mission Planning System F-15 v1.3 MPE Test Plan

Joint Mission Planning System F-16 M4.2+ MPE IOT&E

Joint Mission Planning System F-22A MPE IOT&E

Joint Warning and Reporting Network (JWARN) Multi-Service OT&E

Laser Joint Direct Attack Munition (LJDAM) Operational Utility Evaluation

Laser Joint Direct Attack Munition (LJDAM) Quick Reaction Assessment

LPD 17 Amphibious Transport Dock Landing Ship Program Operational Test-IIC Phase 3

LPD 17 Amphibious Transport Dock Landing Ship Program Operational Test-IIC1 Data Collection

LPD 17 Amphibious Transport Dock Landing Ship Program (Amphibious Warfare Phase)

LPD 17 Amphibious Transport Dock Landing Ship Program Change Transmittal 1

MH-60R Multi-Mission Helicopter Preplanned Product Improvement Program Follow-on OT&E (OT-IIIA)

MH-60S Block 2A Airborne Mine-countermeasures System

MH-60S Multi-Mission Helicopter Preplanned Product Improvement Program Follow-on OT&E (OT-IIIA)

Mk 48 Advanced Capability (ADCAP) Spiral 1 Torpedo Operational Test-IIIH Change Transmittal 1

MQ-9 Reaper Increment 1 IOT&E Plan

Multi-functional Information Distribution System - Joint Tactical Radio System Program

Navy Enterprise Resource Planning (Navy ERP) IOT&E (OT-C1)

Net-Centric Services (NCES) Increment 1, Spiral 2.0 Operational Assessment

Net-Enabled Command Capability (NECC) Operational Detailed Test Plan

Public Key Infrastructure (PKI) Program Increment 1, Spiral 2 IOT&E

Ship Self-Defense Ship (SSDS) Mark 2 Mod 1B Program (Operational Test-IIIG Phase 1)

Ship Self-Defense System (SSDS) Operational Test-IIIC Phase 3

Ship Self-Defense System Follow-on OT&E (OT-IIID) of the Cooperative Engagement Capability, and Follow-on OT&E (OT-IIIA) of the Evolved SeaSparrow Missile Programs

Space-Based Infrared System Interim Highly Elliptical Orbit Operational Utility Evaluation

Surface Electronic Warfare Improvement Program (SEWIP) Operational Test-B5

Surface Electronic Warfare Improvement Program Block 1B1 Operational Test-B4

Theater Medical Information Program Event Design Plan Block 2, Release 1

Virginia (SSN 774) Class Submarine IOT&E OT-IID

Virginia (SSN 774) Class Submarine Information Assurance Blue Team Testing Operational Test-IID

Virginia (SSN 774) Class Submarine Information Assurance Red Team Test

Virginia (SSN 774) Class Submarine IOT&E (OT-IID) Revision B

Wideband Global SATCOM System

XM142 High Mobility Artillery Rocket System (HIMARS) Increased Crew Protection Upgrade (ICP)

XM31E1 Guided Multiple Launch Rocket System Unitary (GMLRS-U) Rocket IOT&E

LIVE FIRE TEST AND EVALUATION STRATEGIES AND TEST PLANS

Expeditionary Fighting Vehicle (EFV)

Guided Multiple Launch Rocket System - Unitary (GMLRS-U)

REPORTS TO CONGRESS FOR FY08

Program	Report Type	Date
XM982 Excalibur Precision Engagement Projectile	OT Early Fielding Report	October 2007
T-AKE *Lewis and Clark* Class of Auxiliary Dry Cargo Ships	Combined OT / LFT Report	October 2007
Air Force Mission Planning System (MPS) Program, Increment II (F-15)	OT Report	November 2007
Mk 48 Mod 7 Common Broadband Advanced Sonar System (CBASS) Phase I Torpedo	OT Report	January 2008
Stryker Mobile Gun System (MGS)	Combined OT / LFT Report	February 2008
FY07 Assessment of the Ballistic Missile Defense System (BMDS)	Annual Report	February 2008
High Mobility Artillery Rocket System (HIMARS) with the Improved Crew Protection (ICP) Cab	LFT Report	March 2008
SSN 774 *Virginia* Class Submarine	Combined OT / LFT Early Fielding Report	April 2008
Low Band Transmitter (LBT)	OT Report	April 2008
SSGN *Ohio* Class Conversion	Combined OT / LFT Report	May 2008
San Antonio Class Amphibious Transport Dock LPD-17	Combined OT / LFT Early Fielding Report	May 2008
Joint Chemical Agent Detector (JCAD)	OT Report	August 2008
USMC H-1 Upgrades (UH-1Y)	Combined OT / LFT Report	September 2008

During FY08, 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.

In addition to on-site participation and local travel within the national capital region, approximately 659 trips supported the DOT&E mission.

Security considerations preclude identifying classified programs in this report. The objective, however, is to ensure operational effectiveness and suitability do not suffer due to extraordinary security constraints imposed on those programs.

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 322 acquisition programs during FY08.

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 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 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 122 LFT&E acquisition programs during FY08.

DOT&E only includes an individual program in the Annual Report if there has been significant test activity within the fiscal year. Programs contained in this year's Annual Report are denoted by an asterisk on the following pages.

PROGRAMS UNDER DOT&E OVERSIGHT
CALENDAR YEAR 2008
(As taken from the June 2008 Official T&E Oversight List)

DoD PROGRAMS

Ballistic Missile Defense System (BMDS) Program* (separate section)

- Aegis Ballistic Missile Defense (BMD) and SM-3 all Blocks*
- Command, Control, Battle Management, and Communications (C2BMC)*
- Ground-Based Midcourse Defense (GMD) Segment*
- Kinetic Energy Interceptor (KEI)*
- Multiple Kill Vehicle (MKV)*
- Space Tracking and Surveillance System (STSS)*
- Terminal High-Altitude Area Defense (THAAD)*
- YAL-1 Airborne Laser (ABL)*

Armed Forces Health Longitudinal Technology Application (AHLTA)

Ballistic Missile Technical Collection (BMTC)

Chemical Demilitarization Program – Assembled Chemical Weapons Alternatives (CHEM DEMIL-ACWA)*

Chemical Demilitarization Program – Chemical Materials Agency (CHEM DEMIL-CMA) including Chemical Materials Agency Newport (CHEM DEMIL-CMA NEWPORT)*

Collaborative Force Analysis, Sustainment, and Transportation System (CFAST)

Defense Information System for Security (DISS)

Defense Integrated Military Human Resources System (DIMHRS)*

Defense Security Assistance Management System (DSAMS) – Block 3

Defense Travel System (DTS)*

F-35 Lightening II Joint Strike Fighter (JSF)*

Global Combat Support System Combatant Command / Joint Task Force (GCSS (CC/JTF))*

Global Command and Control System – Joint (GCCS-J)*

Integrated Air and Missile Defense (IAMD) Roadmap Programs

Integrated Unit, Base, and Installation Protection (IUBIP)

Internet Protocol version 6 (IPv6)

Joint Biological Agent Identification and Diagnosis System (JBAIDS)

Joint Biological Point Detection System (JBPDS)*

Joint Biological Stand-Off Detection System (JBSDS)*

Joint Counter Radio Controlled IED Electronic Warfare (JCREW) Spiral 3.3

Joint Lightweight Tactical Vehicle (JLTV)

Joint Nuclear, Biological, Chemical Reconnaissance System (JNBCRS)

Joint Service Lightweight Standoff Chemical Agent Detector (JSLSCAD)

Joint Tactical Radio System (JTRS) Airborne / Maritime / Fixed Station (AMF)

Joint Tactical Radio System (JTRS) Ground Mobile Radio (GMR)*

Joint Tactical Radio System (JTRS) Handheld, Manpack, and Small Form Fit (HMS)*

Joint Tactical Radio System (JTRS) Network Enterprise Domain (NED)

Joint Warning and Reporting Network (JWARN)*

Key Management Infrastructure (KMI)

M4 Joint Chemical Agent Detector (JCAD)*

Mine Resistant Ambush Protected Family of Vehicles (MRAP)*

Multi-functional Information Distribution System (MIDS) (Includes Low Volume Terminal and Joint Tactical Radio System)*

Multi-National Information Sharing (MNIS)

Net Enabled Command Capability (NECC) (formerly Joint Command and Control System)*

Network Centric Enterprise Services (NCES)*

Public Key Infrastructure (PKI)*

Single Integrated Air Picture (SIAP), including Integrated Architecture Behavior Model (IABM)

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

Teleport Generation I/II (Teleport)

Theater Medical Information Program (TMIP)*

ARMY PROGRAMS

Abrams Upgrade (M1A1 SA/M1A2 SEP)

Abrams Tank Mod (M1A2SEP Increment 2)

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

Aerial Common Sensor (ACS)

Apache Block III (AB3)

Armed Reconnaissance Helicopter (ARH)*

Armored Knight M1200

* These programs have individual reports for FY08 due to significant test activity.

ARMY PROGRAMS (continued)

Armored Tactical Wheeled Vehicles including:

- Fuel Tankers
- Heavy Equipment Transporter (HET)
- Heavy Expanded Mobility Tactical Truck (HEMTT)*
- High Mobility Multi-purpose Wheeled Vehicle (HMMWV) Armor
- High Mobility Multi-purpose Wheeled Vehicle (HMMWV) Expanded Capacity Vehicle 2 (ECV2)*
- M915A5 Family of Vehicles*
- M939 General Purpose Truck
- Palletized Loading System (PLS)

Army Integrated Air and Missile Defense (IAMD) Program (formerly referred to as AIAMD)

Biometrics

Bradley Next Family of Vehicles

Bradley Upgrade – M2A3 Fighting Vehicle Systems

CH-47F – Cargo Helicopter

Distributed Common Ground System – Army (DCGS-A)

Excalibur XM982 Precision Engagement Projectiles*

Family of Medium Tactical Vehicles (FMTV)*

Force XXI Battle Command Brigade and Below (FBCB2) Program

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

- Armed Robotic Vehicle (ARV) Assault (ASLT)
- Armed Robotic Vehicle (ARV) Assault Light (ASLT(L))
- Armed Robotic Vehicle (ARV) Reconnaissance and Surveillance Target and Acquisition (RSTA)
- Command and Control Vehicle (C2V)
- Common Controller Device (CCD)
- FCS Recovery Maintenance Vehicle (FRMV)
- Infantry Carrier Vehicle (ICV)
- Medical Vehicle (MV) (Treatment and Evacuation Variant)
- Mk 44 Cannon 30 mm Ammunition
- Mounted Combat System (MCS)
- Multi-Functional Utility / Logistics and Equipment Vehicle (MULE) Transport
- Multi-Functional Utility / Logistics and Equipment Vehicle (MULE) Countermine
- Network Battle Command
- Non-Line-of-Sight Cannon (NLOS-C)*
- Non-Line-of-Sight Mortar (NLOS-M)
- Non-Line-of-Sight Launch System (NLOS-LS)*
- Reconnaissance and Surveillance Vehicle (R&SV)
- Small Manpackable Unmanned Ground Vehicle (SUGV)
- Unmanned Aircraft System (UAS) Class I, XM 156*
- UAS Class II
- UAS Class III
- UAS Class IV (Fire Scout)
- Unattended Ground Sensors (UGS) (Tactical and Urban UGS)*

General Fund Enterprise Business System (GFEBS)

Global Combat Support System – Army (GCSS-A)

Global Command and Control System – Army (GCCS-A)

Ground Soldier Ensemble (GSE)

Guided Multiple Launch Rocket System (GMLRS) – Alternative Warhead

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

Guided Multiple Launch Rocket System (GMLRS) – Unitary*

High Capacity Communications Capability (HC3)

High Mobility Artillery Rocket System (HIMARS) including Increased Crew Protection Cab*

Identification Friend or Foe (IFF) Mark XIIA Mode 5 (all development and integration programs)

Intelligent Munitions System (IMS)

Interceptor Body Armor

Javelin Anti-tank Missile System – Medium

Joint Air-to-Ground Missile System (JAGM) (replaces Joint Common Missile)

Joint Battle Command Platform (JBC-P)

Joint Cargo Aircraft (JCA)*

Joint Heavy Lift Program

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

Joint Mission Planning System (JMPS)

Land Warrior – Integrated Soldier Fighting System for Infantrymen

Light Utility Helicopter*

Logistics Modernization Program (LMP)

M855 5.56 mm Green Ammunition

Mid-Range Munition

Mounted Battle Command on the Move (MBCOTM)

One – Tactical Engagement Simulation System (One-TESS)

Paladin/Field Artillery Ammunition Support Vehicle (FAASV) Integrated Management (PIM)

Patriot/Medium Extended Air Defense System Combined Aggregate Program (PATRIOT/MEADS CAP)*

Patriot Advanced Capability 3 (PATRIOT PAC-3) Missile

Precision Guidance Kit XM1156 (PGK)

Precision Guided Mortar Munitions (PGMM)

Shadow Unmanned Aircraft System (Shadow UAS)

Sky Warrior Unmanned Aircraft System (Sky Warrior UAS) (also called Extended Range / Multi-purpose Unmanned Aircraft System (ER/MP UAS) including Hellfire Missile Upgrade and Common Sensor Upgrade

Small Unmanned Aircraft System (Raven UAS)

* These programs have individual reports for FY08 due to significant test activity.

ARMY PROGRAMS (continued)

Spider XM7 Network Command Munition (formerly Anti-Personnel Landmine Alternative (APLA)/Spider)*

Stryker – Armored Vehicle and all associated systems (and active protective systems), including:

- Stryker – Anti-Tank Guided Missile Vehicle
- Stryker – Commander's Vehicle
- Stryker – Engineer Squad Vehicle
- Stryker – Fire Support Vehicle
- Stryker – Infantry Carrier Vehicle
- Stryker – Medical Evacuation Vehicle
- Stryker – Mobile Gun System*
- Stryker – Mortar Carrier
- Stryker – Nuclear, Biological, and Chemical (NBC) Reconnaissance Vehicle*
- Stryker – Reconnaissance Vehicle

Stryker Product Improvement Program (formerly called Stryker Enhanced Platform (StEP))

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

UH-60M Black Hawk Upgrade Utility Helicopter*

Warfighter Information Network-Tactical (WIN-T) Increment 1*

Warfighter Information Network-Tactical (WIN-T) Increment 2*

Warfighter Information Network-Tactical (WIN-T) Increment 3*

Warfighter Information Network-Tactical (WIN-T) Increment 4*

XM1022 Long-Range Sniper Ammunition*

NAVY PROGRAMS

21" Mission Reconfigurable Unmanned Undersea Vehicle System (21" MRUUVS)

Acoustic Rapid Commerical Off-the-Shelf (COTS) Insertion for Sonar AN/BQQ-10 (V) (A-RCI)*

Active Electronically Scanned Array (AESA)

Advanced Extremely High Frequency Multi-Band Terminal Satellite Program (NMT) (formerly Navy Advanced EHF Multi-Band Terminal)

Advanced SEAL Delivery System (ASDS)

Aegis Modernization

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

AIM-9X – Air-to-Air Missile Upgrade including AIM-9X Preplanned Product Improvement*

Air and Missile Defense Radar (AMDR)

Airborne Mine Neutralization System (AMNS)

Airborne Resupply / Logistics for SeaBasing (AR/LSB)

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

AN/APR-39 Radar Warning Receiver

AN/BYG-1 Combat Control System*

AN/WLD-1 Remote Mine-hunting System (RMS)*

AN/WSQ-11 Anti-Torpedo Torpedo Defensive System

Armored Tactical Wheeled Vehicles including:

- Logistics Vehicle System Replacement*
- Medium Tactical Vehicle Replacement Program (USMC) (MTVR)*

Broad Area Maritime Surveillance (BAMS)

CG(X) – Next Generation Cruiser

CH-53K Heavy Lift Replacement (HLR) Program

Close-In Weapon System (CIWS) including SeaRAM

Cobra Judy Replacement (CJR) – Ship-based Radar System

Command Ship Replacement (LCC(R))

Common Aviation Command and Control System (CAC2S)*

Common Link Integration Processor (CLIP)

Common Submarine Radio Room (CSRR) / Submarine Exterior Communications System (SubECS)*

Consolidated Afloat Network and Enterprise Service (CANES)

Cooperative Engagement Capability (CEC) (including Preplanned Product Improvement effort)*

CVN 21 – Next Generation Nuclear Aircraft Carrier*

DDG 51 *Arleigh Burke* Aegis Destroyer*

DDG 1000 *Zumwalt* Class Destroyer (formerly DD(X) Future Surface Combatant)*

Department of the Navy Large Aircraft Infrared Countermeasures (DoN LAIRCM)*

Deployable Joint Command and Control (DJC2)*

Digital Modular Radio (DMR)

Digital Radio Frequency Modulator – Jammer (DMRF-J)

Distributed Common Ground System – Marine Corps (DCGS-MC)

Distributed Common Ground System – Navy (DCGS-N)

E-2D Advanced Hawkeye (AHE)

EA-18G Airborne Electronic Attack (AEA) Variant of F/A-18*

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

Electronic Patrol – X (EP-X)

Evolved SeaSparrow Missile (ESSM)*

Expeditionary Fighting Vehicle (EFV)*

* These programs have individual reports for FY08 due to significant test activity.

NAVY PROGRAMS (continued)

Extended-Range Munition (ERM)

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

Global Combat Support System – Marine Corps (GCSS-MC)

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

Harpoon Weapon System Block III (A/RGM-84/M)

H-1 Upgrades (4BW/4BN) – USMC Upgrade to AH-1W Attack Helicopter and UH-1N Utility Helicopter*

Identification Friend or Foe (IFF) Mark XIIA Mode 5 (all development and integration programs)

Integrated Defensive Electronic Countermeasures (IDECM)*

Joint and Allied Threat Awareness System (JATAS)

Joint Expeditionary Fires (JEF)

Joint High-Speed Vessel (JHSV)

Joint Mission Planning System - Maritime (JMPS-M)*

Joint Precision Approach and Landing System (JPALS)

Joint Standoff Weapon (JSOW) Baseline Variant, Unitary Warhead Variant, and C-1*

KC-130J Aircraft

LHA 6 (formerly LHA(R)) – New Amphibious Assault Ship*

LHD 8 Amphibious Assault Ship

Littoral Combat Ship (LCS) (includes 57 mm ammunition and NLOS-LS)*

LPD-17 *San Antonio* Class Amphibious Transport Dock (Includes 30 mm ammunition)*

Marine Expeditionary Armored Forces (M1A1 Upgrade, Light Armored Vehicle Upgrade, Armored Vehicle Launched Bridge Upgrade, Amphibious Assault Vehicle Upgrade)

Maritime Prepositioning Force (Future) (MPF (F)) Large, Medium Speed, Roll-on/Roll-off Ships (LMSR)

Maritime Prepositioning Force (Future) (MPF (F)) Mobile Landing Platform (MLP)

MH-60R Multi-Mission Helicopter Upgrade*

MH-60S Fleet Combat Helicopter*

Mk 48 Advanced Capability (ADCAP) Torpedo Mods*

Mk 54 Lightweight Torpedo*

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

Navy Enterprise Resource Planning (ERP)*

Navy Unmanned Combat Air System (NAVY UCAS) (previously called J-UCAS)

Next Generation Jammer

P-8A Poseidon Program*

Rapid Airborne Mine Clearance System (RAMICS)

Rolling Airframe Missile (RAM) including RAM Block 1A Helicopter Aircraft Surface (HAS) and RAM Block 2 Programs

Ship Self-Defense System (SSDS)*

Ship-to-Shore Connector – Joint Assured Maritime Access (planned replacement for Landing Craft Air Cushion and Landing Craft Utility)

SSGN *Ohio* Class Conversion*

SSN 774 *Virginia* Class Submarine*

Standard Missile 2 (SM-2) Block IIIB

Standard Missile 6 (SM-6)

Surface Electronic Warfare Improvement Program (SEWIP)*

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

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

TB-33 Array Fiber Optic Thin Line System

TB-34 Next Generation Fat Line Replacement Towed Array

Tomahawk Missile and Weapon System*

Trident II Missile

V-22 Osprey Joint Advanced Vertical Lift Aircraft, including the CV-22 and the MV-22*

Vertical Take-Off and Land Tactical Unmanned Aircraft System (VTUAS) (also called Fire Scout) including Tactical Control System (TCS)

VH-71 Presidential Helicopter Fleet Replacement Program*

AIR FORCE PROGRAMS

20 mm PGU-28/B Replacement Combat Round*

3rd Generation Infrared Surveillance (3IRS)

Advanced Extremely High Frequency (AEHF) Satelitte Communications System*

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

Air and Space Operations Center – Weapons System (AOC-WS) initiatives including 10.0, 10.1, and 10.2

Airborne Signals Intelligence Payload (ASIP)

ALR-56M Radar Warning Receiver

ALR-69A Radar Warning Receiver*

B-2 Radar Modernization Program (B-2 RMP)*

B-2 SPIRIT Advanced Extremely High Frequency Satellite Communications Capability (B-2 EHF)

Battle Control System – Fixed (BCS-F)*

Battle Control System – Mobile (BCS-M)

C-5 Avionics Modernization Program (AMP)*

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

* These programs have individual reports for FY08 due to significant test activity.

AIR FORCE PROGRAMS (continued)

C-17A – Globemaster III Aircraft*

C-130 Avionics Modernization Program (C-130 AMP)*

C-130J Aircraft*

Combat Identification / Identification Friend or Foe (CID/IFF)

Combat Information Transport System (CITS)*

Combat Search and Rescue Replacement Vehicle (CSAR-X) (formerly Personnel Recovery Vehicle (PRV))

Combat Survivor Evader Locator (CSEL) and the PRC Family of Handheld Survivor Radios

Combatant Commanders Integrated Command and Control System (CCIC2S)*

Command and Control Air Operations Software (C2AOS) (follow-on to Theater Battle Management Core System)

Defense Enterprise Accounting and Management System (DEAMS)

Deliberate and Crisis Action Planning and Execution Segments (DCAPES)

Distributed Common Ground System – Air Force (DCGS-AF) Block 10

Distributed Common Ground System – Air Force (DCGS-AF) Increment II

E-3 Airborne Warning and Control System (E-3 AWACS) *

Enhanced Polar System (EPS)

Evolved Expendable Launch Vehicle (EELV)

Expeditionary Combat Support System (ECSS)

F-15 Mark XIIA Integration

F-15E Radar Modernization Program

F-22A – Advanced Tactical Fighter*

Family of Beyond Line-of-Sight Terminals (FAB-T)

Full Scale Aerial Target

Global Broadcast Service (GBS)*

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

Global Command and Control System – Air Force (GCCS-AF)

Global Command and Control System – Air Force (Infrastructure) (GCCS-AF(I))

Global Hawk High Altitude Endurance Unmanned Aerial System, RQ-4*

Global Positioning Satellite IIIA (GPS IIIA)

Global Positioning Satellite Next Generation Control System (GPS OCX)

HC/MC-130 Recapitalization Program

Identification Friend or Foe (IFF) Mark XIIA Mode 5 (all development and integration programs)

Integrated Strategic Planning and Analysis Network (ISPAN)*

Integrated Space Situational Awareness (ISSA) System

Joint Air-to-Surface Standoff Missile (JASSM) and JASSM Extended Range (ER) (including Electronic Safe and Fire Fuze (ESAF))*

Joint Direct Attack Munition (JDAM) (including Laser JDAM)*

Joint Primary Aircraft Training System (JPATS)

KC-45A

Land-Based Strategic Deterrent (LBSD)

Large Aircraft Infrared Countermeasures (LAIRCM)*

Miniature Air Launched Decoy (MALD), including MALD-Jammer (MALD-J)*

Minuteman III Guidance Replacement Program (GRP)

Minuteman III Propulsion Replacement Program (PRP)

Mission Planning System (MPS) including Joint Mission Planning System (JMPS)*

Mobile User Objective System (MUOS)

MQ 9 Reaper Hunter Killer Armed Unmanned Aircraft System (UAS)*

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

National Airspace System (NAS)

National Polar-Orbiting Operational Environment Satellite System (NPOESS)

NAVSTAR Global Positioning System (GPS)*

New Bomber (NB) (formerly called Next Generation Bomber (NGB))

Objective Gateway (OG)

Predator Unmanned Aircraft System (UAS)

Rapid Attack Identification, Detection, and Reporting System (RAIDRS)

Small Diameter Bomb Increment I (SDB I)*

Small Diameter Bomb Increment II (SDB II)

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

Space-Based Space Surveillance (SBSS) and follow-on Blocks

Space Command and Control (C2)

Space Fence (SF)

Space Radar (SR)

Theater Battle Management Core System - Force Level (TBMCS-FL)

Theater Deployable Communications

Transformational Satellite Communications System (TSAT)

Wideband Global Satellite Communications Program (WGS)*

* These programs have individual reports for FY08 due to significant test activity.

DoD Programs

DoD Programs

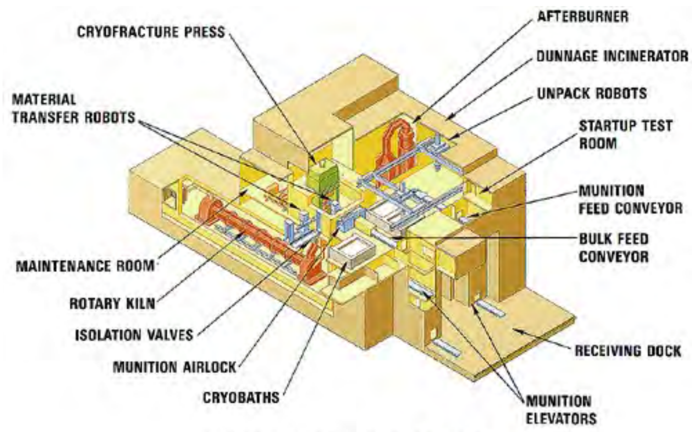
Chemical Demilitarization Program (CHEM DEMIL)

Executive Summary

- Army testing of stockpile and non-stockpile systems in the Chemical Demilitarization Program has been adequate to ensure the safe disposal of chemical warfare material.
- All operational testing (OT) was conducted in accordance with DOT&E-approved test plans.
- The Army conducted successful testing at Anniston, Alabama; Umatilla, Oregon; and Pine Bluff, Arkansas, stockpile facilities.
- The Army conducted successful testing of non-stockpile programs for two Explosive Destruction Systems as well as for the Large Item Transportable Access and Neutralization System, the Transportable Detonation Chamber, the Munitions Assessment and Processing System, and the Pine Bluff Ton Container Decontamination Facility.
- Disposal operations of the U.S. chemical stockpile failed to meet the original Chemical Weapons Treaty deadline of April 2007 and, based on the current program schedule, will fail to meet the extension to April 2012.

System

- The Chemical Demilitarization Program involves the destruction of lethal chemical agents, chemical munitions, and non-stockpile chemical warfare material.
- Four stockpile disposal facilities are employing the baseline chemical weapons disassembly and incineration process:
  - Anniston, Alabama
  - Pine Bluff, Arkansas
  - Tooele, Utah
  - Umatilla, Oregon
- With the completion of neutralization operations at Newport, Indiana, two stockpile disposal facilities plan to employ chemical neutralization of agents followed by post-treatment of the neutralized products:
  - Blue Grass, Kentucky
  - Pueblo, Colorado
- There are two non-stockpile fixed facilities:
  - Ton Container Decontamination Facility at Pine Bluff Arsenal
  - Munitions Assessment and Processing System Facility at Aberdeen Proving Ground, Maryland



NOTIONAL DESTRUCTION FACILITY

- There are four non-stockpile transportable systems:
  - Explosive Destruction System – 1
  - Explosive Destruction System – 2
  - Large Item Transportable Access and Neutralization System
  - Transportable Detonation Chamber

Mission

- The United States is using the Chemical Demilitarization Program to comply with the Chemical Weapons Convention. This is an arms control and nonproliferation treaty that requires the destruction of the U.S. stockpile of lethal chemical agents, chemical munitions, and non-stockpile chemical warfare material.
- The Non-stockpile Chemical Material Project is responsible for the destruction of non-stockpile chemical warfare material, including the components of binary chemical weapons, miscellaneous chemical warfare material, recovered chemical weapons, former production facilities, and buried chemical warfare material.

Prime Contractor

- Chemical Materials Agency

Activity

- Chemical Demilitarization programs are not traditional acquisition programs for DOT&E oversight. DOT&E oversight began in 1999 when Congress directed that DoD oversee these programs as major defense acquisition programs due to cost and schedule overruns.
- The test and evaluation program for each stockpile incineration disposal facility consists of several phases:
  - The developmental testing (DT) phase consists of subsystem component testing without agent.

- 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.

• OT supports a decision to proceed to full operational status for a specific agent/munition campaign. For example, one campaign would destroy 8-inch projectiles equipped with Sarin nerve agent, another would destroy M55 rockets with Sarin, and a third would destroy 1-ton containers of mustard blister agent. After completion of each campaign, the facility reverts to OT status for the next planned campaign. This process is repeated until destruction of all agent/munition configurations in the site's stockpile is complete. DOT&E monitors the test activity and independently analyzes test data for all stockpile facilities and non-stockpile systems.
• The Newport, Indiana, stockpile disposal facility completed VX neutralization and ton container processing and transitioned to closure activities.
• As of August 5, 2008, approximately 56 percent of the total U.S. chemical weapons stockpile (originally 31,498 agent tons) had been destroyed. FY08 test activity for stockpile facilities and non-stockpile systems is summarized in Table 1.

Assessment

• Army testing of stockpile and non-stockpile systems in the Chemical Demilitarization Program has been adequate to ensure the safe disposal of chemical warfare material. The U.S. Army Material Systems Analysis Activity is providing effective independent oversight of the testing of both stockpile and non-stockpile programs. Their expertise and vigilance has resulted in early identification and resolution of problems as they occur. Fully integrated operational demonstrations that confirm all phases of operations (including preparation, destruction/neutralization, and disposal) remain critical prerequisites before transition to operations with live agents.
• Disposal operations of the U.S. chemical stockpile failed to meet the original Chemical Weapons Treaty deadline of April 2007 and, based on the current program schedule, will fail to meet the extension to April 2012.

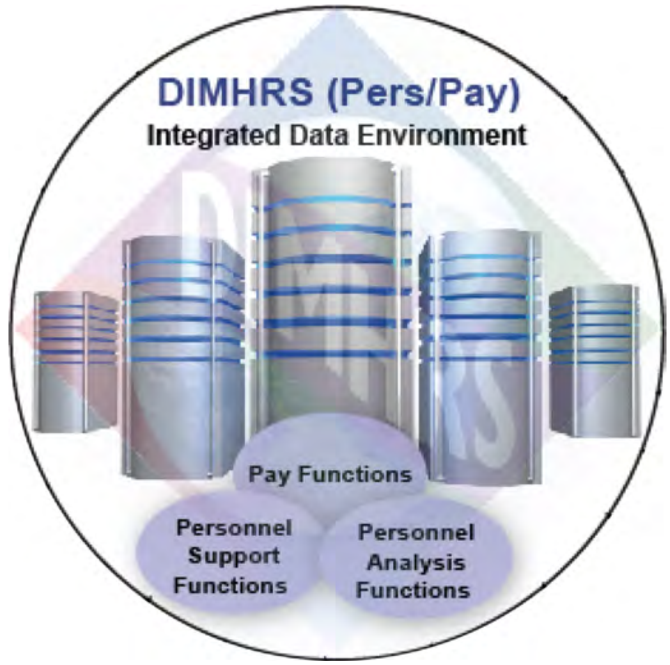
Recommendations

• Status of Previous Recommendations. There were no FY07 recommendations for the Chemical Demilitarization Program.
• FY08 Recommendations. None.

Table 1. Chemical Demilitarization Test and Evaluation Activity

Facility/System	Technology	FY08 Activity	Agent Tested	Planned FY09 Activity
Anniston	Incineration	OT	VX M23 Land Mines	OT
Umatilla	Incineration	OT	VX M55 Rockets VX 155 mm Projectiles VX 6-inch Projectiles	OT
Pine Bluff	Incineration	OT	VX M23 Land Mines	OT
Newport	Neutralization	Operations Closure Activities	VX Neutralization and Ton Container Processing	Closure Activities
Explosive Destruction System Version 1	Neutralization	DT/OT	Chloroacetophenone (a.k.a. CNS, CNB) 75 mm Projectiles Phosgene (a.k.a. CG) 4.2-inch Mortar and 75 mm Projectile (simultaneous)	OT
Explosive Destruction System Version 2	Neutralization	OT	Arsenicals German Traktor Rockets Mustard (a.k.a. HD) M70/M47 Bombs	OT
Large Item Transportable Access and Neutralization System	Neutralization	OT	Phosgene (a.k.a. CG) M-78 500-pound bomb M-79 1,000-pound bomb (simulated munitions)	OT
Transportable Detonation Chamber	Thermal Decomposition	DT/OT FOT&E	Phosgene (a.k.a. CG) 155 mm, 75 mm Projectiles and 4.2-inch Mortars (recovered) Chloropicrin (a.k.a. PS) one Mortar Round	DT/OT
Munitions Assessment and Processing System	Neutralization	OT	Phosgene (a.k.a. CG) 75 mm Projectiles (recovered)	Testing Suspended (recovered munitions unavailable)
Pine Bluff Ton Container Decontamination Facility	Magnetic Induction Heating	DT/OT	Trace Agents during Ton Container Processing	FOT&E

Defense Integrated Military Human Resources System (DIMHRS)



Executive Summary

- During FY08, a contractor-controlled Army System Integration Test (SIT) of the Department of Defense (DoD) Defense Integrated Military Human Resources System (DIMHRS) was conducted from September 2007 through August 2008.
- The program manager initiated the government-controlled DIMHRS Army System Acceptance Test (SAT) in late August 2008. However, significant problems with user roles and permissions, converted data, and interfaces slowed SAT progress.
- The program manager delayed the multi-Service Limited User Test, originally scheduled to start on September 29, 2008, to allow more time to correct system and data deficiencies.
- The program manager and Air Force are applying lessons learned from Army DIMHRS development to the design and development of Air Force specific functionality and interfaces.

System

- DIMHRS is an automated information system designed to integrate and modernize all military personnel and pay data collection and processing capabilities into a single, standard military personnel and pay system. The system will provide personnel support, analysis, and pay functions to approximately 3.1 million military personnel of all Services and Service Components and 3 million retirees and survivors.
- Release 1, Initial Operational Capability (IOC), will provide the core DIMHRS integrated personnel and pay functionality along with Army-specific data and interfaces. Release 2 will contain any enhancements to the fielded core software along with Air Force-specific data and interfaces. The Full Operational Capability (FOC) will be obtained when the Department of the Navy is fully integrated into DIMHRS.

Mission

- Military Service pay and personnel specialists will employ DIMHRS to support the full range of personnel life-cycle activities; such as, accessing members, documenting factors required to ensure proper pay and benefits, and tracking service in theater, to separating, retiring, or transferring individuals to other Services or components.
- Human Resources managers will leverage DIMHRS fully integrated Enterprise Resource Planning system to reduce the personnel service support footprint and provide near-real-time delivery of personnel and pay services.

Prime Contractor

- Northrop Grumman

Activity

- The developing contractor conducted the SIT of the DIMHRS core plus Army functionality from September 2007 through August 2008 at the DIMHRS facility, the Space and Naval Warfare (SPAWAR) Systems Center (SSC), New Orleans, Louisiana.
- The program manager initiated the SAT in late August 2008 and it is ongoing. The SAT is being conducted at the Army's Human Resource Command (HRC), Alexandria, Virginia, and DIMHRS facility, the Space and Naval Warfare (SPAWAR) Systems Center (SSC), New Orleans, Louisiana.
- The program manager and Air Force continue to design and develop Air Force functionality, applications, and interfaces.

Assessment

- Changing system requirements, ongoing interface development, and the correction of data conversion processing errors caused the SIT to extend from three months to nearly a year. The breadth and depth of system problems found during the SAT clearly indicate that the contractor-controlled SIT was inadequate. System fixes made and retested in SIT were later found to be inadequate in SAT. This was especially prevalent in the area of interfaces where the initial failure rate in SAT was over 90 percent. The majority of the problems experienced in SAT should have been detected and corrected during the SIT.
- Significant problems with user roles and permissions, system performance, converted data errors, and failed interfaces have severely limited the conduct of SAT. However, the transition from the contractor-controlled SIT to the government-controlled SAT has brought increased visibility to the problems and enabled the program manager to more effectively resolve them. DOT&E endorses the move to government-controlled testing, as it has lead to improvements in the detection, management, and resolution of DIMHRS problems.
- The program manager delayed the multi-Service Limited User Test, originally scheduled to start on September 29, 2008, to allow more time to correct identified problems and complete SAT.
- The program manager and Air Force are applying lessons learned from DIMHRS Army development to Air Force development.

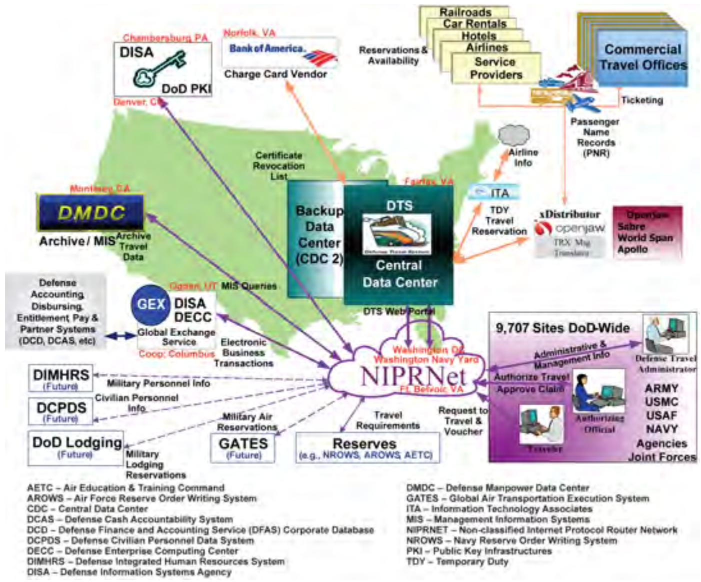
Recommendations

- Status of Previous Recommendations. This is the first annual report for this program.
- FY08 Recommendations.
  1. The DIMHRS program must correct identified Priority 1 and 2 deficiencies and data conversion problems prior to entering operational testing.
  2. The DIMHRS program manager should review the SIT process and take appropriate contractual action to ensure that the SIT for the upcoming DIMHRS release with Air Force functionality incorporates the lessons learned from the Army development effort.

Defense Travel System (DTS)

Executive Summary

- The Army Test and Evaluation Command (ATEC) conducted a combined developmental and operational test on a Technical Refresh release from January 15 through February 21, 2008, in a test environment with much smaller capacity than the production environment. The Technical Refresh release converted some of the Defense Travel System (DTS) proprietary software code to the Java programming language as well as incorporating minor functional enhancements and a number of deficiency fixes.
- ATEC completed its evaluation on March 21, 2008, and concluded that DTS should remain operationally effective, suitable, and survivable with the new release. DOT&E concurred with the recommendation to place the new release into the production environment, with follow-on operational assessments to be conducted at selected operational sites as soon as practicable.
- The program manager placed the Technical Refresh release into the production environment on April 19, 2008; however, the system exhibited serious performance problems when a large number of users attempted concurrent use. To limit disruption of service, the program manager rolled the production release back to the prior DTS release on April 23, 2008. Subsequent investigation identified the root cause as computing bottlenecks within Java, which did not appear until after deployment.
- The program manager hired an outside contractor, the Hewlett Packard Company, to perform load testing of the corrected deficiencies and to assist the program management office to establish better practices for future load testing. The program manager plans to deploy the corrected Technical Refresh release in May 2009.



System

- DTS is a Major Automated Information System designed to automate and streamline the DoD travel process, support DoD travel requirements, and reduce the associated cost for the DoD. With DTS, travelers perform many of the administrative tasks themselves.
- DTS integrates commercial travel reservation systems and DoD accounting and disbursing systems using secure networks and procedures.
- There are two major functional blocks. Block 1 focuses on Temporary Duty (TDY) travel. Block 2, which is under development, focuses on Military Permanent Duty Travel (PDT).
- The program manager is developing DTS in releases of increasing functionality. Each major TDY release was named after a U.S. president. The Monroe release (the final TDY presidential release) was deployed in 2006. DTS will continue to use a spiral development strategy during FY09 and FY10 to develop the PDT functionality and the remaining TDY functionality that was not included in the presidential releases.

Mission

DoD travelers use DTS as a single interface to process their end-to-end travel requirements via an Internet connection or a Non-classified Internet Protocol Router Network connection using a Common Access Card with Public Key Infrastructure certificates. Travelers use an automated mechanism to prepare travel authorizations and vouchers, to get the documentation approved, and to get reimbursed once their travel is completed.

Prime Contractor

- Northrop Grumman

Activity

ATEC conducted a combined developmental and operational test on a Technical Refresh release from January 15 through February 21, 2008, in a test environment with much smaller capacity than the production environment. The Technical

Refresh release converted some of the DTS proprietary software code to the Java programming language, as well as incorporating a few functional enhancements and a number of deficiency fixes.

Assessment

- For a Major Automated Information System, operational testers typically conduct an OT&E at selected operational sites with a production system prior to a full-deployment decision. Since DTS is a web-based system, the traditional OT&E methodology is not practical. Any new DTS release placed on the enterprise web server for operational testing is in fact already fully deployed.
- To mitigate risk, ATEC typically conducts an operational test in a test environment with production-representative hardware and software. If the test results are satisfactory, the new release is placed on the production server for all users. ATEC then conducts a follow-on operational assessment at selected operational sites to confirm the performance of the new release and to identify opportunities for improvement.
- ATEC completed its evaluation of the Technical Refresh release and concluded on March 21, 2008, that DTS should continue to be operationally effective, suitable, and survivable with the new release. DOT&E concurred with the ATEC findings and the recommendation to place the release into the production environment, with follow-on operational assessments to be conducted at selected operational sites as soon as practicable.
- The program manager placed the Technical Refresh release into the production environment on April 19, 2008, but the system exhibited serious performance problems when a large number of users attempted to use the system simultaneously. To limit disruption of service, the program manager rolled the production release back to the prior DTS release on April 23, 2008. Subsequent investigation identified the root cause as computing bottlenecks within Java that did not appear in the test environment due to its capacity limitations and deficient load testing conducted by the contractor.
- Government and vendor engineering investigation teams performed independent reviews of the production problems and determined the root cause. The program manager hired an outside contractor, the Hewlett Packard Company, to perform load testing of the corrected deficiencies and to assist the Program Management Office in establishing better practices for future load testing. The program manager plans to deploy the corrected Technical Refresh release in May 2009.

Recommendations

- Status of Previous Recommendations. The Program Management Office has taken effective action on the FY07 recommendation.
- FY08 Recommendations.
  1. ATEC should validate the corrections to the Technical Refresh release deficiencies when available.
  2. ATEC should continue to conduct risk assessments on upcoming releases to determine the appropriate level of OT&E, recognizing the demonstrated limitations of the existing test environments.
  3. Once the Technical Refresh release (or any other substantial upgrade) has been deployed, ATEC should conduct follow-on operational assessments at selected operational sites to determine DTS operational effectiveness, suitability, and survivability.

F-35 Lightning II Joint Strike Fighter (JSF)

Executive Summary

- The F-35 test effort increased in June with the addition of Short Takeoff and Vertical Landing (STOVL) test aircraft BF-1, the first of 12 weight-optimized flight test aircraft. While important discoveries improved the design and accomplishments in flight sciences testing occurred, the pace of flight test was slower than planned. The volume of lab and surrogate testing increased. This retired risks in air vehicle development and mission systems. Many of these efforts exceed those of legacy systems at this point in their respective development. Accreditation of all test assets is not complete.
- F135 engine deficiencies place STOVL operations at high risk until further testing demonstrates better performance from a new turbine blade design, intended to address deficiencies found in ground testing. Actual STOVL operations in the aircraft, which the test team plans for mid-FY09, will provide feedback for correction of deficiencies.
- The program incorporated a 12-month extension to System Design Demonstration (SDD) in order to complete Block 3. An updated Acquisition Strategy reflects appropriate operational test schedules and procurement profiles. However, further extension of SDD may be necessary to complete Block 3 due to the growing likelihood that insufficient flight sciences and missions system flight testing are planned. The prime contractor's plans for reducing manpower on the SDD contract do not support a realistic test tempo and should be re-examined.
- The JPO is executing a comprehensive, robust, and fully funded Live Fire test plan. However, the program's recent removal of shutoff fuses for engine fueldraulics lines, coupled with the prior removal of dry bay fire extinguishers, has increased the likelihood of aircraft combat losses from ballistic threat induced fires. At present, only the Integrated Power Plant (IPP) bay has a fire suppression system. Though the JSF Executive Steering Board (JESB) has approved the JPO's request to remove the shutoff fuses and defer consideration of installation of the PAO shutoff valves as an acceptable system trade to balance weight, cost, and risk, DOT&E concerns remain regarding the vulnerability to threat induced fires.
- High production rates concurrent with a relatively slow increase in flight test production over the next three years commit the DoD and Services to high risk test, training, and deployment plans. Program management needs to emphasize maintaining robust engineering/test forces, early completion of detailed test plans, linking fully resourced test venues, accreditation of test assets for assigned tasks, and sharing demonstrated performance in a transparent, shared-data environment. Production and deliveries of OT&E assets for all Services must stabilize.

System

- The F-35 Lightning II program is a joint, multi-national, single-seat, single-engine family of strike aircraft consisting of three variants:
  - F-35A Conventional takeoff and landing (CTOL)
  - F-35B STOVL
  - F-35C Aircraft carrier takeoff and landing (CV)
- It is designed to survive in an advanced threat (year 2012 and beyond) environment using a blend of advanced technologies with improved lethality compared to legacy multi-role aircraft.
- Using an Active Electronically Scanned Array (AESA) radar and other sensors, the F-35 is intended to employ precision-guided bombs such as the Joint Direct Attack Munition and Joint Standoff Weapon, AIM-120C radar air-to-air missiles, and AIM-9 infrared air-to-air missiles.
- The program incrementally provides mission capability: Block 1 (initial), Block 2 (advanced), Block 3 (full).
- The F-35 is under development by a partnership of countries: the United States, Great Britain, Italy, the Netherlands, Turkey, Canada, Australia, Denmark, and Norway.

Mission

- A force equipped with F-35 units should permit the combatant commander to attack targets day or night, in all weather, in highly-defended areas of joint operations.
- Targets include fixed and mobile land targets, enemy surface units at sea, and air threats, including advanced cruise missiles.

Prime Contractor

- Lockheed Martin

Activity

- F-35 Flight Test

  BF-1
  - SDD flight test operations added SDD STOVL test aircraft BF-1 in June. First flight occurred four weeks later than planned.
  - By the end of September 2008, testers accumulated 14 test flights, of approximately 5,000 planned for SDD, and demonstrated the ability to fly twice in one day on one occasion.
  - Flight tests led to discoveries in wheel brakes and electrical battery fault isolation that resulted in modifications. BF-1 completed important handling qualities test points in STOVL configurations at medium altitude.

  AA-1
  - Aircraft AA-1 (the non-weight-optimized CTOL SDD test article) continued to mitigate risks for production aircraft, accumulating 54 flights by the end of September 2008. AA-1 experienced a three month down time due to engine bay nacelle vent fan malfunctions that were resolved.
  - AA-1 testing contributed to discoveries in landing gear door fitting, aerial refueling operations, and weapons bay functions, with design and/or production changes in development. Flight tests also demonstrated a portion of heavy gross weight handling characteristics.
  - AA-1 deployed to Edwards AFB, California, on October 1, 2008, to test engine restart in-flight and acoustic test points. AA-1 will return to Fort Worth, Texas, to enter storage for future live fire testing.
- Additional Testing
  - In February 2008, the F135 engine ground testing discovered deficiencies in blade design and manufacturing in the third Low Power Turbine section of the engine. Under STOVL mode conditions at high power setting, a blade fractured and damaged the engine. This failure is the second of its kind in the F135. The contractor is implementing design changes to improve blade performance. The test team plans full STOVL operations after further testing of modified engines in February 2009 at medium altitudes. The test team plans the first short takeoff and vertical landings in mid-2009.
  - The Cooperative Avionics Test Bird (CATB) flew its first four test missions with communications-navigation-identification software and hardware. The test team is preparing the CATB for test operations in November 2008 with mission systems software Block 0.5, the first mission systems software version that provides integrated sensor and processor operations, and the AESA radar. The verification team expects the CATB to maintain a minimum pace of 10 missions per month.
  - The test team conducted testing of electronic protection and attack sensors (radar, electro-optical targeting system, distributed aperture system, and countermeasures systems) in labs and on surrogate aircraft. These labs are not yet accredited for verification tasks.
  - The contractor successfully completed initial mission systems software stability testing in ground labs for Block 0.1, and portions of Block 0.5. Analysis of results is on-going.
  - The contractor investigated weapons bay fit checks and recorded the results for weapons integration engineering analysis. The test team plans initial tests of weapons bay door operations for FY09.
  - The Joint Strike Fighter (JSF) Operational Test Team (JOTT), comprised of the Operational Test Agencies, concluded the third operational assessment, OT-2C, of the F-35 weapons system. The Program Executive Officer assigned responsibility for resolving deficiencies identified in the assessment.
  - The contractor conducted initial structural loads testing on the STOVL test aircraft with loads up to 150 percent of the design load limit. Analysis of the results will support comparison of predictions with actual performance and continued flight sciences testing.
  - Service, Joint Program Office (JPO), contractor, and test teams conducted site surveys of LH and CVN class ships to assess ship suitability factors for the STOVL and CV variants.
- Activity Affecting Test Strategy And Resourcing
  - In April 2008, the Operational Test Review Team, comprised of the JOTT, Service representatives, DOT&E, and the JPO, recommended a minimum extension of 12 months to SDD in order to accumulate the necessary aircraft, train operators, and complete the development and testing needed for IOT&E of Block 3 capability. The Program Executive Officer updated the F-35 Acquisition Strategy accordingly, with the Milestone C/full-rate production decision now planned in FY15.
  - The Marine Corps and the Air Force are conducting reviews of Initial Operational Capability assumptions and criteria since their intended dates, 2012 and 2013, respectively, now occur prior to the completion of SDD and IOT&E of the required Block 3 capability.
  - The JOTT and JPO continued to refine plans for partner involvement in F-35 OT&E resulting in an amendment to the United States - United Kingdom IOT&E Memorandum of Understanding (MOU) that provided for the inclusion of the Netherlands and Italy as participants The Netherlands signed the MOU and associated Statement of Principles; Italy declined.
  - The prime contractor continued work on the Data Analysis Plans that may lead to a completion of the verification test plans. Formal test plan working groups have yet to convene and determine test content necessary to complete SDD. Linking accreditation support packages for verification labs and models to the expected verification activity is also a goal. The contractor is developing a new Air System Capabilities Matrix, which may show the relationship between requirements, test, and production during SDD.

- Lockheed Martin and Pratt & Whitney completed Estimate at Completion (EAC) activities for their respective SDD contracts. As product teams determined necessary increases to budgets, program management sought sources for offsetting funds. The JPO channeled resource needs to the DoD budget process for resolution.
- Lockheed Martin continued product development of the Verification Simulation (VSIM) – a man-in-the-loop model for verification of mission effectiveness in a virtual operational environment. The JOTT provided a document describing the shortfalls of the VSIM for adequate OT&E.
- The JOTT provided an updated operational test input to the Test and Evaluation Master Plan, Third Revision. The JPO plans to produce the final revision in 2QFY09.

• Live Fire Test and Evaluation
  - DOT&E has recommended that the JPO reconsider their decision to remove shutoff fuses for engine fueldraulics.
  - Live Fire ballistic tests conducted on electrical lines and data lines evaluated the potential for threat impact on wires to initiate fires.
  - Live Fire ballistic tests conducted on electro-hydraulic actuators evaluated the capability of the aircraft to maintain flight control with threat damaged control surfaces.
  - Flight simulations held in the F-35 Vehicle Integration Facility determined pilots' capability to fly and/or escape from an aircraft with threat damaged flight control systems.

Assessment

• The 12-month extension of SDD is a minimum schedule addition for the completion of Block 3 development. As the ability to avoid future extensions depends on the pace and success of verification test and evaluation, it is essential that: 1) SDD flight test aircraft are delivered on time and quickly integrated into a high pace of testing; 2) all ground and flight test venues become adequately staffed, accredited, and resourced beginning in FY09; and 3) production of OT&E and early training assets are stabilized for all three variants. Early, sufficient, and robust resourcing is critical for a successful SDD that leads to success in IOT&E.
  - Flight sciences flight testing warrants close monitoring to determine if the assumptions of the FY07 test reductions can be validated; such as commonality of handling characteristics among the variants, structures testing predictions, and the skipping of build-up points. If not, additional schedule for flight sciences may be required and a ripple effect in SDD will occur.
  - Current resource plans reduce engineering staff and test personnel too rapidly in the FY09 through FY13 timeframe. Additional resource concerns are: reduced number of missions systems test aircraft, availability of spare engines for flight test, CATB spares for the sensors and basic aircraft, development of a VSIM that is also adequate for OT&E, autonomic logistics verification, and data network resources for sharing data and integrating plans and activity of multiple test centers/agencies.
  - The deployed flight test operations at Edwards AFB, California, provided insight into the challenges ahead for the program to integrate multiple flight test operations that will sustain a combined tempo of 140 test flights per month. The analytical, scheduling, and decision-making power of the combined SDD force to discern an appropriate response to flight test data is crucial.

• The test team was not able to maintain the planned test tempo for BF-1 since first flight in June. The test team was able to execute 14 of 20 flights intended in the first 10 weeks. The pace has been affected by delays caused by the engine discoveries, weather, and additional discoveries resulting in minor design changes and electrical fault isolation corrections. However, the test team was able to accomplish the desired flight science test objectives before it was necessary to put BF-1 into modifications for STOVL operations.

• The impact of the contractor's adjustments during the latest EAC budget assessment on verification test and evaluation and planned OT&E is unknown. Program management intended to improve the contractor's management reserve through last year's "mid-course risk reduction," potentially offsetting budget pressures expected to result from this year's EAC. A limited amount of information regarding EAC impacts on testing is available: marginal improvement for flight test manpower at the government test facilities for FY09; reduced signature verification; reduced autonomic logistics verification; and reduced resources for the VSIM.

• Progress in completing high fidelity verification test plans and accreditation of test assets has been slow. Planning teams are behind schedule for completing Data Analysis Plans by nine months.
  - The test team completed the Block 0.5 joint flight test plan without a formal test plan working group.
  - Progress of accreditation support packages, needed to ensure adequate capability of labs and models to perform verification tasks, is behind the schedule revealed in August 2007.
  - The extent of government oversight and specific roles in the process is not clear. In particular, the relationship between requirements documents, the system specification, and new capabilities reference matrices are not yet well defined.

• The JOTT OT-2C operational assessment determined that, while the F-35 program has progressed in air vehicle, sensors, and support systems development, the following items, if not adequately addressed, are likely to pose substantial or severe operational impact to F-35 mission capability or ability to conduct operational test:
  - Autonomic Logistics Information System architecture limits deployment of partial unit detachments and the recovery of diverted aircraft.
  - F-35 thermal management challenges hamper the ability to conduct missions in hot and cold environments.
  - Acoustic, thermal, and blast impacts on airfields and flight decks caused by the propulsion system pose risks to personnel and facilities.

  - Information assurance deficiencies may place operating limits on the F-35.
  - Lack of cruise energy management functions increased pilot workloads in critical phases of flight.
- The Power Thermal Management System requires a new design to handle the currently known thermal loads on the F-35. A "cooler" main engine fuel pump design is under development but will not be available before low-rate initial production Lot 3, which is likely to impact integrated testing in Block 2 OT&E and, potentially, IOT&E. The test team aborted an AA-1 test sortie due to high fuel temperatures in June. Thermal management is a significant challenge for F-35 development, test, and fielded operations.
- Removal of engine fueldraulics shutoff fuses increases the likelihood of aircraft loss from in-flight ballistic threat induced fires.
- Ballistic tests showed that threat penetration of high voltage electrical wires could cause electrical short circuits, increasing the likelihood of fire in the presence of leaking fuel.
- Flight control system simulations showed that electro-hydraulic actuators were capable of operating threat damaged control surfaces under load.
- Flight simulations indicated that the F-35 might be able to operate with a variety of inoperable flight control components. Final full-up system-level testing planned for FY10 will determine how the aircraft flight control systems react to actual ballistic threat impacts.

Recommendations

- Status of Previous Recommendations. The JPO and Services have made satisfactory progress on six of 12 recommendations from FY06 and FY07. The remaining previous recommendations that primarily addressed test resources and integration are valid and merit immediate attention.
- FY08 Recommendations. The program should:

1. Add resources and plan to increase the pace of flight sciences testing in FY09, FY10, and FY11. This includes manpower to increase the flight test sortie rate, analyze data, and direct the integration of all flight sciences test venues.
2. Provide an explanation to DOT&E and the JOTT of all changes to any flight and ground test assets or plans (e.g. manpower, spares, test articles, modeling environments, integration plans) associated with the prime contractors' EAC actions.
3. Initiate the Test Plan Working Groups using the Data Analysis Plans product; integrate the JOTT and DOT&E in these venues. Report and track the status of accreditation support packages for all test assets.
4. Stabilize the production and deliveries of systems needed for OT&E and initial training for all three variants. Ensure the JOTT is involved in configuration decisions for these lots. Actions to reduce concurrency risk should not target test assets. Ensure production decisions rely on performance demonstrated in test.
5. Complete the Third Revision of the Test and Evaluation Master Plan and ensure the developmental test section includes the System Verification Plans and the product of the associated Data Analysis Plans.
6. Improve the VSIM so that it meets all requirements for adequate verification and operational testing, as described by the JOTT.
7. Restore the capability to minimize engine fueldraulics fluid spillage from threat-induced damage. Consider the addition of polyalphaolephin (PAO) shutoff valves for all variants.

Global Combat Support System Combatant Command / Joint Task Force (GCSS CC/JTF)

Executive Summary

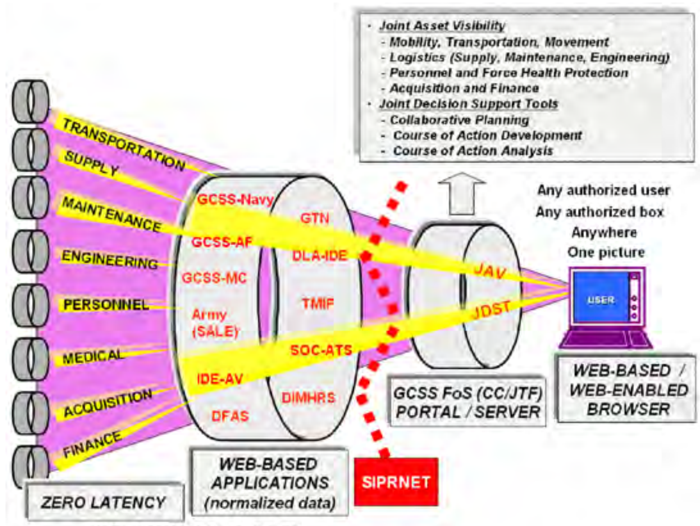
- The Joint Interoperability Test Command (JITC) conducted an operational test of Global Combat Support System Combatant Command / Joint Task Force (GCSS CC/JTF) version 6.1 in May 2008.
- The GCSS CC/JTF version 6.1 did not meet the user requirements for accurate and timely response to database queries. Analysis indicated that the majority of the timeliness issues may be attributed to the response times of legacy databases external to the system.
- The Defense Information Systems Agency (DISA) Acquisition Review Board (ARB) approved deployment of version 6.1 in parallel with the existing version 6.0 for the purpose of collecting additional data to benchmark performance metrics.

System

- GCSS CC/JTF is a web portal that enables users at combatant commands and joint task forces to access joint logistics applications.
- The system supports planning, execution, and control for engineering, health services, logistics services, supply, and distribution. It is comprised of strategic servers located in Montgomery, Alabama, and Pearl Harbor, Hawaii; a commercial off-the-shelf (COTS)-based infrastructure; and Public Key Infrastructure (PKI).
- GCSS CC/JTF provides the following applications: reports capability; watchboard (allowing rapid comparison of planned actions with actual events); electronic battlebook (organizing files and web pages into categories); knowledge management; business intelligence; mapping capability; joint engineer planning; and execution capability.

Mission

- Joint commanders use GCSS CC/JTF to move and sustain joint forces throughout the entire spectrum of military operations.
- Combatant Command and Joint Task Force commanders and logistics staffs use the GCSS CC/JTF to gain end-to-end visibility of Combat Support (CS) capability up through the strategic level, facilitating information flow across and between CS and command and control functions.



CC - Combatant Command
DFAS - Defense Finance and Accounting Service
DIMHRS - Defense Integrated Military Human Resources Syste,
DLA-IDE - Defense Logistics Agency - Integrated Data Environment
FoS - Family of Systems
GCSS-AF - Global Combat Support System-Air Force
GCSS-MC - Global Combat Support System-Marine Corps
GCSS-Navy - Global Combat Support System-Navy
GTN - Global Transportation Network
IDE-AV - Integrated Data Environment - Asset Visibility
JAV - Joint Asset Visibility
JDST - Joint Decision Support Tool
JTF - Joint Task Force
SALE - Single Army Logistics Enterprise
SIPRNET - Secret Internet Protocol Routed Network
SOC-ATS - Special Operationis Command - Asset Tracking System
TMIP - Theater Medical Information Program

Prime Contractor

- Northrop Grumman

Activity

- JITC conducted operational testing of GCSS CC/JTF version 6.1 in May 2008 in accordance with the DOT&E-approved test plan. The system could not satisfy the key performance parameters (KPP) requirements for accuracy and timeliness. After implementing corrective actions, the test activity resumed. However, the system still did not meet the timeliness requirements for database queries.
- The DISA component acquisition executive (CAE) convened the ARB on June 30, 2008. The ARB directed the following:
  - Maintenance of version 6.0 while authorizing deployment of version 6.1 on a separate Uniform Resource Locator (URL)

- The program manager to prominently display warnings to version 6.1 users, highlighting the identified shortfalls
- JITC to continue collecting performance metrics
- The Joint Staff J4 and the program manager to conduct a robust post implementation review with the user community to benchmark the system performance and the user expectations

Assessment

- As tested by JITC, version 6.1 was neither operationally effective nor operationally suitable.
  - The system could not meet the accuracy and timeliness KPP for database queries. The accuracy problem was corrected and demonstrated in a developmental test environment, but has not been operationally validated.
  - The test did not provide sufficient quantitative data for root cause analysis, but the metrics collected during the limited deployment show the timeliness shortfalls are due to data processing times within various external legacy data sources. Fixing these legacy data sources is outside of the program manager's authority.
  - During the operational test, users encountered problems with the helpdesk. Specifically, helpdesk personnel did not have ready access to a secure phone to discuss classified issues, and they were not able to understand the technical details relating to the GCSS system. DISA has provided secure communications for the helpdesk and is working to improve the training for helpdesk personnel.
- The data collected during the post implementation review should help Joint Staff J4 to benchmark the system performance and user expectations, including the impact of external legacy databases on the timeliness KPP.

Recommendations

- Status of Previous Recommendations. DISA has taken appropriate action on the previous recommendations.
- FY08 Recommendations.
  1. JITC should verify correction of the problems identified with version 6.1 in an operational environment prior to discontinuing access to and support of version 6.0.
  2. The GCSS CC/JTF program manager should continue monitoring version 6.1 performance to provide a benchmark for managing future expectations.

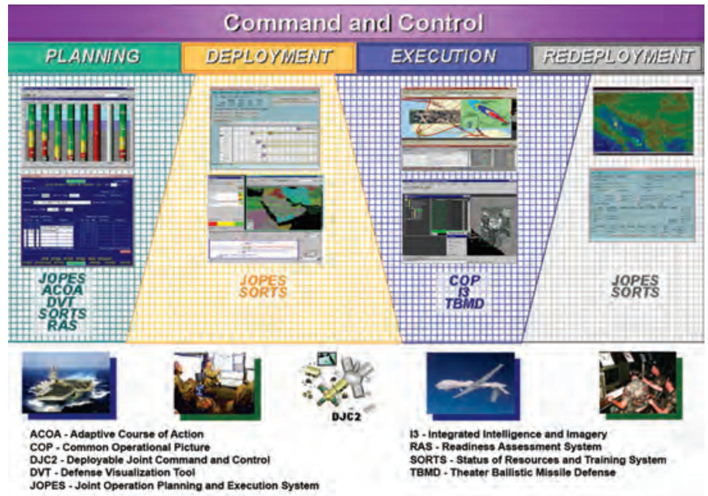
Global Command and Control System – Joint (GCCS-J)

Executive Summary

- The Joint Interoperability Test Command (JITC) tested the Global Command and Control System - Joint (GCCS-J) Global Release v4.1.1, in accordance with the DOT&E-approved test plan, at three Combatant Command Headquarters in June 2008. Testing identified deficiencies in the areas of the Integrated Imagery and Intelligence capability, installation, configuration, and documentation.
- JITC conducted a GCCS-J Global Release v4.1.1 regression test at U.S. Central Command (CENTCOM) in August 2008 to validate that corrective actions were adequate. DOT&E determined that the GCCS-J Global Release v4.1.1 was operationally effective, suitable, and survivable.
- JITC initiated a combined developmental/operational test of the GCCS-J Joint Operation Planning and Execution System (JOPES) v4.1.1 at six Combatant Command Headquarters in June 2008, but it was not completed. Problems with the integration of the Turbo Planner and the JOPES Data Network (JDNET) caused the program manager to forgo further development of JOPES v4.1.1 and to focus resources on JOPES v4.2.
- JITC planned a GCCS-J Status of Resources and Training System (SORTS) v4.1.1 operational test in June 2008; however, problems with the integration of web services for the Army and Navy caused the test to be cancelled. The program manager will forgo development and fielding of GCCS-J SORTS v4.1.1 and focus resources on GCCS-J SORTS v4.2.

System

- GCCS-J is a command, control, communications, computers, and intelligence system consisting of hardware, software (commercial off-the-shelf and government off-the-shelf), procedures, standards, and interfaces that provides an integrated near real-time picture of the battlespace necessary to conduct joint and multi-national operations.
- GCCS-J consists of three main components:
  - GCCS-J v4.1.1 Global Release (Force Protection, Situational Awareness, Intelligence applications)
  - JOPES v4.1.1 (Force Employment, Projection, Planning and Deployment/ Redeployment applications)
  - SORTS v4.1.1 (Force Readiness and Sustainment applications)



- GCCS-J consists of a client/server architecture using open systems standards, government-developed military planning software, and an increasing use of World Wide Web technology.

Mission

- Joint Commanders utilize the GCCS-J to accomplish command and control.
- Commanders use GCCS-J:
  - As an integrated, scalable command and control, communications, computers, and intelligence system
  - To link the National Command Authority to the Joint Task Force, component commanders, and Service-unique systems at lower levels of command
  - To process, correlate, and display geographic track information on friendly, hostile, and neutral land, sea, and air forces, integrated with available intelligence and environmental information to provide the warfighter a fused battlespace picture

Prime Contractor

- Government Integrator (DISA)

Activity

- JITC conducted operational testing of the GCCS-J Global Release v4.1.1 in June 2008 at CENTCOM, U.S. Pacific Command, U.S. Special Operations Command, and the Joint Staff Support Center in the Pentagon. Testing focused primarily on the situational awareness and intelligence mission areas.
- JITC conducted the GCCS-J Global Release v4.1.1 regression test at CENTCOM Headquarters in August 2008.

- JITC conducted the combined developmental/operational testing of the GCCS-J JOPES v4.1.1 in June 2008, at multiple sites, including U.S. Transportation Command, U.S. Joint Forces Command, U.S. Southern Command, U.S. Northern Command, U.S. Pacific Command, U.S. Special Operations Command, and at the Joint Staff Support Center, Pentagon.

Assessment

- During FY08, JITC tested GCCS-J Global Release v4.1.1. Testing identified deficiencies in the areas of the Integrated Imagery and Intelligence capability, installation, configuration, and documentation. DOT&E assessed the testing to be adequate.
- A GCCS-J Global Release v4.1.1 regression test was conducted by JITC at CENTCOM Headquarters to validate corrective actions were adequate. DOT&E determined that the GCCS-J Global Release v4.1.1 was operationally effective, suitable, and survivable.
- The combined developmental/operational test of the GCCS-J JOPES v4.1.1 never completed due to problems with the integration of the Turbo Planner and the JOPES JDNET. The program manager terminated development of JOPES v4.1.1 and shifted efforts to the development of JOPES v4.2 in late July 2008 in order to conserve resources and reduce user downtime.
- JITC planned a GCCS-J Status of Resources and Training System (SORTS) v4.1.1 operational test in June 2008; however, problems with the integration of web services for the Army and Navy caused the test to be cancelled. The program manager is continuing to work the integration issues in conjunction with other Block 5 requirements to support a delivery of GCCS-J SORTS v4.2.
- All three GCCS-J v4.1.1 builds (Global, JOPES, and SORTS) have had significant integration problems, which the program manager is working to mitigate. However, the GCCS-J program manager does not appear to have adequate test scripts or representative operational traffic to realistically stimulate the system in an operational environment.

Recommendations

- Status of Previous Recommendations. The GCCS-J Program Management Office is making progress on DOT&E's three FY07 recommendations.
- FY08 Recommendation.
  1. The Defense Information Systems Agency should assess the GCCS-J developmental test program and develop options for improving the effectiveness of developmental testing across their Command and Control portfolio.

Joint Biological Point Detection System (JBPDS)

Executive Summary

- The Air Force Operational Test and Evaluation Center led the four Service Operational Test Agencies (OTAs) in Multi-Service Operational Test and Evaluation (MOT&E) Phase VI in September to November 2007 at Dugway Proving Ground, Utah, and at Eglin AFB, Florida.
- The Joint Project Manager and the Service OTAs developed Whole System Live Agent Testing (WSLAT) methodology and conducted initial testing in FY06-08 to characterize the detection and identification performance Joint Biological Point Detection System (JBPDS) against biological warfare agents and their new simulants. DOT&E is analyzing data from these test activities to support a full-rate production decision.

System

- The JBPDS provides detect-to-treat biological agent point detection, identification, and sampling capability for fixed-site, mobile (shelter, man portable, and trailer), and shipboard applications in one of four variants:
  - Man-portable and trailer variants for the Air Force
  - Shipboard variant for the Navy
  - Shelter variant for the Army mounted in a High Mobility Multi-purpose Wheeled Vehicle or integrated into the Stryker Nuclear, Biological, and Chemical Reconnaissance Vehicle
- The JBPDS consists of a biological suite that has a Biological Aerosol Warning Sensor (or trigger), collector, fluid transfer system, and identifier. The identifier inoculates assays that contain antibodies of specific biological warfare agent antigens.
- The Services require the trigger to detect presence of a biological mass within 1 minute of initial contact and to identify the biological warfare agent in less than 15 minutes.

1 - Man-portable 2 - Shelter 3 - Trailer 4 - Shipboard

- JBPDS provides the capability to collect and preserve samples for confirmatory analyses to support follow-on courses of action for the commander including treatment, quarantine, countermeasures, and litigation.

Mission

Units equipped with the JBPDS support U.S. forces by providing early warning and identification of up to 10 aerosolized biological warfare agents.

Prime Contractor

- General Dynamics

Activity

- The Joint Project Manager and the Service OTAs developed WSLAT methodology and conducted initial testing in FY06-08 to characterize the detection and identification performance of JBPDS against biological warfare agents and their new simulants. These new simulants are inactivated vaccine strains and toxoids of those biological warfare agents. Testers and test units may safely use the simulants in open air operational testing, as recommended by a Committee Report in 2004 from the National Academy Sciences/National Research Council.
- The WSLAT methodology development established the relationships of four (of 10 required) inactivated vaccine strains and toxoids to their biological warfare agent counterparts. Progress met entrance criteria to begin MOT&E Phase VI as scheduled.
- The Air Force Operational Test and Evaluation Center lead the four Service OTAs in MOT&E Phase VI in September to November 2007 at Dugway Proving Ground, Utah, and in an Air Force/Navy phase at Eglin AFB, Florida. During the Dugway Proving Ground phase, the multi-Service test team conducted open air operational testing with the new simulants and a simulant for spore-forming biological warfare agents.

- The Joint Requirements Oversight Council approved the Capability Production Document for the JBPDS Increment 1 on October 15, 2008.
- The Joint Program Executive Office for Chemical Biological Defense plans to make a full-rate production decision and an ensuing competitive procurement to be awarded in spring 2009. The Army OTA will continue WSLAT for six additional biological warfare agents that JBPDS is required to detect and identify after the full-rate production decision.

Assessment

- Analysis and evaluation of the MOT&E and WSLAT results are ongoing.
- WSLAT is important because it demonstrates end-to-end performance against live biological warfare agents, provides concentration levels of lower limits of detection and identification, and establishes relationships between biological warfare agents and their simulants.

Recommendations

- Status of Previous Recommendations. The Joint Program Manager and Service OTAs implemented prior DOT&E recommendations.
- FY08 Recommendations.
  1. The Joint Program Manager and Army Test and Evaluation Command must continue to characterize the detection and identification performance of JBPDS against the remaining 10 biological warfare agents and their simulants in WSLAT and field tests.
  2. Regardless which vendor successfully competes for the full-rate production, the Operational Test Agencies must confirm operational effectiveness and suitability with an operational test.

Joint Biological Stand-Off Detection System (JBSDS)

Executive Summary

- The Army Test and Evaluation Command (ATEC), with support from the Air Force Operational Test and Evaluation Center (AFOTEC), completed the multi-Service operational test.
- The Program Office has not demonstrated their proposed test and evaluation methodology that allows evaluation of the system's performance against biological warfare agents when releasing simulants in open field tests.

System

- The Joint Biological Stand-off Detection System (JBSDS) is a light detection and ranging (LIDAR)-based system that is designed to detect aerosol clouds out to 5 km in a 180-degree arc, and discriminate clouds with biological content from clouds without biological material at distances of 1 to 3 km or more. The system operates at night only, because sunlight would interfere with the ultraviolet laser signal used for discrimination and its sensors would be damaged if operated during daylight hours.
- The Air Force will employ JBSDS in semi-fixed locations. The Army will employ the system on a High-Mobility Multi-purpose Wheeled Vehicle and operate when stationary.
- Increment 1 is a limited production of 25 units to provide an interim stand-off biological detection warning.

Mission

- Commanders use biological detection information from JBSDS to support their contamination avoidance decision-making process.

- The system provides a commander with advance warning of the presence of potential biological weapon aerosol cloud hazards so the commander can implement individual and collective protective measures for assigned forces.

Prime Contractor

- SESI

Activity

- The Program Office completed JBSDS Production Verification Tests (PVT) in 2005, 2006, 2007, and September of 2008.
- ATEC, with support from AFOTEC, conducted a multi-Service operational test and evaluation in 2006. The results of this test highlighted a number of hardware and software problems. After the Program Office addressed these problems, AFOTEC conducted a second operational test in October 2007 in accordance with the DOT&E-approved test plan.
- The Program Office conducted PVT-3b in September 2008 to continue to develop their proposed test and evaluation methodology, which allows evaluation of the system's performance against biological warfare agents when releasing simulants in open field tests.

Assessment

- Although work continues, the Program Office has not yet demonstrated their proposed test and evaluation methodology. The effectiveness of the system in detecting biological warfare agents cannot be determined until this effort is completed. The suitability evaluation is ongoing.
- The system's design limits its operation to nighttime use only.
- The short stand-off distances required for detection and discrimination limit warning time, which may provide the supported commander insufficient time to respond.
- The Air Force's successful use of the wireless connectivity for partial control of the system's operation during the first operational test in 2006 prompted the Army to adopt wireless control as well. Wireless connectivity allows for simplified control and reduces the number of people required for

operation. However, each JBSDS must be turned on and off by an operator at the system.

- The system is subject to misalignment caused by road shock when used in the ground mobile system. Also, there is no built-in test capability to warn an operator that the system might be misaligned.

Recommendations

- Status of Previous Recommendations. There are no outstanding recommendations for this program.
- FY08 Recommendations. None

Joint Tactical Radio System (JTRS) Ground Mobile Radio (GMR)

Executive Summary

- The Joint Tactical Radio System (JTRS) Ground Mobile Radio (GMR) product line continues developmental testing to include completing tests of up to 12 nodes using pre-Engineering Developmental Model (pre-EDM) sets and use of pre-EDM GMR in the Future Combat System (FCS) Spin Out (SO) Preliminary-Limited User Test (LUT). The program and contractor will perform Production Qualification Testing (PQT) on GMR EDM sets in 2009.
- JTRS GMR continues to develop its Increment 1 program baseline, including finalizing acquisition documentation and movement toward operational test.
- The Defense Acquisition Executive (DAE) directed the program to work with OSD and the FCS program to address the need to complete a 30 node test to evaluate the Wideband Networking Waveform (WNW), and associated network management.
- The program is working with DOT&E to determine the number of radios and associated platforms required to assess networking scalability, performance of the networking waveforms, and network enterprise services appropriate for the GMR.
- The Joint Program Executive Office (JPEO) is reviewing JTRS enterprise-level testing requirements and responsibilities between the GMR, the Networking Enterprise Domain, and other JTRS product lines.

System

- JTRS is a family of software-programmable and hardware-configurable digital radios designed to provide increased interoperability, flexibility, and adaptability to support many diverse warfighter communications requirements.
- JTRS GMR components include control display devices, universal transceivers, network/information security interface units, and power amplifiers, which combine to create radio sets for Army, Marine Corps, and Air Force ground vehicle installations.

1 - Control Display Device
2 - Universal Transceivers with Network / Information Security Interface Unit
3 - Power Amplifiers

Mission

Commanders from the Army, Marine Corps, and Air Force intend to use JTRS GMR to:
- Communicate and create networks to exchange voice, video, and data during all aspects of military operations.
- Provide the capability to interface with other JTRS product line radios and legacy radio systems in joint and coalition operations.

Prime Contractor

- Boeing

Activity

- JTRS GMR experienced cost overruns resulting from waveform interface software security deficiencies and the Soldier Radio Waveform. These funding shortfalls could impact the program's test schedule. The DAE prescribed action for the JPEO to identify cost issues early to ensure a successful Milestone C decision in late FY10.
- The DAE requested the Assistant Secretary of Defense (Network Information and Integration), with the Director of Defense Research and Engineering, the Deputy Under Secretary of Defense (Acquisition and Technology), DOT&E, and the FCS Program Manager, work with the JPEO JTRS program to provide near term testing of at least 30 GMR nodes with WNW and associated network management functions. This testing would fully evaluate waveform capability, hardware performance, and network management operations.
- The prime contractor continued its series of developmental tests using pre-EDM hardware versions of the GMR to test incremental improvements in software and waveforms to mitigate risk to PQT.
- The JTRS GMR program received testing data and had representatives at the FCS SO Preliminary-LUT at White Sands Missile Range, New Mexico. The program used this data to support ongoing improvements to the GMR.
- The program began planning for PQT of the GMR EDM versions to occur in 2009.

- The JTRS GMR Test and Evaluation Working Integrated Product Team (T&E WIPT) updated the GMR Test and Evaluation Master Plan (TEMP) and initiated formal staffing. DOT&E, JPEO, and the Army are working resolution of final DOT&E adequacy deficiencies.

Assessment

- GMR funding shortfalls could affect radio configuration types (2 versus 4 channels), reduce the number of sets procured under the program, and introduce schedule delays.
- The JPEO is examining means to execute a 30 node WNW test within either a new or existing test event.
- JTRS GMR developmental tests with pre-EDM radios (up to 12 node networks) provided insights on software waveforms and experience in testing software-defined radios. The program's testing identified performance concerns with the networking waveforms and radio initialization times, which the program has used to improve its GMR design.
- The program plans to implement an integrated PQT to meet their proposed aggressive test schedule.
- The T&E WIPT identified significant issues impacting test adequacy as part of the GMR TEMP update. The most significant issues are determining the numbers of radios and associated platforms necessary to adequately assess network scalability, maintaining operational synchronization with the FCS program, and assessing performance of cross-JTRS enterprise capabilities; networking waveforms, enterprise network management, and network enterprise services.

Recommendations

- Status of Previous Recommendations. The GMR program is addressing all previous recommendations.
- FY08 Recommendations.
  1. The JTRS GMR program should resolve issues with test adequacy to support the LUT in FY10 and Multi-Service Operational Test and Evaluation in FY12.
  2. The JTRS GMR program should establish agreement with the JTRS Networking Enterprise Domain regarding roles and responsibilities for testing waveforms, network management, and services for large-scale JTRS networks.

Joint Tactical Radio System (JTRS) Handheld, Manpack, and Small Form Fit (HMS)

Executive Summary

- The Joint Tactical Radio System (JTRS) Handheld, Manpack, and Small Form Fit (HMS) product line continues to progress within its 2005 program baseline under the direction of the Joint Program Executive Office (JPEO).
- The Small Form Fit (SFF) Cv(1) Rifleman Radio is on schedule for operational testing to support a Milestone C decision in 3QFY09.
- The Handheld and Manpack variants are proceeding with test planning for operational testing in FY11 to support a low-rate production decision for Phase 2.
- The JPEO is reviewing JTRS enterprise-level testing requirements and responsibilities between HMS, the Networking Enterprise Domain, and other JTRS product lines.

System

- JTRS is a family of software-programmable and hardware-configurable digital radios designed to provide increased interoperability, flexibility, and adaptability to support many diverse warfighter communications requirements.
- The JTRS HMS program provides handheld and two channel manpack radios for Army, Marine Corps, Navy, and Air Force operations. The program develops SFF radio configurations which produce the standalone Army Rifleman Radio and embedded SFF variants that serve in Army host platforms such as the Intelligent Munitions System, Unattended Ground Sensors, Ground Soldier System, Unmanned Aerial Vehicle (Class I and Class IV), and the Non-Line-of-Sight Launch System.
- The program strategy defines two phases of HMS production, differentiated by the type of encryption. Phase 1 will produce Rifleman Radios requiring encryption of unclassified information (National Security Agency (NSA) Type 2). Phase 2 will produce manpack radios requiring encryption of classified information (NSA Type 1).

Mission

Commanders from the Army, Marine Corps, Navy, and Air Force intend to:

- Use JTRS handheld, manpack, and Rifleman Radios to communicate and create networks to exchange voice, video, and data using legacy waveforms or the newly developed Soldier Radio Waveform during all aspects of military operations.
- Integrate JTRS SFF variants into host platforms to provide networked communications capabilities for users engaged in land combat operations to support voice, video, and data across the immediate battlespace.

Prime Contractor

- General Dynamics

Activity

- The JTRS HMS program continues baseline efforts under the restructured JTRS program and the transfer of the program office from Fort Monmouth, New Jersey, to San Diego, California.
- The JTRS HMS program is reestablishing its Acquisition Programming Baseline and updating acquisition documents, including the HMS annex to the JTRS Enterprise Acquisition Strategy and the HMS Test and Evaluation Master Plan (TEMP).
- The JTRS HMS program is conducting developmental testing and production of embedded SFF radio variants. The SFF variants will be used as components of Army host platform programs (e.g. Future Combat System (FCS) Unattended Ground Sensors) which will then complete platform developmental and operational testing.
- The JTRS HMS program will conduct a SFF Cv(1) Rifleman Radio Limited User Test (LUT) in 3QFY09 to support

Milestone C in 3QFY09. The Army completed Operational Test Readiness Review 1 for this LUT on July 10, 2008.
- The JTRS HMS program continues to synchronize activities with FCS.

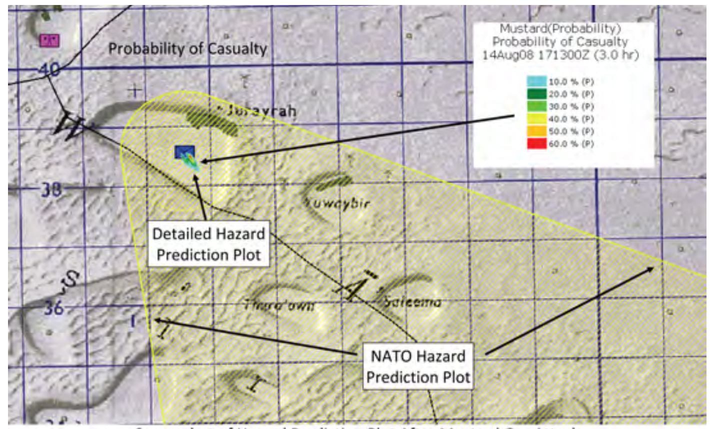
Assessment
- The JTRS HMS program continues hardware development, technical testing, and preparation activities for the SFF Cv(1) Rifleman Radio LUT. The program is working to develop the maturity of the Soldier Radio Waveform and network management software necessary for the Phase 1 LUT.
- The Handheld and Manpack sets continue development in support of a LUT scheduled for 1QFY11 to support a low-rate production decision in process review for Phase 2.

Recommendations
- Status of Previous Recommendations. The HMS program is addressing all previous recommendations.
- FY08 Recommendation.
  1. The JTRS HMS program should establish agreement with the JTRS Networking Enterprise Domain regarding roles and responsibilities for testing waveforms and large-scale JTRS networks.

Joint Warning and Reporting Network (JWARN)

Executive Summary

- The program completed Developmental Test-3 and an Operational Assessment in FY07 to support a Milestone C decision in July 2008. The Joint Warning and Reporting Network (JWARN), specifically the mission application software, demonstrated basic functionality and integration with the host communications networks.
- The Air Force Operational Test and Evaluation Center (AFOTEC) conducted Multi-Service Operational Test and Evaluation (MOT&E) in August 2008. AFOTEC is analyzing and evaluating the test data.



Screenshot of Hazard Prediction Plot After Mustard Gas Attack

System

- JWARN mission application software (JMAS) implements NATO reporting and hazard prediction for chemical, biological, radiological, and nuclear (CBRN) hazards. The program also includes a hardware device that links CBRN sensors to the JWARN network. This device is called the JWARN component interface device (JCID).
- The Services host JMAS on Global Command and Control Systems and other tactical command, control, communications, computers, and intelligence (C4I) networks.

Mission

Commanders use JWARN to disseminate warning and CBRN hazard prediction in order to protect the force. JWARN:

- Warns units of NBC hazards
- Formats, sends, receives, and correlates CBRN and Release Other Than Attack (ROTA) reports
- Interacts with Joint Effects Model to generate detailed hazard predictions; will be able to interact with the Joint Operational Effects Federation to determine the impact of CBRN warfare on military operations and provide decision support for operational planning
- Correlates multiple CBRN and ROTA detection reports from manual sources and from automated sensor networks
- Provides hazard prediction and targeting analysis
- Provides information to manage CBRN assets and support planning for CBRN operations.

Prime Contractor

- Northrop Grumman

Activity

- The prime contractor completed JMAS integration activities on three platforms in March 2008: Global Command and Control System, Command and Control Personal Computer, and Maneuver Control System.
- The program completed Developmental Testing-3 and a user assessment in March 2008.
- In July 2008, the Joint Program Executive Officer for Chemical and Biological Defense approved entry to MOT&E for JMAS in FY08 and the production of 300 low-rate initial production (LRIP) JCIDs to provide production-representative articles for a JCID IOT&E in FY09.
- AFOTEC, along with the Service OTAs, conducted the MOT&E for JMAS in accordance with the DOT&E-approved Test and Evaluation Master Plan (TEMP) and test plan at Fort Hood, Texas, in August 2008.
- The program manager is updating the TEMP to reflect the Milestone C LRIP decision to de-link JMAS and JCID IOT&Es.

Assessment

- Developmental Test-3 demonstrated integration of JMAS with the host C4I systems. The program manager did not identify any priority one failure modes (complete loss of JWARN or host system functionality).
- The program manager conducted the user assessment in a controlled environment, and demonstrated basic JWARN functionality and integration with the host C4I networks with operational users.
- Because of the difficulty in finding a suitable operational exercise to sponsor the JWARN IOT&E, AFOTEC tested JWARN in a closed environment at Fort Hood, Texas. Due to the current immaturity of the interaction functionality in the Services' host networks, the architecture under test was not representative of the network architecture that the program will field to all Services in FY09-10.
- AFOTEC and DOT&E are analyzing and evaluating the test results for the JMAS IOT&E.

Recommendations

- Status of Previous Recommendations. The Air Force has addressed all previous recommendations.
- FY08 Recommendations.
  1. Under the auspices of the Service-specific host platform programs, all Services should test JWARN operating on representative Maneuver Control System, Global Command and Control System, and Command and Control Personal Computer networks.
  2. The program manager should conduct additional operational testing of JWARN in realistic operating environments and networks. These plans should be included in the revised TEMP.

M4 Joint Chemical Agent Detector (JCAD)

Executive Summary

- The Joint Project Manager and the Service Operational Test Agencies (OTAs) completed a comprehensive developmental and operational test (DT/OT) program for the JCAD Increment 1 during FY08. DOT&E delivered the JCAD Beyond Low-Rate Initial Production (BLRIP) Report to Congress in August 2008. The Joint Program Executive Office for Chemical and Biological Defense (JPEO(CBD)) made a full-rate production decision.
- JCAD Increment 1 is operationally effective and suitable for detecting blister, nerve, and blood chemical warfare agents. JCAD can detect chemical agents at concentration levels within time durations required to prevent acute health effects to personnel. Its performance was at least as good as currently fielded detectors. JCAD met user false alarm requirements.

System

- JCAD is a hand-held device that automatically detects, identifies, and alerts warfighters to the presence of nerve, blister, and blood chemical agent vapors, and some toxic industrial chemical vapors.
- JCAD Increment 1 is a non-developmental item modified from a commercially available device. It will operate as a stand-alone detector. It will be carried by personnel and placed onto various platforms, including ground vehicles, at fixed site installations, and at collective protection shelters. It supplements or replaces existing fielded chemical agent vapor detectors.
- The JPEO intends JCAD Increment 2 to be a commercially available device designed to detect lower levels of chemical vapors and have a networking capability.
- The total quantity of Increment 1 systems is 60,000 detectors, with 6,000 low-rate initial production. The total planned Acquisition Objective for JCAD is 145,150 detectors.
- The JCAD will be issued to:
  - Army squads
  - Marine platoons
  - Air Force aircraft, base reconnaissance, and ground-service personnel
  - Navy shore installations, and riverine or land-based units

Mission

- Units use JCAD to provide hazard level indication of chemical warfare agent and toxic industrial chemical vapors to alert personnel to take personal protection measures including masking and unit force protection measures.
- JCAD accomplishes the following tasks:
  - Personal chemical vapor detector
  - Monitor in and around a vehicle or shelter's interior and exterior, or aircraft interior
  - Fixed installation monitor or array of monitors to provide remote alarming

Prime Contractors

- Increment 1: Smith's Detection
- Increment 2: Contract not yet awarded

Activity

- The Joint Project Manager with the Service OTAs conducted a comprehensive DT/OT program for the non-developmental JCAD Increment 1 in FY06 and FY07. The Army Test and Evaluation Command led the Service OTAs in conducting the Multi-Service Operational Test and Evaluation (MOT&E) in accordance with the DOT&E-approved Test and Evaluation Master Plan (TEMP) and test plan. DOT&E delivered the JCAD Increment I Report to the congressional committees in August 2008.
- The program conducted initial customer developmental testing on three industry-provided candidates for the JCAD Increment 2 detector during FY08.

Assessment

- JCAD Increment 1 is operationally effective and suitable for detecting blister, nerve, and blood chemical warfare agents. JCAD can detect chemical agents at concentration levels within time durations required to prevent acute health effects to Service personnel. Its performance was at least as good as currently fielded detectors. JCAD met user false alarm requirements.
- JCAD is easy to operate, troubleshoot, and maintain. Its light weight and small size makes it more portable than currently fielded chemical warfare agent point detectors.
- The currently-fielded Automatic Chemical Agent Detector Alarm should be used instead of JCAD for the detection of VX nerve agent. The currently-fielded Improved Chemical Agent Monitor should be used instead of JCAD for detecting Sulfur Mustard and Lewisite.
- JCAD Increment 1 is not effective for detecting most toxic industrial chemicals.
- Due to concerns regarding the loss of sensitivity over time during developmental testing, the program manager developed a surveillance, inspection, and calibration plan for JCAD.

Recommendations

- Status of Previous Recommendations. The Joint Program Manager addressed DOT&E's previous recommendations.
- FY08 Recommendation.
  1. The Joint Program Manager should implement the surveillance, inspection, and calibration program for fielded JCADs.

Mine Resistant Ambush Protected (MRAP) Vehicles

Executive Summary

The Mine Resistant Ambush Protected (MRAP) Vehicle program procured the total Service and Special Operations Command requirement for 15,838 MRAP vehicles. The majority of this procurement has been delivered to operating forces in Iraq and Afghanistan. Developmental, live fire, and operational testing was completed in FY08 for all six of the MRAP vehicles.

System

- MRAP vehicles are a family of vehicles designed to provide increased crew protection and vehicle survivability against current battlefield threats, such as IEDs, mines, and small arms. DoD initiated the MRAP program in response to an urgent operational need to meet multi-Service ground vehicle requirements. MRAP vehicles provide improved vehicle and crew survivability over the High Mobility Multi-purpose Wheeled Vehicle (HMMWV) and are employed by units in current combat operations in the execution of missions previously executed with the HMMWV.
- This report covers two types of MRAP vehicles. The MRAP Category I (CAT I) vehicle is designed to transport six persons while the MRAP Category II (CAT II) vehicle is designed to transport 10 persons. An ambulance variant of the MRAP vehicle is also being developed.
- MRAP vehicles incorporate current Service command and controls systems and counter-IED systems. MRAP vehicles incorporate gun mounts with gunner protection kits capable of mounting a variety of weapons systems such as the M240B medium, the M2 .50 caliber heavy machine gun, and the MK-19 grenade launcher. The program has developmental efforts underway to integrate improved armor protection against Explosively Formed Penetrators (EFPs) on existing MRAP vehicles.
- Five vendors have been awarded ongoing production contracts for MRAP CAT I and CAT II vehicles: Force Protection Industries (FPI), General Dynamics Land Systems Canada (GDLS-C), International Military and Government (IMG), BAE-Tactical Vehicle Systems (BAE-TVS), and BAE Systems (BAE). Six CAT I and CAT II variants have been purchased:
  - FPI Cougar CAT I
  - FPI Cougar CAT II
  - IMG MaxxPro CAT I
  - BAE RG-33L CAT II
  - GDLS-C RG-31A2 CAT I
  - BAE TVS Caimen CAT I

FPI Cougar Category I

FPI Cougar Category II

IMG MaxxPro Category I

BAE RG-33L Category II

GDLS RG-31A2 Category I

BAE TVS Caimen Category I

Mission

- Units equipped with the MRAP CAT I vehicles conduct small unit combat operations such as mounted patrols and reconnaissance. Many of these operations are conducted in urban areas. Units equipped with MRAP CAT II conduct ground logistics operations including convoy security, troop and cargo transportation, and medical evacuation.
- MRAP vehicles support multi-Service missions and are fielded to units based upon priorities established by the operational commander.

Prime Contractors

- BAE Systems
- Force Protection, Inc.
- General Dynamics
- International Military and Government

Activity

- The MRAP program has procured the total Service and Special Operations Command requirement for 15,838 MRAP vehicles. The majority of this procurement has been delivered to operating forces in Iraq and Afghanistan.
- Developmental, live fire, and operational testing was completed in FY08 for all six of the MRAP vehicles.
- The Army and the Marine Corps conducted a series of four Initial Operational Tests (IOT) for the six MRAP vehicles at Yuma Proving Ground, Arizona, in the period from October 2007 to June 2008.
- The MRAP program initiated two efforts in FY08 to improve base MRAP effectiveness, suitability, and survivability. The first is a program to develop, evaluate, and integrate a series of Engineering Change Proposals (ECP) tailored to each of the individual MRAP base vehicles with the intent of improving vehicle capability. The second effort, the MRAP Expedient Armor Program (MEAP), is intended to provide improved, add-on armor for existing base MRAP vehicles. These two programs are undergoing a developmental and live fire test program to assess their contribution to MRAP vehicle capabilities.
- The program developed MRAP ambulance variants using the MaxxPro and RG-33L. The program completed test planning for these ambulances and began developmental testing. An operational test on both ambulance variants was conducted at Fort Hood, Texas, in October to November 2008.
- The MRAP Program Office conducted an initial assessment of two MRAP II variants. The program intends the MRAP II to provide increased ballistic protection against explosively formed projectiles (EFP). Two vendors delivered MRAP II vehicle prototypes. DoD has made no decision to procure any MRAP II vehicles.
- In September 2008, the program purchased 822 IMG MaxxPro Dash vehicles. The MaxxPro Dash is a smaller and lighter modified version of the IMG MaxxPro. The program intends the MaxxPro Dash to provide improved mobility over current MRAPs.

Assessment

- Based upon analyses of the IOTs and LFT&E programs conducted for the six MRAP I variants, DOT&E's assessment of the operational effectiveness, suitability, and survivability of these vehicles is:
  - FPI Cougar CAT I and CAT II are operationally effective and suitable. They are survivable against the requirement threats.
  - IMG MaxxPro is operationally effective and suitable. It is survivable against the requirement threats.
  - BAE RG-33L is operationally effective, but not operationally suitable. The RG-33L was assessed as not suitable primarily because of demonstrated low reliability and significant limitations in its ability to be towed. The RG-33L is operationally survivable against the requirement threats.
  - BAE-TVS Caimen is operationally effective and suitable. It is survivable against the requirement threats.
  - GDLS-C RG-31 is operationally effective, but not operationally suitable. The RG-31 demonstrated low reliability. The RG-31 is operationally survivable against the requirement threats.
- MRAP I vehicles successfully demonstrated in operational testing their primary capability to provide armor-protected tactical mobility to transport units over primary and secondary roads. The size and weight of these vehicles limit their off-road tactical mobility and reduce their maneuverability in urban terrain.
- LFT&E of the six MRAP variants demonstrated that MRAP vehicles provide crew and passenger protection against the immediate effects of the threats identified in the MRAP requirements documents. Testing also revealed automotive vulnerabilities to a wide range of threats, which can affect vehicle mobility. Though all MRAP I variants were assessed as operationally survivable, they did provide different levels of survivability against threats that exceeded the requirements.
- Because of the urgent operational requirement for MRAP vehicles, the program pursued an aggressive acquisition strategy emphasizing rapid procurement and fielding of these vehicles, with minimal testing conducted in advance of these efforts. This approach, while necessitated by operational need, provides little opportunity to incorporate design modifications resulting from lessons learned from more extensive testing prior to operational use.

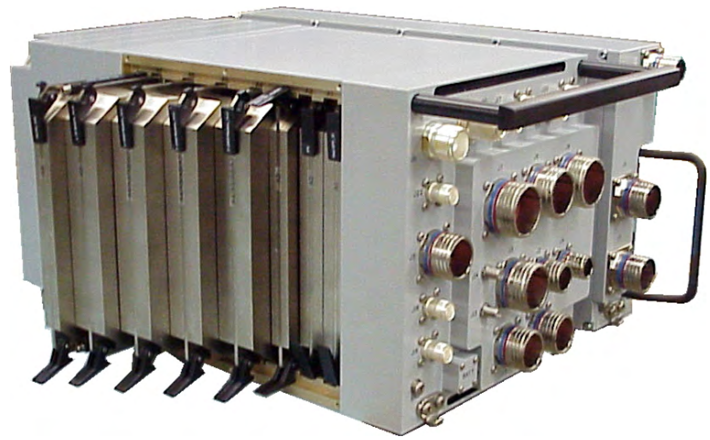
Recommendations

- Status of Previous Recommendations. The MRAP program continues to address the previous recommendations.
- FY08 Recommendations.
  1. The program should continue to ensure that adequate T&E plans are developed and executed to support future upgrades to MRAP vehicles that may be implemented, such as armor improvements or other ECPs applied to existing MRAPs.
  2. The Army Test and Evaluation Command, in conjunction with the MRAP program, should conduct a detailed operational assessment of all variants of MRAP vehicles based upon data gathered from deployed MRAP-equipped units. This operational assessment would provide information for further vehicle improvements.

Multi-functional Information Distribution System (MIDS) (includes Low Volume Terminal (LVT) and Joint Tactical Radio System (JTRS))

Executive Summary

- The Multi-functional Information Distribution System-Low Volume Terminal (MIDS-LVT) continues to mature and is being integrated into host platforms such as amphibious ships and the AC-130U Gunship. Tests have indicated uneven performance, particularly in the Tactical Air Navigation (TACAN) function.
- The MIDS-Joint Tactical Radio System (JTRS) is in development; however, early flight tests indicate performance concerns with the TACAN function, and laboratory tests indicate performance issues with terminal start-up and Link 16 digital voice quality.



System

- MIDS-LVT is a communications and navigation terminal in full-rate production, that when integrated into a host platform provides Link 16 digital data link, Link 16 digital voice communications, and TACAN capabilities. Since production started, the MIDS-LVT has evolved with hardware, firmware, and software updates to resolve performance and stability deficiencies and to provide new Link 16 capabilities.
- MIDS-JTRS is a pre-planned product improvement of the MIDS-LVT system. When integrated into a host platform, MIDS-JTRS provides MIDS-LVT capabilities, plus three additional programmable channels capable of hosting JTRS Software Communications Architecture compliant waveforms in the 2 to 2,000 megahertz radio frequency bandwidth.
- The system under test includes the MIDS terminals and the host platform interfaces such as controls, displays, antenna, high power amplifiers, and any radio frequency notch filters.
- TACAN has an air-to-air mode and air-to-ground mode and is a primary means of air navigation by military aircraft. Link 16 data link is a joint and allied secure anti-jam high speed data link that uses standard messages to exchange information among flight or battle-group host platforms or between combat platforms and command and control systems. Link 16 digital voice provides host platforms a secure anti-jam voice line-of-sight communications capability.

Mission

- U.S. Services and many allied nations will deploy MIDS-LVT and MIDS-JTRS-equipped aircraft, ships, and ground units in order to provide military commanders with the ability to communicate with their forces by voice, video, and data during all aspects of military operations. MIDS-JTRS networking capability and multiple waveforms (including new waveforms such as the Wideband Networking Waveform (WNW)) will allow collaboration despite geographical and organizational boundaries.
- MIDS-JTRS-equipped units will be able to seamlessly exchange information including air and surface tracks, identification, host platform fuel, weapons, mission status, engagement orders, and engagement results.

Prime Contractor

- ViaSat

Activity

- The Commander, Operational Test and Evaluation Force (COTF) completed the operational test of the MIDS-LVT on Ship (MOS) integration for amphibious ships during late 2007. Test data and the operational test report were delivered during 2008.
- The Space and Naval Warfare Systems Command conducted laboratory development test of the MOS integration into the guided missile cruiser and destroyer command and control host system.

- The 18th Flight Test Squadron, Air Force Special Operations Command, conducted the operational test of the MIDS-LVT version 6 into the AC-130U aircraft during August and September 2008. Analysis is ongoing.
- COTF conducted an operational assessment of the MIDS-JTRS during September 2008.
- The Navy conducted F/A-18E/F MIDS-JTRS TACAN developmental flight tests during 2008.
- All testing was conducted in accordance with the DOT&E-approved Test and Evaluation Master Plan (TEMP) and test plans.

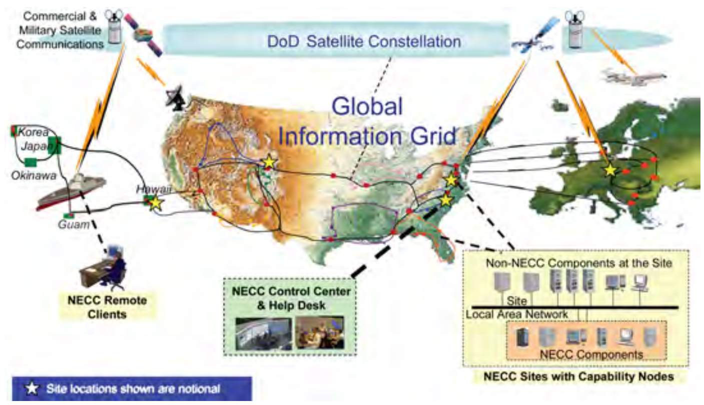
Assessment

- The MOS amphibious ship operational test indicated that the data were adequate to demonstrate that the integration for amphibious ships was operationally effective and suitable. The test, however, did not successfully demonstrate the operation of MOS with the legacy Link 16 High Power Amplifier. The test team identified that MOS could not support the Link 16 Time Slot Reallocation Mode, and there was a safety hazard related to voltage markings. The Navy is reviewing the data and electrical interfaces for the amplifier compatibility problem and is evaluating the changes needed to allow the MOS to operate in the Time Slot Reallocation mode. There were also host platform timing interface problems with MOS, which affected Link 16 network entry. The safety hazard was immediately mitigated with a temporary warning placard.
- The mission planning system-guided missile cruiser and destroyer integration developmental tests are ongoing; however, initial results indicate Link 16 data link message exchange is functional. The test did discover that Aegis-guided missile cruiser track processing anomalies require correction before fielding.
- The MIDS-LVT version 6 AC-130U integration operational test has been completed by the Air Force Special Operations Command's 18th Flight Test Squadron, the Operational Test Agency. They are analyzing the test data and have not yet released their end of test report. The program manager and MIDS-LVT integration contractor have released new software to correct many of the critical deficiencies uncovered during developmental and operational test, and another release of software is planned to address the remaining deficiencies.
- The FA-18 MIDS-JTRS Operational Assessment is ongoing. MIDS-JTRS TACAN developmental test results from F/A-18E/F flight tests conducted during 2008 by the Navy indicate this capability is not effective. Performance issues include erroneous TACAN station identification, range, and bearing information provided to the host platform and aircrew. Laboratory and flight tests also indicate deficiencies with Link 16 digital voice communications and MIDS-JTRS terminal navigation. The MIDS program manager and developmental contractors are developing new software to resolve performance issues. COTF has extended the Operational Assessment to examine planned performance improvements of the next MIDS JTRS software. This software is expected to be ready for flight test in November 2008.
- Developmental test results from MID-JTRS laboratory tests indicate developmental issues with terminal start-up and quality issues with Link 16 digital voice communications. The MIDS program manager and developmental contractors developed new software and firmware that improves terminal start-up. They also developed enhanced digital voice coder software to improve Link 16 digital voice quality.

Recommendations

- Status of Previous Recommendations. There were no previous recommendations.
- FY08 Recommendations.
  1. The Navy should continue to develop an engineering solution for MOS compatibility with the legacy High Power Amplifier or consider developing a replacement amplifier capability.
  2. The Navy should design and test a solution to the MOS Time Slot Reallocation deficiency in order to maximize the use of limited Link 16 timeslots within a network and resolve timing interface issues to support MOS entry into Link 16 networks.
  3. The Navy should correct and test the implementation of the fighter control commands for the MOS integration into the guided missile cruisers and destroyers and should investigate Aegis track processing anomalies.
  4. The MIDS program manager should resolve the MIDS-LVT and MIDS-JTRS TACAN performance issues and support flight testing of TACAN performance before the start of host platform integration developmental and operational test.

Net Enabled Command Capability (NECC)



Executive Summary

- The Net Enabled Command Capability (NECC) program continues in the Technology Development phase. In July 2008, the Defense Acquisition Executive authorized continued work to refine cost estimates, confirm technical maturity, and clarify management provisions prior to entry into the System Development and Demonstration phase.
- Program Decision Memorandum II in November 2007 focused the NECC program on development of an initial increment of capability that will enable the retirement of the Global Command and Control System-Joint family of systems.
- During 3Q-4QFY08, the NECC program completed an end-to-end exercise of development and test processes that provided significant lessons. The program demonstrated the ability to share, access, and display information using a service-oriented architecture across the Global Information Grid; however, the software was unstable and the delivered capability would not have had sufficient utility to warrant fielding. The demonstration highlighted that fielding of user-defined operational capability sets could better align the expenditure of test and evaluation resources with delivered capability.
- The NECC Joint Program Management Office plans to complete an event-driven program leading to a Milestone B decision in 2009.

System

- NECC is the DoD's principal Command and Control Capability (C2C) that will provide access to a net-centric strategic, operational, and tactical environment.
- NECC is a family of net-centric services comprised of software applications and databases implemented using service-oriented architecture technology.
- Functionality is provided through a software architecture composed of Capability Modules that are collections of net-centric services or data providing an operationally useful capability.
- Operators will access NECC via a standard Global Information Grid computing node on a physical network architecture consisting of operator clients and sites/nodes that access Capability Modules (on both classified and non-classified networks).
- The objective "mission space" for the NECC encompasses command capabilities and command and control (C2) activities that extend from the National Military Command System (NMCS) through the domain of the existing Global Command and Control System (GCCS) Family of Systems (FoS).
- The DoD will develop NECC in three increments:
  - Increment 1 is intended to provide net-centric capabilities which will replace the existing GCCS FoS. Beginning in FY10 and completing in FY17, the DoD will initially extend NECC capabilities to a Service Joint Task Force at one geographic Combatant Command, with subsequent NECC fieldings to users where GCCS FoS is currently accessed and used.
  - Increments 2 and 3 will provide NECC capabilities beyond that of the current GCCS FoS.

Mission

- Joint Commanders will use the NECC to accomplish joint global command and control.
- Commanders intend to use the NECC to:
  - Link the National Command Authority to the Joint Task Force and Service/functional components down to the unit level
  - Access, display, and understand information necessary for the warfighter to make efficient, timely, and effective decisions
  - Achieve decision superiority and to execute joint operations planning

Prime Contractor

- Government Integrator (DISA)

Activity

- Program Decision Memorandum II in November 2007 defined the scope of NECC Increment 1 to include transitioning the Global Command and Control System FoS to NECC service-oriented architecture capabilities. The FoS Transition Plan was developed to establish the current capability and support transition planning.
- The NECC Acquisition Decision Memorandum of February 1, 2008, authorized several activities including exercising developmental and operational test processes and fielding decision procedures to support efforts to better define Increment 1, providing evidence of technical maturity, and gathering data to improve the NECC cost estimate. The program exercised these processes using the initial "spiral one" version of five NECC capability modules.
- The pilot effort included planning, conducting, and reporting for two test activities: a Developmental Test B1 conducted by the Navy Component Program Management Office from December 2007 through May 2008 and an Early User Test conducted by the U.S. Army Test and Evaluation Command in June 2008.
- The Defense Acquisition Executive reviewed the NECC program in July 2008 and issued the NECC Acquisition Decision Memorandum of August 16, 2008, authorizing continued NECC investment and directing further refinement of cost estimates, confirmation of technical maturity, and clarification of management provisions in order to inform a Milestone B decision in FY09.

Assessment

- The test activities confirmed for DOT&E that the program processes delivered a service-oriented architecture that was capable of sharing, accessing, and displaying information across a distributed network. Testing also confirmed that the delivered "spiral one" capability was unstable and would not have had sufficient operational utility to warrant fielding. As demonstrated, DOT&E assesses that the original NECC program processes could lead to the development, operational testing, and fielding of entities that of themselves have minimal operational utility.
- The proposed test process demonstrated significant challenges with supporting the on-demand testing and fielding of individual capability modules. The Joint Program Management Office's emphasis on fielding individual NECC capability modules does not efficiently align expenditure of test and evaluation resources with delivered capability.
- Both the test community and the operational users identified the need to shift the focus from testing and fielding individual NECC capability modules to testing and fielding user defined operational capability sets that provide utility to the warfighter.
- The existing Test and Evaluation Master Plan (TEMP) no longer accurately describes the test strategy that is emerging from lessons learned.

Recommendations

- Status of Previous Recommendations. The NECC program addressed one of the three FY07 recommendations. The recommendations to update the TEMP at Milestone C and develop Annexes to define an adequate and executable test strategy remain valid.
- FY08 Recommendations. The NECC Program Management Office should:
  1. Define and implement an integrated test strategy that emphasizes fielding user-defined operational capability sets that provide discrete capabilities to the warfighter rather than individual capability modules.
  2. Update the TEMP to support the event-driven Milestone B and Milestone C, as required.

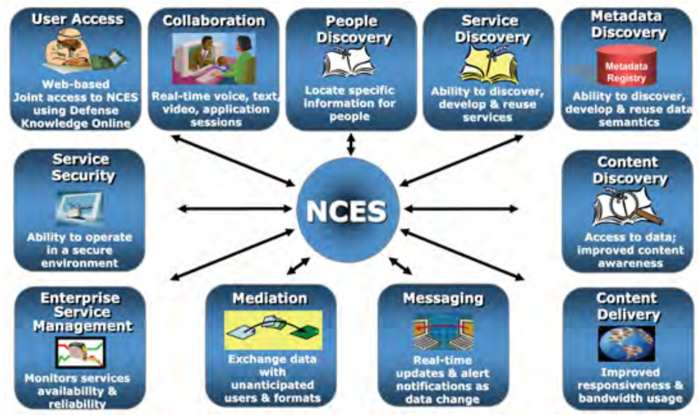
Network Centric Enterprise Services (NCES)

Executive Summary

- The Network Centric Enterprise Services (NCES) program completed an operational assessment on the Increment One Spiral 2 capabilities to include Collaboration services, Content Discovery and Delivery services, Defense Knowledge Online Portal, Metadata Discovery services, and the People Discovery service.
- The Joint Interoperability Test Command (JITC) could not execute the operational assessment in accordance with the test plan because key services were not available as planned and an inadequate number of users participated, which precluded exercising the mission threads as scripted. Nevertheless, DOT&E considered the results adequate to support a Milestone C decision in June 2008, and Limited Operational Availability decisions for all the Spiral 2 services, with the exception of Enterprise File Delivery on the SECRET Internet Protocol Router Network.
- JITC led a risk assessment to determine the level of testing required for each NCES service in support of the IOT&E planning. As a result, certain capabilities are being assessed through continuous monitoring of real-world usage while other capabilities require dedicated test events.
- JITC is currently conducting Performance Verification Testing (PVT) on the Service-Oriented Architecture Foundational capabilities.
- Various communities across DoD (to include the Assistant Secretary of Defense (Networks and Information Integration)/DoD Chief Information Officer, DOT&E, Defense Information Systems Agency, programs of record, and Operational Test Agencies) are finding it more difficult than anticipated to develop the policies, processes, procedures, and governance structures needed to contract for, manage, integrate, and test and evaluate rapidly evolving, commercially-managed enterprise services.

System

- NCES is a suite of capabilities that support automated information exchange across DoD on both classified and unclassified networks. These capabilities include collaboration, discovery, and subscriber tools.
- NCES collaboration tools enable users to hold meetings and exchange information by text, audio, and video.
- The discovery capabilities (content, people, services, metadata, publish/subscribe) allow data producers to post



information, alert others to the presence of new information, and evaluate the relevance of the data to their current roles and activities.

- NCES includes security and management capabilities that integrate with, and rely upon:
  - Network operations management capabilities supporting enterprise service/network management
  - Information assurance/computer network defense
- The warfighting, intelligence, and business communities will access NCES capabilities either directly or through a portal that controls access by the use of Public Key Infrastructure profiles.
- Increment 1 services are available to all operational and tactical users who connect to a Defense Information System Network (DISN) point-of-presence. Future increments will extend NCES capabilities to operational and tactical users who are not connected to a DISN point of presence.
- The software is comprised of commercial off-the-shelf and government off-the-shelf products. The concept is to provide commercially available products managed under a series of Service-Level Agreements.

Mission

Joint Force Commanders will use NCES to enable shared understanding, interface with other decision-makers, orient forces, assess the situation, and synchronize operations.

Prime Contractor

- Government Integrator (DISA)

Activity

- JITC conducted an operational assessment on NCES Increment One Spiral 2.0 services in December 2007. The operational assessment considered information from five venues: an information assurance assessment of the NCES

host sites, mission thread execution, a Command and Control Data Pilot led by U.S. Strategic Command, the Global Information Systems Management Center Help Desk support, and unstructured user participation.
- JITC conducted an information assurance assessment in December 2007 that focused on a review of documentation, interviews with security and system administrator personnel, and observations of system operations to determine whether the established information assurance policies and procedures were adequate to protect the systems or services.
- JITC began PVT in May 2008 on NCES services that did not have sufficient previous testing or had no testing. PVT focuses on assessing technical performance parameters outlined in the Capability Production Document (CPD).
- The joint operational test community revised the critical operational issues in the updated NCES Test and Evaluation Master Plan to support the current acquisition strategy, which recommends unbundling the individual NCES capability sets into discrete deployment decisions. The NCES program formalized implementation plans in Memoranda of Agreement (MOA) with programs of record and communities of interest to assess the contribution of NCES towards their individual missions.

Assessment

- JITC could not conduct the operational assessment in accordance with the approved test plan as key services were not available and an insufficient number of users exercised the mission threads as scripted. However, the testing was adequate to support a recommendation to proceed to Milestone C.
- The scope of testing during the operational assessment varied, as some services were tested in previous Early User Tests (for example, E-Collabcenter collaboration service), some were existing operational capabilities (Portal, Content Delivery, Metadata Registry), some were immature (Joint Enterprise Directory Service), and in some cases, appropriate users were not available to demonstrate the contribution to mission (Machine-to-Machine Messaging).
- The operational assessment highlighted two aspects of the NCES development effort:
  - The NCES services are maturing at different rates, with some services approaching sufficient maturity for operational testing and others requiring further development.
  - The implementation and adoption of the services are also progressing at different rates.
- NCES Increment One services are a collection of disparate services with distinct user groups. The IOT&E will be a series of separate events designed to exercise a single service or set of services that have been adopted by a defined set of users per the MOAs.
- Both the E-Collabcenter and Defense Connect Online (DCO) collaboration capabilities are available to 100,000 registrants. Issues with latency and audio performance are still prevalent especially for large meetings.
- The Defense Knowledge On-line (DKO) Portal underwent successful software upgrades in April 2008 on the classified environment and in June 2008 on the unclassified environment. Infrastructure upgrades to support 2.5 million accounts on the unclassified environment were completed in September 2008.
  - Scalability assessments were successful for the classified environment. Testing of the unclassified environment, which must be capable of supporting 750,000 active authorized users by the end of Increment One, is scheduled for November 2008.
  - While DKO provides access points to the other NCES services, available services have not established a single sign-on capability as required by the CPD. Only the Metadata Registry has successfully established a single sign-on interface with DKO.
- Testing has been hampered by:
  - The slow adoption rate of NCES by existing programs of record
  - The continual evolution of core enterprise capabilities
  - The level of effort needed for programs to expose their capabilities using NCES
  - The lack of established governance standards for exposing information on the Global Information Grid

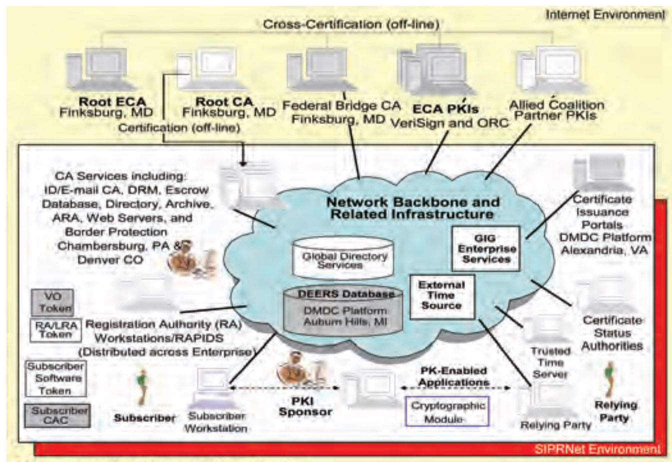
Recommendations

- Status of Previous Recommendations. Effective action has been taken on all previous recommendations.
- FY08 Recommendations.
  1. The Milestone Decision Authority should modify the decision supported by the IOT&E from "full-fielding" to continued expansion of "Limited Operational Availability" so that those products that are not yet fully mature and that are being gradually adopted are reassessed periodically.
  2. The Operational Test Agencies should fully leverage actual service operating experience to assess trends over time, including adoption rates, sustainability, product improvements, and improvements in end-to-end information exchange. JITC should gather metrics to assess NCES' contribution towards the reuse of registered services.

Public Key Infrastructure (PKI)

Executive Summary
- DoD Public Key Infrastructure (PKI) Increment 1 provides authenticated identity management via password-protected Common Access Card (CAC) to enable DoD members, coalition partners, and others to access restricted web sites, enroll in online services, and encrypt and digitally sign e-mail.
- The Joint Interoperability Test Command (JITC) conducted the DoD PKI Increment 1, Spiral 2 IOT&E in February and March 2008. DOT&E assessed the PKI system as operationally effective and operationally suitable for use in its intended operational environment.
- The DoD PKI Program Office should correct unresolved deficiencies identified during the IOT&E prior to the Full Deployment Decision at the end of Increment 1.

System
- DoD PKI is a critical-enabling technology for Information Assurance (IA) services to support seamless secure information flows across the Global Information Grid (GIG) or when stored locally.
- DoD PKI is the framework and services that provide for the generation, production, distribution, control, revocation, recovery, and tracking of Public Key certificates and their corresponding private keys, and enables commercial off-the-shelf (COTS) and government off-the-shelf (GOTS) applications to provide IA and e-business capabilities.
- Using authoritative data, obtained via face-to-face identity proofing, DoD PKI creates a credential that combines this identity information with cryptographic information that is non-forgeable and non-changeable. In this way, DoD PKI provides a standards-based representation of a physical identity in an electronic form.
- DoD PKI Certification Authorities (CA) reside in the Defense Information Systems Agency (DISA) Defense Enterprise Computing Centers (DECC) in Chambersburg, Pennsylvania, and Oklahoma City, Oklahoma.
  - DoD PKI is comprised of COTS hardware, COTS software, and the National Security Agency (NSA)-developed applications software.
  - Certificates are imprinted on the DoD CAC token for personnel identification using Defense Enrollment Eligibility Reporting System (DEERS) personnel data.
- DoD PKI is being developed jointly by DISA and the NSA using spiral acquisition in multiple increments. The current increment, Increment 1, is being deployed in five spirals, of which two have been operationally tested and deployed.



NOTE: Elements in Gray are not on SIPRNet

ARA - Auto-key Recovery Agent
CA - Certification Authority
CAC - Commom Access Card
DEERS - Defense Enrollment Eligibility Reporting System
DMDC - Defense Manpower Data Center
DRM - Data Recovery Manager
ECA - Enterprise Certification Authority
GIG - Global Information Grid
ID - Identification
LRA - Local Registration Authority
ORC - Operational Research Consultants, Inc.
PK - Public Key
RA - Registration Authority
RAPIDS - Real-Time Automated Personnel Identification System
SIPRNet - SECRET Internet Protocol Router Network
VO - Verifying Official

Mission
- DoD PKI enables net-centric operations by allowing warfighters, communities of interest, and other authorized users to securely access, process, store, transport, and use information, applications, and networks regardless of technology, organization, or location.
- Commanders at all levels will use DoD PKI to provide authenticated identity management via password-protected CAC to enable DoD members, coalition partners, and others to access restricted web sites, enroll in online services, and encrypt and digitally sign e-mail. Commanders will use specific PKI services to:
  - Enable and promote a common ubiquitous secure web-services environment
  - Enable the integrity of data/forms/orders moving within the GIG, via use of digital signatures
  - Enable management of identities operating in groups or certain roles within GIG systems
  - Ensure the integrity and confidentiality of what is operating on a network by provision of assured PKI-based credentials for any device on that network

Prime Contractor
- Government Integrator (DISA)

Activity

- JITC conducted the DoD PKI Increment 1, Spiral 2 IOT&E in February and March 2008. Testing was accomplished according to DOT&E-approved test plans and procedures. All or parts of 13 of the 14 Increment 1 enhancements were evaluated in the operational PKI environment, with typical users providing system support.
- Prior to the IOT&E, JITC observed developmental testing in the DISA PKI Laboratory at Fort Huachuca, Arizona. JITC observations were captured in a series of Letters of Observation submitted to DOT&E.
  - Early observation of this testing allowed JITC to identify issues that could impact operations.
  - The Program Office was able to correct areas of concern prior to the IOT&E, or schedule for their correction prior to deployment.

Assessment

- The testing conducted by JITC was adequate to assess the operational effectiveness and suitability of the DoD PKI Increment 1, Spiral 2 configuration. DOT&E concurred with the JITC assessment that the DoD PKI Increment 1, Spiral 2 capabilities provide an operationally effective and operationally suitable system.
- DoD PKI system IA controls were met, with the exception of physical access controls at the Chambersburg DECC at the Letterkenny Army Depot in Pennsylvania.
- Other deficiencies observed during the IOT&E include:
  - A single point of failure in the PKI system architecture
  - Training materials and system documentation did not reflect the current system under test
  - A system resource conflict occurred when generating the daily revocation list
- JITC's early observations of developmental testing were invaluable in reducing risk to the PKI operational mission when the baseline was deployed for IOT&E.

Recommendations

- Status of Previous Recommendations. This is the first annual report for this program.
- FY08 Recommendations.
  1. DISA should coordinate with the Letterkenny Army Depot to eliminate the physical security vulnerability created by the lack of access control to the area surrounding the DECC.
  2. The PKI Program Management Office should resolve the single point of failure in the system, correct the resource allocation issue during creation of the revocation list, and provide system documentation and training materials that accurately describe the actual system configurations.

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

Executive Summary

- Emerging results from the FY07 Suite of Integrated Radio Frequency Countermeasures (SIRFC) IOT&E indicate that the SIRFC:
  - Radar Warning Receiver (RWR) provides significant improvement to effectiveness and situational awareness for special operations helicopter pilots in operationally-representative mission environments
  - Electronic Countermeasures Suite has effectiveness and reliability limitations, but does provide some level of increased jamming effectiveness against 80 percent of all threats evaluated during testing when combined with tactics and expendables.
  - Electronic Countermeasures suite continues to demonstrate reliability problems that limits the availability of self-protection jamming during IOT&E
- The U.S. Army's Special Operations Command (USASOC) completed IOT&E of SIRFC for the MH-47G in late 4QFY07. A full-rate production decision was originally scheduled for 1QFY08, but due to multiple failures in the Radio Frequency Switch Assembly (item 5 in diagram) during the IOT&E, correction of deficiency testing delayed the decision until 3QFY08.
- The Navy and Air Force Special Operations Command (AFSOC) completed operational testing of SIRFC on the CV-22 aircraft during the 3QFY08 CV-22 IOT&E.

System

- SIRFC is an advanced radio frequency self-protection system designed for installation on aircraft.
- Major SIRFC subsystems are:
  - Advanced threat RWRs (Numbers 1, 2, 3, 6, and 9 in picture)
  - Advanced threat radar jammer/Electronic Countermeasures (Numbers 4, 5, 7, and 8 in picture)
- SIRFC platforms are Army Special Operations MH-47 and MH-60 helicopters and Air Force Special Operations CV-22 tilt rotor aircraft.

1 - LRU (Line Replaceable Unit) Receive Processor
2 - Receive Antenna
3 - Amplifier
4 - LRU Advanced Countermeasure
5 - Radio Frequency Switch Assembly
6 - Electrical Assembly
7 - LRU High Power Receive Transmit
8 - Transmit Antenna
9 - Cockpit Display

Mission

Special Operations Forces will use SIRFC to enhance the survivability of aircraft on missions that penetrate hostile areas. SIRFC-equipped units should be able to provide self-protection against threat radar-guided weapons systems by:

- Improving aircrew situational awareness and threat warning
- Employment of active electronic jamming countermeasures
- Expending countermeasures (i.e., chaff)

Prime Contractor

- ITT

Activity

U.S. Army Special Operations Command

- USASOC completed the IOT&E of SIRFC on the MH-47G helicopter in 4QFY07. This test event supported a full-rate production decision in 3QFY08.
- Multiple failures in the Radio Frequency Switch Assembly (item 5 in diagram) during IOT&E delayed the USASOC's full-rate production decision of SIRFC. At the conclusion of IOT&E, the Milestone Decision Authority (MDA) instructed the contractor for SIRFC to redesign the Radio Frequency Switch Assembly and for the Army Communications Electronic Research, Development, and Engineering Center

(CERDEC), to verify that the switch redesign corrected deficiencies seen in IOT&E.
- CERDEC conducted a 570-hour chamber test on the newly designed switch assembly during 2QFY08. One failure occurred during this test period; however, this failure mode was determined to be random and not related to the failures that occurred during IOT&E.
- DOT&E requested additional flight-testing of the newly designed switch assembly in order to verify installed on-aircraft performance and suitability. USASOC scheduled these flights from 4QFY08 through 1QFY09.
- USASOC's FY08 testing was conducted in accordance with the DOT&E approved SIRFC Test and Evaluation Master Plan (TEMP).

Air Force and Navy
- The Navy, in coordination with AFSOC and the Air Force Operational Test and Evaluation Center (AFOTEC), the Air Force's Operational Test Agency, completed operational testing of SIRFC on the CV-22 aircraft during the 3QFY08 CV-22 IOT&E
- The CV-22 IOT&E included 171 hours of dedicated SIRFC missions spread across four aircraft over an eight-week period. AFOTEC conducted test missions at the Naval Air Warfare Center, China Lake, California, and the Air Force's Nevada Test and Training Range. Analysis of this testing is ongoing.
- The Navy and Air Force conducted FY08 testing in accordance with the DOT&E-approved V-22 TEMP.

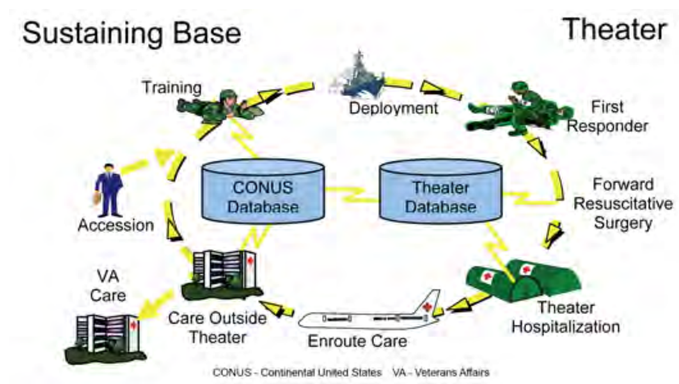
Assessment
Although the Services conduct SIRFC development and testing under two separate TEMPS, inter-program communication is good and allows the CV-22 program to benefit from the USASOC SIRFC lessons learned.

U.S. Army Special Operations Command
- DOT&E completed the effectiveness and suitability assessment of SIRFC IOT&E flight data during FY08. DOT&E will release the SIRFC Beyond Low-Rate Initial Production (BLRIP) report after the completion of flight-testing.
  - Emerging results indicate that the SIRFC is operationally effective.
  - DOT&E will complete the suitability assessment at the conclusion of the upcoming 4QFY08 flight tests.

Air Force and Navy
- DOT&E's assessment of the emerging results of the FY08 CV-22 IOT&E and all SIRFC-related test events indicate that:
  - RWR-related SIRFC performance on the CV-22 will be similar to that observed on the USASOC MH-47G installation.
  - SIRFC jamming on CV-22 will not be as effective as was observed on the USACOC MH-47G aircraft primarily due to the difference in jammer power between the two platforms.
  - AFOTEC submitted the multiple deficiency reports against the SIRFC system during the CV-22 IOT&E test period. These deficiency reports are currently under review.

Recommendations
- Status of Previous Recommendations. The Services followed all previous recommendations.
- FY08 Recommendations.
  1. USASOC, the Air Force, and the Navy should all continue to monitor SIRFC reliability. In addition, they should develop more robust tactics and jamming techniques to help improve survivability against all threat systems.
  2. The Air Force should continue their effort to install a higher power jamming transmitter on the CV-22.

Theater Medical Information Program (TMIP)



Executive Summary

- The Army Test and Evaluation Command (ATEC) led a Multi-Service Operational Test and Evaluation (MOT&E) of Theater Medical Information Program (TMIP) Block 2 Release FY07 (B2RFY07) from January 16 through February 1, 2008. All of the Services' operational test agencies participated, as did the Army Medical Department Board, the Army's 1st Information Operations Command (1st IOC), the Air Force Medical Evaluation Support Activity, the Joint Interoperability Test Command, and the Joint Staff.
- The MOT&E results showed that the release is operationally effective, suitable, and survivable; but with limitations in the areas of information assurance, interoperability, continuity of operations (COOP), concepts of operations (CONOPS), logistics support planning, training, and documentation that require remedial actions. Despite these limitations, the software demonstrated significant improvements over the previous release.
- Two issues require immediate attention. The joint and Service TMIP program managers should continue efforts to encrypt data for mobile computing devices; and ATEC should verify the interface between the Theater Medical Data Store (TMDS) and the Clinical Data Repository (CDR), or an acceptable interim substitute, prior to fielding.

System

- TMIP is a multi-Service Major Automated Information System that integrates software from the sustaining base medical applications into a multi-Service system for use by deployed forces.
- Examples of integrated applications include the Armed Forces Health Longitudinal Technology Application, Composite Health Care System, and Defense Medical Logistics Standard Support.
- TMIP provides the following medical capabilities required in the theater:
  - Health care delivery documentation
  - Medical command and control
  - Medical logistics
  - Patient movement
- The Services provide their own infrastructure (networks and communications) and fund the computer hardware to host the TMIP software.
- TMIP consists of two blocks. Block 1 received a limited fielding approval in 2003 and is currently deployed. Block 2 is being developed in multiple incremental releases starting from FY07.

Mission

- Combatant Commanders, Joint Task Force commanders, and their medical support staff equipped with TMIP can make informed and timely decisions regarding the planning and delivery of health care services in the theater.
- Military health care providers equipped with TMIP can electronically document medical care provided to deployed forces to support the continuum of medical care from the theater to the sustaining base.

Prime Contractors

- SAIC
- Northrop Grumman

Activity

- ATEC led an MOT&E of TMIP B2RFY07 from January 16 through February 1, 2008, in accordance with the DOT&E-approved Test and Evaluation Master Plan and Event Design Plan. All of the Services' operational test agencies participated, as did the Army Medical Department Board, the Army's 1st Information Operations Command (1st IOC), the Air Force Medical Evaluation Support Activity, the Joint Interoperability Test Command, and the Joint Staff.
- The MOT&E evaluated production-representative software at sites throughout the United States that included Camp Bullis, Texas (Army site); Camp Pendleton, California (Marine Corps site); Fort Detrick, Maryland (Air Force site); USS *Ronald Reagan* (Navy site); and Falls Church, Virginia (joint task force site).

Assessment

- The MOT&E results showed that TMIP B2RFY07 is operationally effective, operationally suitable, and survivable; but with limitations in the areas of information assurance, interoperability, COOP, CONOPS, logistics support planning, training, and documentation. Despite these limitations, the software demonstrated significant improvements over the previous release.
- The overall success rate for approximately 19,000 critical mission functions attempts was 99.5 percent, exceeding the 95 percent requirement. Only the Army tested the medical logistics capability provided by TMIP B2RFY07; the other Services do not plan to use this capability.
- Information security compliance is adequate, with one notable exception, medical data stored on TMIP servers and mobile computing devices are not encrypted – a vulnerability that could allow unauthorized parties to view or change stored medical information.
- All tested interfaces demonstrated sufficient maturity to support the system's critical mission functions. However, one key interface was unavailable for test. The interface between the TMDS and the CDR ensures that patient encounters from the theater are stored in a permanent digital file where health care providers worldwide can access the information. While this interface is operational with the fielded TMIP Block 1, it is still under development for TMIP Block 2.
- There is no COOP plan for periodic failover testing of the TMDS and Joint Medical Work Station servers to an alternate operational site. The program manager has awarded a contract for development and testing of the COOP plan.
- Only the Army has a fully developed Service-level CONOPS. This is a significant limitation for other Service users.
- The Army and Navy integrated logistics support plans are adequate, but the Air Force did not complete its plan until after the MOT&E. The Marine Corps plan is still under development.

Recommendations

- Status of Previous Recommendation. There were no previous recommendations.
- FY08 Recommendations.
  1. The joint and Service TMIP program managers should continue efforts to encrypt data for mobile computing devices.
  2. ATEC should verify the interface between the TMDS and the CDR, or an acceptable interim substitute, prior to fielding.
  3. The joint and Service TMIP program managers and the TRICARE Management Activity should develop a Plan of Actions and Milestones to correct the other noted deficiencies.

Army Programs

Army Programs

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

Executive Summary

- The Army must determine if the two major program elements, Common Missile Warning System (CMWS) and Advanced Threat Infrared Countermeasures (ATIRCM) should be decoupled or not. ATIRCM program element uncertainties are complicating and confusing the management and execution of the CMWS program element.

Common Missile Warning System (CMWS)

- Following submission of the classified Beyond Low-Rate Initial Production Report to Congress on CMWS, the Army continued to field an interim CMWS designed to support immediate warfighter needs, while deferring development of a full threat capable CMWS. The Army plans to conduct operational tests on the full threat CMWS capability that supports worldwide operations in FY11.
- Based on the FY08 operational reports, the Army should re-evaluate the effectiveness of CMWS in the Operation Iraqi Freedom (OIF) / Operation Enduring Freedom (OEF) threat environments to determine if any effectiveness limitations exist.
- The fielded version of CMWS offers significant advantages in the OIF/OEF environments over the legacy MWS it replaced, but substantial CMWS effectiveness limitations outside the current OIF/OEF environments remain.
- The Army should further improve the CMWS and conduct T&E for combat operations outside the OIF/OEF environments. The Army has initiated both software (Tier 1 update) and hardware (GEN 3 Electronic Control Unit (ECU)) improvements. The testing of these improvements must realistically reflect both the OIF/OEF and non-OIF/OEF threat environments.

Advanced Threat Infrared Countermeasures (ATIRCM)

- The Army stopped testing of the ATIRCM laser jammer in FY05 due to significant reliability problems identified while testing.
- The Army has initiated a Quick Reaction Capability (QRC) program to equip 70 CH-47D/F model aircraft with ATIRCM. The Army has also revised its test and evaluation strategy for the ATIRCM program of record. The test process culminates in a QRC fielding in FY10 and IOT&E in FY11 to support a planned full-rate production decision in FY11.
- DOT&E is unable to assess the ATIRCM performance until the Army conducts adequate government effectiveness and suitability testing.

System

CMWS is the newest Army aircraft missile warning system designed to detect incoming surface-to-air infrared missiles, to warn pilots of the threat, and to command automatic employment of Infrared Countermeasures (IRCM). The current CMWS does not include integration of an infrared laser jammer. It only cues expendable flares.

- The Army will use CMWS as the first missile-warning sensor (MWS) on some aircraft, while augmenting the legacy ALQ-144 passive infrared jammer and replacing the legacy AN/AAR-47 or AN/ALQ-156 missile warning sensors.
- Production CMWS are currently fielded on approximately 950 Army CH-47, UH-60, AH-64, C-12 series, UC-35, and C-23 aircraft. The Army is purchasing 1,742 CMWS systems.
- ATIRCM incorporates an active infrared laser jammer to provide Army helicopters with improved infrared defensive countermeasures. In summer 2008, the Army decided to test and field the existing ATIRCM hardware on the CH-47 Chinook helicopters as a QRC. The Army plans to complete fielding in FY10.
- The Army plans to develop another jammer subsystem for the ATIRCM program of record for installation on all platforms by the end of FY11. This jammer will replace the ATIRCM systems fielded on the CH-47s.

Mission

- Combatant Commanders intend to use the integrated ATIRCM/CMWS suite to enhance threat warning and improve defensive countermeasures for helicopters and some fixed-wing aircraft. The system is also used to protect aircraft and crews during normal take-off and landing, assault, attack, re-supply, rescue, forward arming, and refueling missions against shoulder-fired, vehicle-launched, and other infrared guided missile threats.

- Combatant Commanders currently use the fielded version of CMWS-only to warn pilots and support limited infrared countermeasures.

Prime Contractor

- BAE Systems

Activity

CMWS

- The Army authorized full-rate production of CMWS in FY06, following submission of the classified Beyond Low-Rate Initial Production Report to Congress on CMWS.
- The Army continued to field an interim CMWS designed to support immediate warfighter needs, while deferring development of a full threat capable CMWS. The Army plans to conduct operational tests on the full threat CMWS capability that supports worldwide operations in FY11.
- Scheduled FY08 CMWS software testing, which was intended to partially resolve the shortfalls identified in IOT&E, was repeatedly delayed (current projection for testing is September to November 2008). This was partly the result of technical problems in the design of the update, and partly the result of poor test range resource availability/coordination.
- The CMWS Program Office planned to sponsor CMWS live fire missile testing at Eglin AFB, Florida, in February 2008 in order to provide the prime contractor more data to develop the full threat capable CMWS. The CMWS Program Office cancelled because the contractor was not ready to support the test.
- The Army conducted follow-on testing of the CMWS installation on the Army UH-60, CH-47, and AH-64, as well as the addition of a fifth sensor on select fielded aircraft to improve the CMWS field of view.
- The Navy completed integration testing of CMWS on Marine Corps UC-35D aircraft in November 2007. Integration improvements and insufficient data will require further testing in early FY09.
- The Army has funded a processor hardware upgrade (GEN 3 ECU) in order to increase the capability of the legacy ECU. The Preliminary Design Review was successfully completed in April 2008. The Army plans to conduct the Critical Design Review and first article testing in FY09/10.
- The Army did not conduct the CMWS testing in FY08 in accordance with the DOT&E-approved Test and Evaluation Master Plan (TEMP). The Army needs to update the November 2005 TEMP with current test plans and resources.

ATIRCM

The Army stopped testing of the ATIRCM laser jammer due to significant reliability problems identified during testing in FY05.

- In FY07, the Army initiated a significant redesign of the ATIRCM laser jammer to address reliability issues and to provide a multi-band laser jamming capability. No operational testing has taken place on the FY08 redesign.
- Testing of the new multi-band laser and jam codes started in 3QFY08 at the Guided Weapons Evaluation Facility at Eglin AFB.
- The Program Office initiated an ATIRCM QRC program in order to equip 70 Army CH-47D/F aircraft with the ATIRCM. An operational assessment conducted by the Army Test and Evaluation Command is planned for 3QFY09.
- The ATIRCM contractor continued a five-phase reliability growth test to assess the reliability of some components of the ATIRCM redesign. The ATIRCM contractor completed Reliability Development Test-3B in 3QFY08.

Assessment

CMWS

- The Program Office has proposed the GEN 3 ECU upgrade in order to partially address limitations due to the changing OIF/OEF threat environments.
- In FY06, DOT&E determined that CMWS was operationally effective and suitable for the OIF/OEF combat operations when installed on the CH-47, UH-60, AH-64, and C-12 aircraft. Test results from some of the implemented incremental improvements have not been fully analyzed. Other recommendations have only been partially addressed.
- The fielded version of CMWS offers significant improvements over the legacy MWS it is replacing in the OIF/OEF environment. However, testing has shown substantial system effectiveness limitations for CMWS outside the FY06 OIF/OEF threat environments, as well as limitations caused by specific platform integration problems.
- The Army has not accredited their end-to-end CMWS simulation model, which has the potential to reduce the flight test requirements of follow-on testing.
- The Army has not coordinated test planning with DOT&E for CMWS FOT&E and the integration on new platforms as stated in the approved TEMP.

ATIRCM

- DOT&E assesses the Army's schedule for a planned full-system (CMWS and ATIRCM) IOT&E in FY10 as optimistic because there are no government test data products available to support the assessment of ATIRCM performance improvements since development of the redesigned ATIRCM began over two years ago.
- The direction of the ATIRCM program element has continued to be a source of uncertainty. Consequently, adequate test planning and resourcing is at risk.

ATIRCM/CMWS

- The combined ATIRCM/CMWS TEMP does not adequately detail current plans to integrate testing and evaluate a laser-based jamming capability integrated with CMWS.

- The approved Army Acquisition Strategy for ATIRCM/CMWS does not detail an incremental CMWS capability (Tier 1) to full threat capability, or provide an accurate timeline for planned ATIRCM and CMWS integration. Likewise, the Acquisition Strategy does not reflect the options being considered and pursued by the program manager or the Program Executive Officer.

Recommendations

- Status of Previous Recommendations. Three DOT&E recommendations from FY06 and FY07 remain valid.
- FY08 Recommendations.
  1. The Army must either establish a program Acquisition Strategy that addresses the combined requirements of the CMWS and ATIRCM and produce a matching TEMP; or formally decouple the acquisition from the ATIRCM component from the CMWS and produce a separate Acquisition Strategy and TEMP documents for ATIRCM and CMWS.
  2. The Army must continue to develop the ECU update program (GEN 3 ECU) to provide additional processing resources to both the CMWS alone and the integrated CMWS/ATIRCM programs.
  3. The Army should conduct an operational assessment of the combined CMWS and ATIRCM system in FY09 in order to assess the current operational effectiveness and suitability of CMWS and ATIRCM.

Armed Reconnaissance Helicopter (ARH)

Executive Summary

- This report is submitted in accordance with Title 10 to document testing that occurred in FY08; however, on October 16, 2008, the DoD notified Congress and Bell Helicopter that it will not certify the Armed Reconnaissance Helicopter (ARH) program for continuation. DoD officials determined through the Nunn-McCurdy certification process that the fundamental cost and schedule basis underlying the award of the ARH contract is no longer valid.
- DOT&E published an operational assessment (OA) on January 23, 2008. The OA concluded that the correction of identified Target Acquisition Sensor System (TASS) and Common Avionics Architecture System (CAAS) cockpit integration deficiencies and successful integration of remaining mission equipment are required before the Armed Reconnaissance Helicopter (ARH) can be an effective and suitable replacement for the OH-58D armed reconnaissance helicopter.
- The ARH program completed live fire testing of the main transmission, flight control system, tail rotor blades, controls and hub, and main rotor mast. The Army conducted testing under static conditions and submitted final test reports. Subsystems still requiring test and evaluation include: engine armor, aircraft structure, and the propulsion system. The Program Office deferred all dynamic Full-Up System-Level (FUSL) testing to FY09.

System

- The Army planned for the ARH to replace the OH-58D helicopter. The ARH is based on the commercial Bell Helicopter 407 and 417 designs and incorporates new designs for several major components.
- The ARH integrates the CAAS cockpit with a TASS for day, night, and marginal weather operations.
- The ARH will have a 50-caliber machine gun and be able to fire 2.75-inch aerial rockets and Hellfire missiles. The ARH plan was to have armored crew seats and cockpit floor, and engine armor. The ARH would employ Aircraft Survivability Equipment, to include radar, laser, and missile warning systems and chaff/flare dispensers.
- The acquisition objective was set at 512 aircraft (increased from the original objective of 368) with a full-rate production decision in 3QFY10. The increase would have equipped Army National Guard Apache Helicopter units with ARHs. The Army planned to have 10 ARH per troop and 30 per squadron.

Mission

- A Regimental Aviation Squadron, as part of Combat Aviation Brigades, employs ARH to conduct aerial armed reconnaissance for collection of combat information and intelligence about enemy and terrain.
- ARH squadrons provide security and early warning against enemy observation or attack for ground maneuver forces.
- ARH troop missions include:
  - Command and control
  - Communications relay
  - Convoy security
  - Nuclear/chemical surveys

Prime Contractor

- Bell Helicopter

Activity

- This report is submitted in accordance with Title 10 to document testing that occurred in FY08; however, on October 16, 2008, the DoD notified Congress and Bell Helicopter that it will not certify the Armed Reconnaissance Helicopter (ARH) program for continuation. DoD officials determined through the Nunn-McCurdy certification process that the fundamental cost and schedule basis underlying the award of the ARH contract is no longer valid.
- The Army submitted a revised ARH program deviation report on June 24, 2008, stating that due to unit cost growth exceeding critical Nunn-McCurdy thresholds, the program will require Nun-McCurdy certification.
- DOT&E approved the ARH LUT test plan on October 22, 2007.
- The Army conducted LUT 1 at Yuma Proving Grounds, Arizona, in November 2007, flying two SDD aircraft

approximately 16 hours each. Experimental Test Pilots with extensive operational and test experience executed five daytime and four nighttime missions focused on employing the aircraft's TASS and enhancing the ability of the ARH team to locate and report stationary and moving vehicular and personnel targets.
- A combined contractor and government test team continued developmental flight and ground testing on three SDD aircraft. These tests included nearly 1,200 developmental flight test hours and focused on the Advanced Flight Control System development, integration of the Forward Looking Infrared (FLIR) and CAAS software, firing/non-firing load surveys, and low altitude performance testing. Ground testing included environmental and electromagnetic compatibility testing and qualification at the component level.
- Live fire component testing completed to date includes main and tail rotor servo actuators, main rotor pitch links, main rotor swash plate assembly, tail rotor blade, hub and controls, main transmission, main rotor mast and hub, the proposed cockpit armor system, and the fuel cell. The Army conducted tests on components under static conditions and will use the test results in planning for the more realistic FUSL dynamic testing later in the program. The program is not testing the main rotor blades because the same blades were previously tested during OH-58D LFT&E.
- The program's initial fuel cell ballistic qualification testing conducted in 1QFY08 indicated self-sealing problems with the fuel bladder. A second set of ballistic tests conducted in 2QFY08 evaluated three additional design configurations. As a result of these tests the program selected a new material configuration for the fuel bladder that successfully demonstrated the required ballistic self-sealing for the fuel cell.

Assessment
- Correction of identified TASS/CAAS integration deficiencies and successful integration of remaining mission equipment is required before the ARH can be an effective and suitable replacement for the OH-58D helicopter.
- Experimental test pilots achieved mission success on four of the five day missions and two of the four night missions during LUT 1.
- Flight handling qualities of the ARH were better than the Kiowa Warrior during LUT 1, but the pilots operated with a limited power margin during tactical maneuvers.
- The integration of the TASS and CAAS software for the reconnaissance/attack application is not mature. TASS tracking and laser target location error performance is not acceptable. The combined TASS/CAAS workload is high for highly experienced experimental test pilot crews flying operational scenarios.
- The ARH platform achieved user desired reliability during flight training and testing. Both LUT 1 aircraft completed all nine missions without a system abort.
- LUT 2 will be more demanding than LUT 1, consistent with production-representative aircraft and the increased capabilities available to the ARH.
- Developmental and integration testing delays have caused more than a two-year lapse for the Army to update the ARH Test and Evaluation Master Plan (TEMP). The TEMP update is ongoing. The current ARH program is schedule-driven leaving limited time to adequately address problems that may result from developmental testing prior to the IOT&E.
- The LFT&E Strategy includes FUSL testing. Component/subsystem live fire testing is providing an adequate understanding of ballistic impact and damage results.

Recommendations
- Status of Previous Recommendations. The Army was adequately addressing the FY07 recommendations.
- FY08 Recommendations. In light of the cancellation of the program, there are no recommendations.

Armored Tactical Wheeled Vehicles - Army

Executive Summary

- The Army is adding armored cabs to tactical wheeled vehicles. The urban and non-linear battlefields of Iraq and Afghanistan made crews of tactical wheeled vehicles susceptible to small arms fire, mines, IEDs, and rocket-propelled grenades.
- Various tactical wheeled vehicles are undergoing armor upgrade development, which include live fire and operational testing.

System

- The following tactical wheeled vehicle systems designed armor protection kits and began testing in the last fiscal year:
  - The Heavy Expanded Mobility Tactical Truck (HEMTT) is a family of heavy tactical trucks with a carrying capacity of 10 tons.
  - The Palletized Load System (PLS) is a heavy tactical truck with a 16.5-ton capacity, capable of self-loading, unloading, and pulling a 16.5-ton capacity trailer. The PLS is basically the same as the HEMTT, but with a higher weight capacity and an extra axle in the rear. The armored cabs are identical.
  - The M915A5 Line Haul Tractor is a diesel-powered, 6x4 truck tractor system that will be compatible with the M872 and other legacy tankers and trailers.
  - The High Mobility Multi-purpose Wheeled Vehicle (HMMWV) is a light, highly mobile, diesel-powered, four-wheel-drive utility vehicle that is configured as a troop carrier, armament carrier, shelter carrier, ambulance, anti-tank guided-missile carrier, or scout vehicle.
- The following tactical wheeled vehicle systems are in the planning and development stages of up-armoring their cabs:
  - The Expanded Capacity Vehicle (ECV2) is a HMMWV variant that intends to restore lost payload, performance, and crew protection.
  - The XM1160 Medium Extended Air Defense System (MEADS) Carrier is an extended variant of the Family of Medium Tactical Vehicles (FMTV).
  - The Joint Light Tactical Vehicle (JLTV) will consist of three payload categories: A (3,500 pounds); B (4,000 pounds for the Marine Corps and 4,500 pounds for the Army); and C (5,100 pounds). Each variant is equipped with a companion trailer. Each Service will configure the vehicle for general-purpose mobility, infantry carrier, reconnaissance, heavy guns carrier, anti-tank guided-missile carrier, ambulance, and shelter carrier.

Mission

The Army employs truck systems as multi-purpose transportation and unit mobility vehicles in maneuver, maneuver support, and sustainment units. The threat to tactical wheeled vehicles has increased, which has created a need for augmented and flexible mission-based ballistic protection.

- The Army issues HEMTT to distribution companies and general supply sections of forward support companies of brigade support battalions. These companies deploy units to a new theater of operations, relocate units to new operating sites, establish unit areas of operations, provide supply and transport support, defend assigned areas, and redeploy units to home station.
- The M915A5 is a tractor truck used primarily in active and reserve component transportation units for the rapid transport of bulk and containerized supplies from ocean ports to division support areas within a theater of operation.

ECV2

HEMTT

M915A5

Prime Contractors

- AM General
- BAE Systems
- Oshkosh

Activity

- In FY08, the Army conducted the following live fire testing:
  - All the truck programs are taking a common building block approach to live fire testing. It begins with ballistically characterizing the armor solutions, followed by a series of exploitation shots against the base armor and armor protection kits of prototype cabs. The focus is on armor and door seams, windows, latches, and seals using small arms threats. Final testing includes full-up and system-level tests against production vehicles using realistic threats such as mines, IEDs, explosively formed penetrators, and rocket-propelled grenades.
  - The Army completed HEMTT full-up and system-level tests at Aberdeen Test Center, Maryland, in FY08.
  - Since the PLS truck uses the same cab as the HEMTT vehicle, DOT&E will make a live fire evaluation of the PLS based on the testing completed on the HEMTT.
  - The Army began M915A5 ballistic armor characterization testing in September 2008.
- In FY08, the Army conducted the following operational testing:
  - The Army conducted a follow-on operational test of the armored cab-equipped HEMTT light equipment tractor and load handling system variant at Fort Campbell, Kentucky, from October 9 to November 2, 2007.
  - The Aberdeen Test Center conducted ongoing Production Verification Testing of the HEMTT at various locations from June 2006 to August 2008.

Assessment

- During FOT&E, the HEMTT did not meet its reliability or maintainability requirements, which negatively impacted HEMTT mission success since the system was often unavailable due to repairs. The HEMTT scheduled maintenance burden is a function of the base vehicle, not the added armor.
- HEMTT provides armor protection to the crews against the likely threats while still maintaining mission capability.
- Live fire system-level testing of the HEMTT truck revealed vulnerabilities in the floor of the cab. As the PLS cab is identical to the HEMTT cab, the same vulnerabilities exist.

Recommendations

- Status of Previous Recommendations. This is the first annual report for this program.
- FY08 Recommendations.
  1. The Army should incorporate both live fire and opposed force-on-force events in future operational testing.
  2. The program managers of the HEMTT and PLS should consider strengthening the floor armor of their cabs.
  3. Additional live fire testing will be required if armor upgrades or design changes are developed for any of the currently tested vehicles.

Excalibur XM982 Precision Engagement Projectiles

Executive Summary

- Paladin-equipped units in Operation Iraqi Freedom have been using Excalibur since May 2007 to engage targets. As of July 2008, Field Artillery units have fired over 66 rounds with reported accuracy better than 10 meters and 80 percent effects on target.
- M777A2 Lightweight 155 mm Howitzer-equipped artillery units have been using Excalibur in Operation Enduring Freedom and Operation Iraqi Freedom since February 2008.
- The Army awarded design and maturation contracts for full and open competition for Excalibur Increment Ib to reduce unit cost and improve reliability.

System

- Excalibur is a family of precision-guided, 155 mm artillery projectiles.
- The Army plans to develop three Excalibur variants:
  - High Explosive, Unitary (Increment I)
  - Smart (Increment II)
  - Discriminating (Increment III)
- The Army is developing the High Explosive, Unitary Projectile (Increment I) in three spirals of increasing capability (Ia-1, Ia-2, and Ib).
- All variants use GPS and an Inertial Measurement Unit to attack point targets with an accuracy of less than 20 meters from the desired aim point.
- The projectiles are fin-stabilized and glide to their target. The Ia-1 projectiles use aerodynamic lift generated by canards to extend range out to 24 km. The Ia-2 projectiles add base bleed technology to further increase range to 30 km.

Mission

Artillery units will use Excalibur to provide fire support to combat maneuver units in all weather and terrain, including urban areas.

Artillery units will use:

- The High Explosive, Unitary Projectile (Increment I) to attack stationary targets in complex and urban terrain and minimize collateral damage
- The Smart Projectile (Increment II) to engage moving and time sensitive targets
- The Discriminating Projectile (Increment III) to search, detect, and selectively engage individual vehicles by distinguishing specific target characteristics

Prime Contractors

- Bofors
- Raytheon

Activity

Increment Ia-1

- Paladin-equipped units in Operation Iraqi Freedom have been using Excalibur since May 2007 to engage targets. As of July 2008, Field Artillery units have fired over 66 rounds with reported accuracy better than 10 meter and 80 percent reliability.
- Following the February 2008 extension of the Excalibur material release to the M777A2 Lightweight 155 mm Howitzer, artillery units in Operation Enduring Freedom and Operation Iraqi Freedom have also been using Excalibur projectiles.

Increment Ia-2

- In the first half of FY08, the program manager conducted a series of Sequential Environmental Tests for Safety and Performance for the Excalibur Increment Ia-2 projectile. The tests evaluated the projectile’s base bleed technology against the requirements identified in the Capability Production Document. The projectile demonstrated 80 percent reliability during the performance tests, which included test firings with the maximum charge. These tests also integrated live fire testing to collect data for lethality analysis by using an array of realistic targets as aim-points.

- In January 2008, the Army fired six Excalibur Increment Ia-2 projectiles at the Cold Regions Test Center, Alaska, in minus 35 degree Fahrenheit weather. Three rounds hit the target with better than 10-meter accuracy. The other three rounds were reliability failures. Two rounds experienced Inertial Measurement Unit (IMU) built-in-test failures that caused them to fly to the ballistic impact point. A software problem with the fuze setter sent incorrect GPS data to the third round that failed.
- The contractor redesigned the base with stronger threads following separation of a projectile base in testing with a foreign cannon and non-standard charges. The program manager continues base qualification testing to demonstrate improved reliability.
- The contractor has selected a new IMU vendor to improve projectile reliability when used with the maximum propellant charge. The Army will conduct further testing to qualify the new IMU and demonstrate that the projectile meets reliability and performance requirements with all propellant charges.
- The contractor has redesigned the GPS antennas and software to improve performance in GPS jamming environments. Additional testing in 2QFY09 should demonstrate the projectile's capabilities in jamming environments.
- The Army postponed the Initial Operational Test by seven months to allow more time to grow reliability to the required 85 percent and align Excalibur testing with development of the Advance Field Artillery Tactical Data System (AFATDS) software version needed to support Excalibur fielding.

Increment Ib

- In September 2008, the Army awarded design and maturation contracts through full and open competition for Excalibur Increment Ib to reduce unit cost and improve reliability. The companies will evolve their proposed concepts and then demonstrate them in a side-by-side live firing event. The Army will then select a single contractor to move forward with the qualification and initial production of the Increment 1b projectile.

Assessment

- The Excalibur Increment Ia-1 projectile achieved the desired lethal effects against personnel and structure targets during the February 2007 Limited User Test. The projectile met reliability, safety, and suitability goals for early release to combat forces. Fielding to artillery units in Operation Iraqi Freedom in 2007 has enhanced their ability to precisely strike targets requiring minimal collateral damage.
- The Excalibur Increment Ia-2 projectile demonstrated effectiveness against personnel and structure targets in an unjammed environment. The Army expects the projectile will meet reliability, lethality, and safety requirements before the Initial Operational Test scheduled for 2QFY09.
- There is significant risk to achieving performance requirements in a GPS jamming environment for all Excalibur projectiles. The contractor and program manager have developed a plan for the Ia-2 projectile to address projectile susceptibility from accredited GPS jamming threats to overcome this. The projectile will have adequate opportunity in the remaining test events to demonstrate performance in a jamming environment.
- The Smart (Increment II) and Discriminating (Increment III) projectiles have been proposed to document the Army's intent to pursue incremental improvements as technology matures. These projectiles will incorporate target discrimination capabilities. The previous efforts to field projectiles with target discrimination capabilities were successful against fully exposed benign targets, but consistently not successful against targets that employed active and passive countermeasures. Successfully demonstrating target discrimination capabilities in the future is a concern.

Recommendations

- Status of Previous Recommendations. The Army is making progress on DOT&E's previous recommendations.
- FY08 Recommendation.
  1. The Army should closely monitor AFATDS Version 6.6 development for indications of further delays.

Family of Medium Tactical Vehicles (FMTV)

Executive Summary

- The Army conducted a follow-on operational test of armored cab-equipped Family of Medium Tactical Vehicles (FMTV) cargo variants at Fort Campbell, Kentucky, from October 9 to November 2, 2007. The cargo variants met the user's reliability and maintainability requirements.
- The Army conducted a Limited User Test on the 10-Ton Dump Truck at Fort Bragg, North Carolina, from October 19 to November 15, 2007. Test results indicate that the 10-Ton Dump Truck exceeds its Key Performance Parameter of transporting and dumping a payload of not less than 8 tons at 5 cubic yards.
- Two systemic 10-Ton Dump Truck-specific failures impeded mission accomplishment. The instrument panel lights flash when operators apply the brakes in the blackout drive mode, and failures of the hydraulics system cause the dump bed to be stuck in the "up" position. The Army is implementing corrective actions for these failures, but without adequate verification testing of the hydraulic system failure solution.

System

- The Medium Tactical Vehicle 10-Ton Dump Truck is mounted on an enhanced FMTV 5-Ton wrecker chassis. It includes a 14-foot high strength, dump body with a 10 cubic yard capacity. It is capable of transporting and dumping bulk construction materials weighing up to 20,000 pounds. The vehicle is capable of accepting a cover kit and troop seats for dual application as a troop carrier, and is certified to transport ammunition and materials with appropriate blocking, bracing, and tie downs
- This is the last planned variant of the FMTV fleet to be tested.
- The Army intends the 10-Ton Dump Truck to replace the existing FMTV 5-Ton Dump Truck and legacy M900 Series 5-Ton Dump Truck.
- The program manager designed armor protection kits for the 2.5-ton and 5-ton cargo variants.

Mission

- Heavy Combat Engineer Battalions and Combat Engineer Companies of Heavy Brigade Combat Teams will use the 10-Ton Dump Truck to transport and dump bulk construction material (e.g., dirt, sand, gravel, blast rock, and other construction material) in support of mobility, counter-mobility, and survivability missions on both linear and non-linear battlefields. The Army will also use the truck to transport up to 12 Soldiers, engineer squad equipment, and ammunition.
- The Army operates the FMTV worldwide for multi-purpose transportation and unit mobility by maneuver, maneuver support, and sustainment units. Land force units use the FMTV at battalion and company level with missions of maneuver, maneuver support, and sustainment.

Prime Contractor

- BAE Systems

Activity

- The Army conducted a Limited User Test on the 10-Ton Dump Truck at Fort Bragg, North Carolina, from October 19 to November 15, 2007.
- The Army conducted a follow-on operational test of armored cab-equipped FMTV cargo variants at Fort Campbell, Kentucky, from October 9 to November 2, 2007.
- The Army completed FMTV ballistic cab testing and system-level testing in FY08.
- The program manager is recompeting a five-year contract for an additional 20,000 in FY09.

Assessment

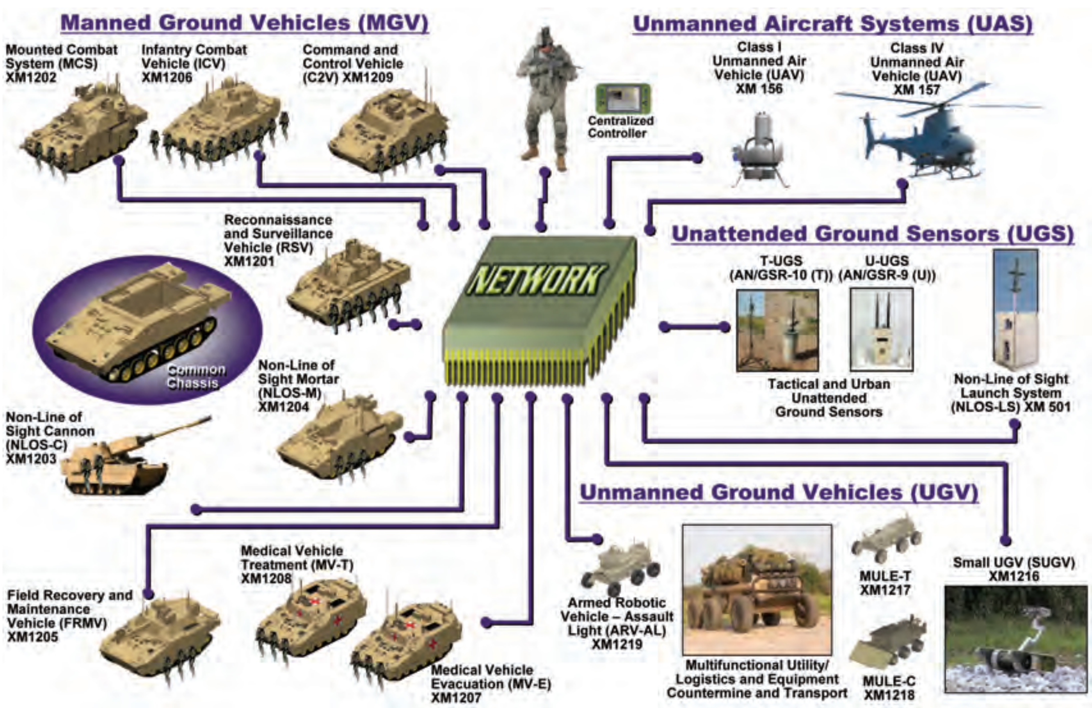
- The 10-Ton Dump Truck:
  - The truck exceeds it's Key Performance Parameter of transporting and dumping a payload of not less than 8 tons at 5 cubic yards.
  - Instrument panel lights flash when operators apply the brakes in the blackout drive mode limiting mission effectiveness under blackout drive conditions. The Army has tested and implemented an adequate solution.
  - The failures of the hydraulics system cause the dump bed to be stuck in the "up" position significantly impeding mission

accomplishment. The Army implemented a solution without adequate verification testing.
  - The Field-Level Maintenance Training Manual/Integrated Electronic Technical Manuals (TM/IETMs) are inaccurate and the vehicle is currently not maintainable when using the Army wheeled vehicle maintenance standards and practices. The Army continues to appropriately update TM/IETMs.
  - Load-sensor procedures were cumbersome, accuracy was sporadic, and the test unit routinely ignored sensor readings during the Limited User Test. There is potential for Soldiers not to use the load sensor in combat environments.
- The armored cab-equipped FMTV cargo variants:
  - The FMTV 2.5-ton variant met its user's requirement for reliability in the follow-on test.
  - The armored cab-equipped FMTV cargo variants met their maintainability requirement.

Recommendations

- Status of Previous Recommendations. There were no previous recommendations.
- FY08 Recommendations.
  1. The Army should conduct additional testing that includes sufficient miles and dump cycles to appropriately verify the correction of hydraulic system failures.
  2. The program manager must submit an updated Test and Evaluation Master Plan reflecting recompetition.

Future Combat Systems (FCS)



Executive Summary

- In 2008, the Army redefined its approach for the Spin Out of FCS systems to current force Brigade Combat Teams (BCTs). FCS Spin Out systems will now be fielded first to Infantry Brigade Combat Teams (IBCT) as opposed to the Heavy Brigade Combat Teams, as previously planned. As a result of this program refocus, the IBCT Spin Out Limited User Test (LUT) scheduled for the summer of 2008 was rescheduled for summer 2009.
- The FCS Spin Out program is reported on separately.
- Design efforts for all FCS systems are ongoing. All preliminary design reviews (PDR) for FCS systems are planned to be completed in early FY09 leading to an FCS system-of-systems PDR in the spring of 2009.
- During FY08, the FCS program executed a wide variety of developmental testing for each FCS system.
- The FCS program continued its efforts to develop armor upgrades for the Manned Ground Vehicles (MGV) aimed at achieving a satisfactory level of vehicle ballistic protection within vehicle weight constraints.

System

FCS is a networked system-of-systems consisting of 14 manned or unmanned systems linked together by an information network. The information network connects FCS via an advanced network architecture to provide joint connectivity and enhance situational awareness, understanding, and synchronized operations. FCS is a system-of-systems which encompasses the FCS program systems and other Army and joint complementary systems in order to meet the missions of the FCS BCTs.

The FCS program consists of manned and unmanned platforms that include:

Manned Ground Vehicles

- Combat Vehicles:
  - Command and Control Vehicle (XM1209)
  - Infantry Combat Vehicle (XM1206)
  - Non-Line-of-Sight Cannon (XM1203)
  - Non-Line-of-Sight Mortar (XM 1204)
  - Mounted Combat System (XM1202)
  - Reconnaissance and Surveillance Vehicle (XM1201)
- Maneuver sustainment vehicles:
  - Medical Vehicle (Evacuation and Treatment variants) (XM1207/XM1208)
  - Field Recovery and Maintenance Vehicle (XM1205)

The Non-Line-of-Sight Cannon (NLOS-C) is the lead vehicle in the development of Manned Ground Vehicles. A detailed report on this system is provided following this overview.

Unmanned Aerial Systems (UAS) (Four variants)

CLASS	FCS UNIT SIZE	TIME ON STATION	OPERATIONAL RADIUS
I	Platoon	50 minutes	8 km
**II*	*Company*	*2 hours*	*16 km*
**III*	*Battalion*	*6 hours*	*40 km*
IV	Brigade	24 hours	75 km

**The Army deferred development of the Class II and III UAS as part of the FCS program. Class II and III UAS remain an FCS objective requirement.*

The Army intends the FCS UAS to be multi-functional and mission tailorable. They are to operate in varying terrain, including urban environments, and be teamed with manned aircraft and ground maneuver forces. A detailed report on this system is provided following this overview.

Unmanned Ground Vehicles (Three types)

TYPE	FUNCTIONS
Small Unmanned Ground Vehicle (SUGV) (XM1216)	Reconnaissance of urban and subterranean battlespace
**Armed Robotic Vehicle (ARV) (two variants):* • *ARV-Reconnaissance, Surveillance, and Target Acquisition* • *ARV-Assault*	• *Reconnaissance, surveillance, and target acquisition* • *Line-of-sight and beyond line-of-sight fires*
Multi-functional Utility/ Logistics Equipment (MULE) (three variants): • MULE – Transport (XM1217) • MULE - Countermine (XM1218) • MULE-ARV - Assault (Light) (XM1219)	• Transport of equipment and supplies • Direct fire in support of dismounted infantry • Detection of mines and IEDs

**The Army deferred development of the larger ARV from the current FCS program. The ARVs require more technological maturity before entering into system development. ARVs remain an FCS objective requirement.*

The Army plans to equip the MULE variants with the Autonomous Navigation System to provide the capability to operate all UGVs either in a man-in-the loop mode or in a semi-autonomous mode.

Unattended Munitions

The Army intends the Non-Line-of-Sight Launch System (NLOS-LS) to provide networked, extended-range targeting, and precision attack of stationary and moving targets. It consists of a Container Launch Unit (CLU), with self-contained tactical fire control electronics and software for remote and unmanned operations, and the Precision Attack Munition. The program intends NLOS-LS to be able to fire missiles with the CLU on the ground or mounted on a transport vehicle. A detailed report on NLOS-LS is provided following this overview.

Unattended Ground Sensors

FCS Unattended Ground Sensors (UGS) are an array of networked sensors capable of target detection, location, and classification. UGS consist of multiple types of sensors to include acoustic, seismic, magnetic, electro-optical/infrared sensors, and radiological/nuclear sensors. UGS are to be employed to provide enhanced threat warning and situational awareness. A detailed report on UGS is provided following this overview.

The FCS UGS program is developing two major sensors:

- Tactical-UGS (AN/GRS-10):
  - Intelligence, surveillance, and reconnaissance sensors
  - Radiological and nuclear sensors
- Urban-UGS (AN/GRS-9) is an array of small, lightweight imagery and intrusion detection sensors emplaced in urban structures.

Battle Command Network

The Battle Command Network is the information network that links together the FCS system-of-systems. The Battle Command Network consists of hardware and software to deliver video, still images, voice, data, and network control services throughout the FCS BCT. The network is to provide an interconnected set of information capabilities for collecting, processing, displaying, disseminating, storing, and managing information on demand with secure and reliable access by Soldiers throughout the FCS BCT. The Army intends for the network to include communications payloads on all FCS ground and air platforms and network management software distributed on all platform computers and communications payloads.

Mission

The FCS BCT will perform all tactical operations – offensive, defensive, stability, and support – currently conducted by light infantry, Stryker, and heavy mechanized forces. The Army intends for the FCS BCT to provide a measurable improvement over current brigade combat teams in terms of deployability, maneuverability, survivability, lethality, battle command, sustainability, and joint interoperability.

Prime Contractors

- Lead Systems Integrators: Boeing/SAIC

Activity

- In 2008, the Army redefined its approach for the Spin Out of FCS systems to current force BCTs. FCS Spin Out systems will now be fielded first to IBCTs as opposed to the Heavy Brigade Combat Teams, as previously planned. As a result of this program refocus, the IBCT Spin Out LUT scheduled for the summer of 2008 was rescheduled for summer 2009.
- Design efforts for all FCS systems are ongoing. All PDR for FCS systems are planned to be completed in early FY09 leading to an FCS system-of-systems PDR in the spring of 2009.
- During FY08, the FCS program executed a wide variety of developmental testing for each FCS system.
- The FCS program continued its efforts to develop armor upgrades for the MGVs aimed at achieving a satisfactory level of vehicle ballistic protection within vehicle weight constraints.

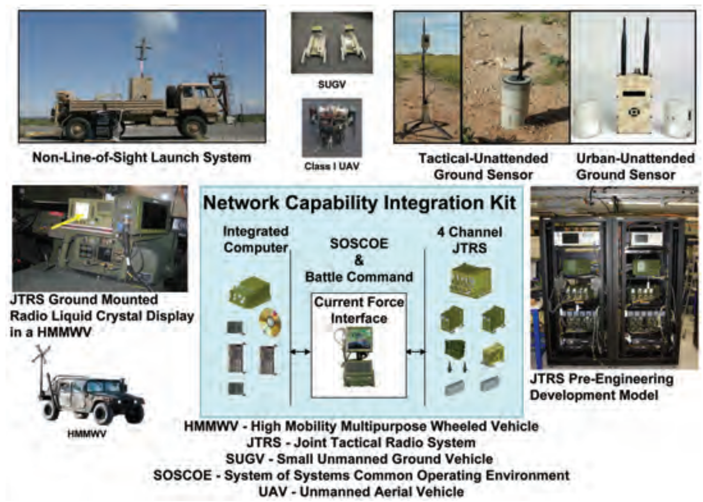
Assessment

- The Army Evaluation Task Force at Fort Bliss, Texas, remains key to the FCS program by providing a stable, dedicated brigade-size unit to support FCS throughout the course of its developmental and operational testing.
- Armor upgrades for the MGV are a technological challenge for the FCS program and are critical to the fielding of operationally effective, suitable, and survivable MGVs.
- Overall platform survivability will be dependent upon an effective Hit Avoidance System that includes an Active Protection System. While Active Protection System technologies are showing some promise in testing, it is not yet clear if their performance will make up for lesser levels of MGV armor protection than those found in current force combat vehicles such as the Abrams and Bradley.
- The FCS program continues to synchronize Joint Tactical Radio System (JTRS) and Warfighting Information Network -Tactical (WIN-T) systems development schedules. Progress is being made, but this remains a significant risk area for the FCS program. The effectiveness of the FCS battle command network will depend upon JTRS and WIN-T performance.
- Adequate operational testing of the FCS BCT requires a high fidelity Real Time Casualty Assessment (RTCA) system. The ability to adequately evaluate the force-level lethality and survivability of the FBCT is highly dependent upon such RTCA.

Recommendations

- Status of Previous Recommendations. The program is addressing the 10 previous recommendations.
- FY08 Recommendations.
  1. In the FY09 Test and Evaluation Master Plan update, the FCS program must:
     - Retain the existing planned series of operational test events culminating in an IOT&E with a fully equipped FCS BCT operating in a sophisticated and robust enemy threat environment. The live brigade-size IOT&E will be essential to assessing the operational effectiveness and suitability of the FCS system-of-systems.
     - Clarify the path for developing and integrating the evolving MGV armor upgrades.
  2. The Army should review its test instrumentation development and procurement strategy to ensure that an adequate high fidelity RTCA system is available to support FCS operational testing.

Future Combat Systems: Infantry Brigade Combat Team (FCS: IBCT) Spin Out



Executive Summary

- In 2008, the Army redefined its approach to the Spin Out of FCS systems to current force Brigade Combat Teams (BCTs). FCS Spin Out systems will now be fielded first to Infantry Brigade Combat Teams (IBCTs) as opposed to the Heavy Brigade Combat Teams, as previously planned.
- As a result of this program refocus, the IBCT Spin Out Limited User Test (LUT) scheduled for July 2008 was rescheduled for summer of 2009.
- The main technical challenge to Spin Out systems will be the ability to effectively manage and integrate battlefield information and images from the Unattended Ground Sensors (UGS), Class I Unmanned Air Systems (UAS) Block 0, and Small Unmanned Ground Vehicle (SUGV) on the Spin Out network.

System

- The Army intends to use the FCS IBCT Spin Out program to field selected FCS systems to current force IBCTs. The Army plans to field the first IBCT equipped with Spin Out systems in FY11.
- Planned FCS IBCT Spin Out capabilities include:
  - Network Capability Integration Kit mounted on a High Mobility Multi-purpose Wheeled Vehicle (HMMWV), consisting of:
    - Integrated Computer System with FCS battle command software
    - Force XXI Battle Command, Brigade and Below (FBCB2) Joint Capability Requirement software
  - Four channel Joint Tactical Radio System – Ground Mobile Radios (JTRS GMR)
  - Unattended Ground Sensors (UGS)
    - Tactical UGS (T-UGS) including a Gateway, Intelligence, Surveillance, and Reconnaissance sensors, Radiological and Nuclear (RN) sensors, and Electro-Optical/Infrared (EO/IR) sensors
    - Urban UGS (U-UGS), which are small, leave-behind imaging and intrusion detection sensors emplaced in structures such as buildings, caves, and tunnels
  - Non-Line-of-Sight Launch System (NLOS-LS) consisting of:
    - Container Launch Unit, which holds 15 missiles (maximum range out to 40 km), and a Computer and Communications System
    - In the IBCT Spin Out, the Battle Command for the Non Line of Sight Launch System is the Advanced Field Artillery Tactical Data System
  - Class I UAS, Block 0
  - Small Unmanned Ground Vehicle, Block 1
- The Army currently plans to equip IBCTs with additional FCS Spin Out systems starting in FY13. These additional Spin Out systems include:
  - Class IV UAS
  - Multi-functional Utility/Logistics and Equipment (MULE) countermine unmanned ground vehicle
  - Armed Robotic Vehicle – Assault Light (ARV-L)

Mission

IBCT's equipped with Spin Out systems will perform all tactical operations – offensive, defensive, stability, and support – currently conducted by light infantry forces. The Army intends the Spin Out systems to enhance IBCT intelligence, surveillance, and reconnaissance, precision indirect fires, and command and control capabilities.

Prime Contractors

- Lead Systems Integrators: Boeing/SAIC
- Class I UAS: Honeywell
- NLOS-LS: Raytheon
- UGS: Textron

Activity
- In 2008, the Army redefined its approach to the Spin Out of FCS systems to current force BCTs. FCS Spin Out systems will now be fielded first IBCTs as opposed to the Heavy Brigade Combat Teams, as previously planned.
- As a result of this program refocus, the IBCT Spin Out LUT scheduled for July 2008 was rescheduled for summer 2009.
- In 2008, the FCS program executed several significant test events for Spin Out to include a Technical Field Test (TFT), a developmental test event conducted under field conditions at White Sands Missile Range, New Mexico. The TFT provided significant data to assess development of the UGS, NLOS-LS, and the Spin Out network. In addition to the TFT, the program executed a Preliminary LUT (P-LUT) in July 2008 with the Army Evaluation Task Force. The P-LUT included for the first time, the Class I UAS and the SUGV, the new additions to Spin Out systems. The P-LUT provided an early look at the redefined IBCT Spin Out.
- Detailed reports on UGS, NLOS-LS, and the Class I UAS are provided after this overview.

Assessment
- The Army's decision to shift the Spin Out focus to the IBCT's will provide an opportunity to further mature Spin Out systems prior to the Spin Out LUT in the summer of 2009. The TFT conducted this year identified a number of deficiencies, particularly in the performance of the T-UGS and its integration into the Spin Out network, which should be able to be resolved prior to the Spin Out LUT.
- The Class I UAS Block 0 and the SUGV Block 1 both demonstrated a level of performance in the P-LUT that should enable them to be effectively integrated into the Spin Out.
- The main technical challenge to Spin Out systems will be the ability to effectively manage and integrate battlefield information and images from the UGS, Class I UAS, and the SUGV on the Spin Out network.

Recommendations
- Status of Previous Recommendations. The previous five recommendations are addressed in the detailed reports on NLOS-LS and UGS.
- FY08 Recommendations. None.

Future Combat Systems: Non-Line-of-Sight Launch System (FCS: NLOS-LS)

Executive Summary

- The Non-Line-of-Sight Launch System (NLOS-LS) participated in the Future Combat Systems (FCS) Preliminary Limited User Test (P-LUT) in July 2008 with the Army Evaluation Task Force. The P-LUT provided an early look at how NLOS-LS will support the redefined Infantry Brigade Combat Team Spin Out.
- The program is making progress, but is schedule-driven leading up to the NLOS-LS Flight Limited User Test (LUT) in 3QFY09. The current schedule has little time to analyze failures should they occur or develop fixes and apply them to the missiles.
- The NLOS-LS unitary warhead is meeting expected performance levels for fragmentation and armor penetration.

System

- The XM501 NLOS-LS is a core FCS program the Army will field to Infantry Brigade Combat Teams.
- The NLOS-LS consists of a Container Launch Unit (CLU) with self-contained electronics and software for remote and unmanned operations. The CLU can be fired from the ground or from a variety of vehicles.
- Each CLU contains a computer, communications system, and 15 Precision Attack Missiles (PAM).
- The PAM is a modular guided missile that receives target information prior to launch and can respond to target location updates during flight.
- PAMs are designed to defeat high-payoff light and heavy armored targets, either moving or stationary at ranges up to 40 km.
- The PAM supports four targeting modes:
  - Laser-designation: the PAM follows the laser beam from the forward observer to the target
  - Laser-anointed: the PAM is initially guided by the laser then uses it's infrared seeker and algorithms to select the aimpoint to the target
  - Autonomous operation mode: the PAM finds targets autonomously using its infrared seeker and computer algorithms
  - GPS mode: the PAM flies to a specific aimpoint using GPS and inertial guidance
- In the Infantry Brigade Combat Team Spin Out, Soldiers communicate with the missile, through the CLU, using the Advanced Field Artillery Tactical Data System. When the full FCS network is complete, Soldiers will communicate directly with the missile from a variety of nodes.

Mission

The Infantry Brigade Combat Teams will use NLOS-LS sections, composed of six CLUs, transported on three Family of Medium Tactical Vehicles, and a Control Cell located within the NLOS-Cannon battalions, to provide a precision-guided munitions launch capability to attack moving and stationary point targets such as tanks, armored troop carriers, and artillery.

Prime Contractors

- Lockheed Martin
- Raytheon

Activity

- Soldiers from the Army Evaluation Task Force tested the NLOS-LS during the Spin Out Tactical Field Test (TFT) in March 2008 and the Force Developmental Test and Evaluation (FDT&E) in May 2008. Tests were conducted at White Sands Missile Range, New Mexico, and Fort Bliss, Texas, respectively. CLU reliability and the tactics, techniques, and procedures for employing NLOS-LS were the focus of these tests.

- NLOS-LS participated in the P-LUT in July 2008 with the Army Evaluation Task Force. The P-LUT provided an early look at how NLOS-LS will support the redefined IBCT Spin Out.
- The program manager has conducted seven early developmental PAM flight tests at White Sand Missile Range, New Mexico, between April 2007 and July 2008. Four tests were successful, demonstrating the PAM's ability to launch, fly a pre-designated route, and impact near an intended aimpoint. The test missiles did not have warheads or seekers, and used only inertial navigation. The program manager intends to test tactical missiles with seekers in 1QFY09.
- During FY08, the program completed developmental and live fire qualification warhead testing against static and dynamic range targets, fragmentation arena tests, and armor penetration tests considering adverse environments using production-representative warheads.

Assessment

- The program is making progress, but is schedule-driven leading up to the NLOS-LS Flight LUT in 3QFY09.
- Early flight tests in 2007 experienced failures at launch and initial flight resulting in test delays. The recent successes indicate the program manager appears to have fixed the problems, but more complicated flight tests with sensors remain. The schedule-driven flight tests leave little chance for reliability growth should the program experience failures. Additional time may be needed if the upcoming tests reveal further problems.
- Six NLOS-LS CLUs participated in the TFT and FDT&E. The program did not meet CLU reliability requirements during the TFT. The CLU's did meet reliability requirements during the FDT&E where there were fewer operating hours. The program manager is planning additional developmental testing for 2009.
- The NLOS-LS unitary warhead is meeting expected performance levels for fragmentation and armor penetration. The missile must target and hit precisely those areas that are vulnerable to the warhead in order to achieve expected lethality levels against heavy armor.
- The Army is involving Soldiers early in the design process for the NLOS-LS interface to develop systems that Soldiers can easily use in a combat environment.
- The change to an Infantry Brigade Combat Team Spin Out focus may change the employment tactics, techniques, and procedures and target set of NLOS-LS. The Army continues to evaluate these potential changes.

Recommendations

- Status of Previous Recommendations. The Army continues to address the two FY06 and FY07 recommendations.
- FY08 Recommendations. The Army should:
  1. Expand the Developmental Flight Test window to allow time to analyze failures, develop fixes, and apply them to the missiles should they occur.
  2. Increase countermeasure testing in the technical flight tests. Previous efforts to field projectiles with discriminating or smart warheads have been successful against benign targets, but have been less successful against targets that employ passive countermeasures.
  3. Reexamine the current target set for the NLOS-LS and consider soft-skinned targets (trucks, civilian, or military non-combat vehicles) as potential targets in the flight LUT.

Future Combat Systems: Unattended Ground Sensors (FCS: UGS)

Executive Summary

- In 2008, the Army redefined its approach to the Spin Out of Future Combat Systems (FCS) systems to current force Brigade Combat Teams (BCTs). FCS Spin Out systems will now be fielded to Infantry Brigade Combat Teams (IBCTs) first as opposed to the Heavy Brigade Combat Teams (HBCTs), as previously planned. As a result of this program refocus, the IBCT Spin Out Limited User Test (LUT) scheduled for the summer of 2008 was rescheduled for summer 2009.
- The FCS program executed several test events for the Unattended Ground Sensor (UGS) program, to include a Technical Field Test (TFT), and a developmental test event conducted under tactical conditions at Fort Bliss, Texas. Included in this testing was a Preliminary LUT (P-LUT) in July 2008 in conjunction with the Army Evaluation Task Force at Fort Bliss in July 2008.
- New Tactics, Techniques, and Procedures (TTPs) must be developed to accommodate the transition of UGS deployments with IBCTs instead of HBCTs.

Tactical-Unattended Ground Sensor (T-UGS) Urban-Unattended Ground Sensor (U-UGS)

System

- FCS has two unattended ground sensors, Tactical-Unattended Ground Sensor (T-UGS) and Urban-Unattended Ground Sensor (U-UGS) capable of target detection, location, and classification. UGS consist of multiple types of sensors to include acoustic, seismic, magnetic, electro-optical/infrared sensors, and radiological/nuclear sensors.
- Tactical-UGS systems are self-organizing networks of remotely deployed, long-range sensors designed to enhance perimeter defenses of forward operating bases and other facilities. It includes a gateway for transmission of information to the FCS network and fusion of data from its various sensors.
- Tactical-UGS sensors include the intelligence, surveillance, and reconnaissance sensors, radiological and nuclear sensors, and electro-optical/infrared sensors. T-UGS are hand-emplaced and hand-retrieved at the end of missions.
- Urban-UGS are small, leave-behind imaging and intrusion detection sensors, similar to commercial burglar alarms that are emplaced in buildings, caves, or tunnels. Information is transmitted to the FCS network via a hand-held gateway.

Mission

Units will employ UGS to provide remote perimeter defense, surveillance, target acquisition, and situational awareness, and high-yield explosive radiological and nuclear early warning.

Prime Contractor

- Textron

Activity

- In 2008, the Army redefined its approach to the Spin Out of FCS systems, which includes both the T-UGS and U-UGS, to current force BCTs. FCS Spin Out systems will now be fielded to IBCTs first as opposed to the HBCTs, as previously planned. As a result of this program refocus, the IBCT Spin Out LUT scheduled for the summer of 2008 was rescheduled for summer 2009.
- The FCS program executed several test events for UGS, to include a TFT, and a developmental test event conducted under tactical conditions at Fort Bliss, Texas.
- The program executed a P-LUT in July 2008 in conjunction with the Army Evaluation Task Force at Fort Bliss in July 2008. The P-LUT provided an early look at the redefined IBCT Spin Out.

Assessment

- The Army's decision to shift the Spin Out focus to the IBCTs will provide an opportunity to further mature UGS prior to the LUT in the summer of 2009. The TFT conducted in 2008 identified a number of indicators of the maturing technological advancement and challenges of UGS specifically in the areas of the detection distances of targets as well as communication range between systems.

- During technical testing, U-UGS demonstrated detection distances of 15 meters which met the LUT entrance criteria. The systems will have to display this capability consistently in an operational environment.
- Performance of the T-UGS did not meet the long distance communication range requirement during the HBCT development test. The Army's updated requirement is for the T-UGS to communicate at a minimum of 3.0 km range. During the test, it was able to maintain communication out to 800 meters. The program is currently exploring several initiatives to meet the minimum range threshold to potentially include a range extension relay.
- Work continues to improve the integration of objects identified by UGS into the Force XXI Battlefield Command Brigade and Below (FBCB2) network. In automatic mode, UGS frequently overwhelmed FBCB2 subsequently slowing down the internal processing. Manual inputting of target data alleviated the stress on the network.

Recommendations

- Status of Previous Recommendations. This is the first annual report for this program.
- FY08 Recommendations. The Army should:
  1. Retain the existing planned series of operational test events culminating in an IOT&E with a fully equipped IBCT operating in a sophisticated and robust enemy threat environment.
  2. Refine the TTP's developed to accommodate the transition of UGS deployments with IBCT instead of HBCTs.

Future Combat Systems: Class I Unmanned Aircraft System (FCS: UAS), XM 156

Executive Summary

- The Future Combat System (FCS) Unmanned Aircraft Systems (UASs) are designed to provide enhanced situational awareness to the FCS Brigade Combat Team and its subordinate organizations through a robust, organic suite of systems.
- The Army selected the Micro Air Vehicle (MAV) system as the Future Combat Systems Class I UAS. The Army deployed the MAV system to include 30 air vehicles with the 2nd Brigade, 25th Infantry Division to Operation Iraqi Freedom in FY08 prior to formal operational test and evaluation. The MAV system employed with the 25th is the first FCS Class I UAS block design.

System

- The MAV system is the basis for FCS Class I UAS.
- The Army intends to employ the FCS Class I UAS at the company/platoon level:
  - Man-portable and weighs 43 pounds
  - Time on station of 40 minutes
  - Operates at an altitude of 500 feet and below and a range out to eight km
- The FCS Class I UAS consists of an air vehicle with a five horsepower engine, a ground station consisting of a ground data terminal and an operator control unit, payload, avionics pod, and support equipment.
- The electro-optical pod or infrared pod payloads are interchangeable sensors. The Class I Air Vehicle can carry one sensor at a time.
- The Class I UAS will use autonomous flight and navigation with Vertical Take-off and Landing and provide target acquisition and laser designation for the Line-of-Sight and Beyond-Line-of-Sight.
- The Army intends FCS UASs to be:
  - Multi-functional and tailorable with small units/teams

  - Operable in varying terrain, including urban environments
  - Teamed with manned aircraft and ground maneuver forces

Mission

- Units will use FCS Class I UAS to conduct reconnaissance, surveillance, target acquisition (RSTA), and communication relay missions.
- The Class I UAS will be carried by dismounted Soldiers and used for RSTA operations in open, rolling, complex and urban terrain under canopy, and in urban environments.

Prime Contractor

- Honeywell

Activity

- The FCS Class I UAS was originally developed by Defense Advanced Research Projects Agency (DARPA) Advanced Concept Technology Demonstration (ACTD) as the MAV. In support of the ACTD, DARPA conducted an operational experiment, System Functional Reviews, and Environmental Effects testing with the MAV from August 2005 through May 2008.
- The Army deployed the MAV system to include 30 air vehicles with the 2nd Brigade, 25th Infantry Division to Operation Iraqi Freedom during 3QFY08 prior to formal operational test and evaluation. The MAV system employed with the 25th is the fist block design for the FCS Class I UAS.
- The Army is developing an overall operational test strategy for FCS Class I UAS, Block 0 for the current FCS Test and Evaluation Master Plan, and employed Class I UAS during the Preliminary Limited User Test. The Army will incorporate FCS Class I UAS, Block I, as part of the Spin Out Infantry Brigade Combat Team.

- The Army is currently developing and refining tactics, techniques, and procedures for the Class I UAS.

Assessment

- The FCS Class I UAS is continuing to develop. The Army incorporated changes to the system in a Block I design such as updated software for vehicle control, faster manual commands, electric fueler, and larger operational control unit.
- The Army plans to incorporate modifications that will enhance mission effectiveness to include a gimbaled electro-optical sensor or a gimbaled infrared sensor.
- During the Military Utility Assessment and other assessment opportunities, the MAV system assisted the using unit in accomplishing its assigned tactical missions and is the basis for FCS Class I UAS, Block 0.

Recommendations

- Status of Previous Recommendations. The Army addressed the previous recommendations.
- FY08 Recommendations. The Army should:
  1. Improve the reliability and durability of the air vehicles.
  2. Improve the training course for operators to include tactical operations, mission planning, airspace management, frequency de-confliction, and emplacement.
  3. Continue development of gimbaled sensors to enhance the capabilities of building security missions.
  4. Improve and reduce the acoustic signature of the air vehicle to improve unit survivability and employment.

Future Combat Systems: Non-Line-of-Sight Cannon (FCS: NLOS-C)

Executive Summary

- The Defense Acquisition Executive approved the Non-Line-of-Sight Special Interest Program (SpI) Acquisition Decision Memorandum, in August 2008, directing the Milestone C decision to be no later than 1QFY09.
- BAE Systems delivered the P1 NLOS-C prototype vehicle for lethality testing at Yuma Proving Ground, Arizona, in August 2008 and the P3 NLOS-C Prototype for mobility testing to Camp Roberts, California, in October 2008.

System

- NLOS-C, XM1203, is a tracked, self-propelled, hybrid electric drive 155 mm Howitzer with a two-man crew.
- NLOS-C is the lead Future Combat Systems (FCS) Manned Ground Vehicle (MGV). Three MGV are designed to be deployable on one C-17 aircraft (before installing extra protective armor) to support early deploying forces with cannon fires.
- The Army will:
  - Procure eight prototypes in FY08 and FY09 for testing
  - Procure up to 18 Initial Production systems under a separate program called the NLOS-C SpI, in FY10-FY13 for fielding to the Army Evaluation Task Force for experimentation and training
- The cannon will fire six standard artillery rounds or four Excalibur munitions per minute to ranges of 30+ km leveraging its automated ammunition handling system and laser ignition.
- NLOS-C battalions, composed of 18 cannons, are expected to achieve improved accuracy with unguided projectiles.
- NLOS-C battalions are expected to respond to fire mission requests within 20 seconds when stationary and within 30 seconds when moving.

- NLOS-C is expected to have six times the reliability Paladin howitzers demonstrated during Initial Operational Testing.

Mission

- NLOS-C battalions provide area and precision fires in support of FCS Brigade Combat Teams and other mechanized brigade combat teams.
- NLOS-C battalions are capable of firing the entire suite of Army 155 mm munitions, including Excalibur precision munitions, to attack point and area targets.

Prime Contractors

- BAE Systems
- General Dynamics

Activity

- The Army continued their 2008 weapons firing test program of the NLOS-C Firing Platform at Yuma Proving Ground, Arizona. The Firing Platform is a surrogate chassis with a mounted Mission Module containing the gun mount, cannon, aiming, and ammunition handling systems that closely resembles mission equipment in the early prototype vehicles. The program has fired more than 2,000 rounds since 2006 from the Firing Platform to gather data for risk reduction in cannon and mount development, safety certification, and improving reliability.
- In December 2007, the Army conducted compatibility testing with the Firing Platform and the Excalibur precision munition. The Firing Platform fired Inert Excalibur rounds supporting redesign of the NLOS-C muzzle break and new base for the Excalibur.
- In May 2008, the program obtained a safety release allowing Soldiers to perform maintenance and rearm activities with the Firing Platform.
- The Army continues to test the NLOS-C subsystems on the Mission Equipment Integration Test Stands in Minneapolis, Minnesota, gathering development and reliability growth data. The shock simulator test stand has emulated more than 1,800 firings, while the vibration table has subjected

ammunition-handling equipment to the equivalent of more than 7,000 miles traveled and 14,000 operational cycles.
- BAE Systems delivered the P1 NLOS-C Prototype vehicle for lethality testing at Yuma Proving Ground, Arizona, in August 2008, and the P3 NLOS-C Prototype for mobility testing to Camp Roberts, California, in October 2008.
- In August 2008, the Defense Acquisition Executive approved the NLOS-C SpI Acquisition Decision Memorandum, directing the Milestone C decision be no later than 1QFY09 in order to maintain compliance with the congressional direction to field NLOS-C by FY10. The NLOS-C SpI program will produce up to 18 vehicles in three sets, funded with procurement appropriations that are separate and distinct from the NLOS-C core FCS program. The Army Evaluation Task Force, Fort Bliss, Texas, will receive the first set of NLOS-C trainers under a training release in FY10. The delivery of the last set is scheduled for FY13.

Assessment

- NLOS-C performance may be compromised in order to meet C-17 aircraft weight and size restrictions for the standard deployment of three howitzers on one aircraft.
- Using the currently designed breech chamber and 38-caliber cannon tube, the Army reduces the NLOS-C range for most munitions by 3 to 5 km compared to the current 155 mm Paladin breech chamber and 39-caliber cannon tube.
- The two-man NLOS-C crew's endurance and mission focus will be challenged conducting continuous 24-hour operations while performing fire missions, maintenance, resupply, and security associated with combat operations.
- The increase in the reliability requirement to 512 hours between system aborts during operational missions compared to the 87 hours demonstrated by Paladin in its operational test is an area of concern given NLOS-C's automated ammunition handling system, sophisticated automation, and communications equipment.
- Some core NLOS-C FCS capabilities will not be available or sufficiently mature for production integration and fielding of the NLOS-C SpI vehicles. This will limit the Army Evaluation Task Forces' ability to fully evaluate operational concepts, conduct testing and training of FCS equipment, and development of tactics, techniques, and procedures until delivery of FCS Core NLOS-C platforms.

Recommendations

- Status of Previous Recommendations. The Army is addressing the three previous recommendations.
- FY08 Recommendation.
  1. The Army should conduct an operational assessment of the first set of NLOS-C Special Interest trainers in conjunction with their fielding to the Army Evaluation Task Force.

Guided Multiple Launch Rocket System (GMLRS) – Unitary

Executive Summary

- U.S. and allied forces have fired over 930 Guided Multiple Launch Rocket System-Unitary (GMLRS-Unitary) rockets in support of current combat operations.
- The Army completed the GMLRS-Unitary IOT&E in April 2008.
- DOT&E completed a Beyond Low-Rate Initial Production (BLRIP) and LFT&E report in support of the Army's planned December 2008 full-rate production decision. GMLRS-Unitary is operationally effective, lethal, and operationally suitable.
- Operational testing demonstrated unit leaders can use the command and control software to effectively employ GMLRS-Unitary.

System

- The GMLRS-Unitary warhead rocket has a single 196-pound high explosive warhead and a range of 70 km. The rocket uses Inertial Measurement Unit guidance and the GPS to attack targets with a required accuracy of less than 15 meters from the desired aim point.
- The procurement objective for GMLRS-Unitary is 34,848 rockets. The Army plans to enter full-rate production in December 2008.
- The M270A1 Multiple-Launch Rocket System and the High Mobility Artillery Rocket System (HIMARS) are capable of firing GMLRS-Unitary rockets.
- GMLRS-Unitary will have three fuze settings in order to attack different target types at extended ranges:
  - Proximity fuze for use against personnel in the open
  - Delay fuze for lightly fortified bunkers and structures
  - Point detonating fuze for single, lightly armored targets

- GMLRS-Unitary rockets provide a day and night engagement capability in all terrain and weather conditions.

Mission

Commanders will use GMLRS-Unitary rockets to attack point targets in restricted terrain that may require reduced collateral effects beyond cannon artillery ranges.

Prime Contractor

- Lockheed Martin

Activity

- Coalition forces have fired over 930 GMLRS-Unitary rockets in support of current combat operations. The rockets are achieving commander's desired effects based on data provided to DOT&E by the Army.
- The Army completed the IOT&E at White Sands Missile Range, New Mexico, in April 2008.
- DOT&E completed a BLRIP and LFT&E report in support of the Army's planned December 2008 full-rate production decision.

Assessment

- GMLRS-Unitary is operationally effective, lethal, and suitable. GMLRS-Unitary achieved effects on 11 of 12 missions with a median miss distance of 4 meters for all missions during the IOT&E flight phase.
- Operational testing demonstrated unit leaders can use the command and control software to effectively employ GMLRS-Unitary.
- The GMLRS-Unitary with the point detonating fuze meets collateral damage requirements as demonstrated through

modeling and confirmed with developmental and live firing test data.

- The rocket demonstrated the 92 percent reliability requirement in developmental and operational testing. The principal failure mode is lack of warhead detonation in the delay fuze setting.
- Developmental and operational testing confirmed that with accurate target location, GMLRS-Unitary can meet its effectiveness requirements against countermeasured targets. The Army has confirmed deployed units in combat can locate stationary targets with the needed accuracy.
- During the IOT&E, one rocket detonated over 750 meters from its intended aimpoint. The warhead should not detonate at this large miss distance. As designed, the rocket will not arm if its navigation sensors report it is more than 250 meters from the desired flight path 1.5 to 3 seconds prior to impact. The Army conducted a thorough analysis and could not determine a definitive root cause of the anomaly. They did conclude the missile test was within the GMLRS operational envelope and there were no system design deficiencies, assembly discrepancies, or failure trends.
- The Army Aviation and Missile Research Development and Engineering Center and the contractor focused their analysis of the 750-meter miss on the accelerometer within the rocket guidance system. The program manager and contractor have identified software and assembly process enhancements related to the accelerometer and will phase them into the production process. The Army is issuing a Medium Risk Safety of Use Message due to this anomaly.
- During the second IOT&E flight test, two rockets missed the target by 35 to 100 meters due to a software-human interface problem. During the fire mission, the launcher software gave the crew a poorly worded advisory that the rockets did not have GPS capability. The crew proceeded with the fire mission and the rockets flew without GPS and missed the target. The Army is updating the launcher software so that the crew receives a more pronounced warning on their fire control panel.
- Rockets have been restrained in the pod after receiving the command to fire during developmental testing and in a few reported cases in theater. In these rare events, the rocket motor continues to burn inside the rocket pod and does not leave the launcher. These restrained fires have not caused Soldier injuries. The rockets that experienced restrained fires came mostly from one production lot and the Army has removed that lot from theater. The contractor has redesigned the rocket restraining mechanism and will field the redesigned pods after the full-rate production decision and completion of additional flight testing.
- The rocket motor and the warhead are not insensitive munition compliant. The GMLRS-Unitary warhead is the least vulnerable to enemy fire within the family of MLRS munitions. DOT&E recommended that the Army continue pursuing improvements to the insensitive munition rating, which the Army is currently investigating.
- The Army conducted additional GPS jamming in developmental tests and the IOT&E, as requested by DOT&E. The rocket was able to defeat all of the GPS-jammed targets in the IOT&E using GPS jamming tactics, techniques, and procedures.

Recommendations

- Status of Previous Recommendations. The Army is addressing all previous DOT&E recommendations.
- FY08 Recommendations. The Army should:
  1. Continue pursuing methods to improve insensitive munition ratings.
  2. Fully characterize the root cause of the 750-meter radial miss error seen in the IOT&E. Develop, verify, and test the fixes to preclude recurrence.
  3. Continue the planned software modifications to prevent crews from unknowingly firing GMLRS-Unitary rockets that cannot acquire GPS.
  4. Complete planned tests of the redesigned restraining mechanism.
  5. Include GMLRS-Unitary effects against buildings in the Army’s targeting tool. It does not currently include GMLRS-Unitary effects, so Soldiers in the IOT&E had to use a surrogate weapon system.

High Mobility Artillery Rocket System: Increased Crew Protection Cab (HIMARS: ICP)

Executive Summary

- The Army completed the High Mobility Artillery Rocket System (HIMARS) Increased Crew Protection (ICP) Cab Enhanced Field Exercise (EFEX) in July 2008 to evaluate the operational effectiveness and operational suitability of the ICP-configured HIMARS launchers.
- EFEX results indicate that the ICP-configured HIMARS launcher continues to meet the operational effectiveness, accuracy, and overall mission completion requirements.
- The Army completed LFT&E of the ICP cab in 2QFY08 and DOT&E delivered the LFT&E Report to Congress in March 2008. Testing included armor characterization, ballistic exploitation of seams and welds, and full-up and system-level tests against the ICP cab.
- During the EFEX, some HIMARS crewmembers reported difficulty seeing through the transparent armor with its Mylar protective film using night vision goggles. The commander's seat configuration caused more exposure of the commander's torso when standing up in the top hatch, which makes his stance less stable.

- The ICP cab with appliqué armor meets Standard NATO Agreement protection levels and is C-130 transportable when the armor is mounted on a pallet and not installed on the vehicle.

System

- HIMARS entered full-rate production in June 2005. It fires the entire family of Multiple Launch Rocket System (MLRS) rockets to ranges over 60 km, and Army Tactical Missile System (ATACMS) missiles to 300 km.
- Each HIMARS system includes a wheeled launcher, two resupply vehicles, and two resupply trailers.
- Each launcher carries six rockets or one ATACMS missile.
- The Army plans to buy 375 launchers to field 18 HIMARS battalions. The Marine Corps plans to buy 40 launchers to field two battalions.
- The ICP cab program is an evolution of previous armored cab efforts to provide protection from small arms and IEDs consistent with tactical wheeled vehicle protection requirements.

Mission

- Commanders will use HIMARS to attack enemy command and control nodes, artillery, air defense sites, light armor, and other high-value targets at long-range and in urban and open terrain.
- Commanders can use the HIMARS deployment and mobility capabilities (transportable in C-130 aircraft) to:
  - Provide early deploying forces with long-range rocket and missile fires against area and point targets
  - Provide Special Operations Forces with the ability to attack high-value targets at long range

Prime Contractor

- Lockheed Martin

Activity

- Between 1QFY08 and 3QFY08, an ICP-equipped HIMARS launcher fired 54 M26 basic rockets and four Guided MLRS rockets to demonstrate the new cab does not degrade accuracy. The Army has scheduled an ATACMS flight test in October 2008 to complete the flight test series.
- In July 2008, the Army conducted the HIMARS EFEX at White Sands Missile Range, New Mexico. The combined developmental and operational test included live fire missions with 102 Reduced-Range Practice Rockets. One of the launchers participating in the EFEX also employed the Universal Fire Control System. The ICP-configured launchers successfully processed 99 percent of the fire missions it received, including the live missions.
- The Army completed LFT&E of the ICP cab in 2QFY08, and DOT&E delivered the LFT&E Report to Congress in March 2008. Testing included armor characterization, ballistic

exploitation of seams and welds, and full-up and system-level tests against the ICP cab. The Army Research Laboratory and Survivability/Lethality Analysis Directorate used modeling and simulation to assess personnel incapacitation and support the evaluation of crew survivability. The ICP's transparent armor did not meet the multi-hit requirement. Increasing the thickness of the glass would cause an unacceptable increase in front axel weight, which already requires a waiver for C-130 transport. The Army is considering using Sapphire glass, which showed promise in coupon tests for meeting the transparent armor requirement with less weight.

- In 1QFY08, the Army awarded the third full-rate production contract to build launcher modules and integrate them in 57 HIMARS launchers. In 1QFY09, the Army plans to award a contract to purchase the ICP cabs and chassis for those launchers.
- The Army conducted monthly assessments of HIMARS field reliability. The August 2008 assessment reported that fielded launchers have accumulated more than 48,579 operational hours with an overall 331 hours Mean Time Between System Aborts (MTBSA) (requirement is 58 hours). Top failure items include the travel lock actuator, cable assembly, launcher hydraulic swivel, and flex shaft assembly. Reliability tracking has led to design improvements in travel lock actuators and other components.

Assessment

- EFEX results indicate that ICP-configured HIMARS launchers continue to meet the operational effectiveness criteria specified in the Operational Requirements Document (ORD) and system Critical Operational Issues and Criteria (COIC).
- ICP-configured HIMARS launchers demonstrated they meet or exceed ORD requirements for accuracy and overall mission completion. The launchers completed 255 of 257 dry fire missions (99.2 percent) and 17 of 17 live fire missions (100 percent).
- The HIMARS total mission cycle times and reload times achieved during the EFEX demonstrated the system can meet the ORD requirements in an operational environment.
- The Army Reliability, Availability, and Maintainability scoring conference assessed that the MTBSA and the Mean Time Between Essential Function Failures were not met. During the assessment conference, voting members noted that none of the failure modes experienced during EFEX were attributable to the ICP modifications.
- During the EFEX, some HIMARS crewmembers reported difficulty seeing through the transparent armor with its Mylar protective film using night vision goggles. The commander's seat configuration caused more exposure of his torso when he stands up in the top hatch, which makes his stance less stable. The heavy ICP cab doors cannot be secured in an open position, and could injure a Soldier's hands or legs if they closed unexpectedly. Soldiers cited the environmental control unit as an important improvement to the launcher cab.
- HIMARS ICP provides armor protection to the crews against the likely threats while still maintaining mission capability.

Recommendations

- Status of Previous Recommendations. The Army has addressed all previous recommendations.
- FY08 Recommendations. The Army should:
  1. Investigate ways to provide the vehicle commander increased stability while standing in the commander's hatch.
  2. Add a latching device to hold the ICP cab doors open as needed.

Joint Cargo Aircraft (JCA)

Executive Summary

- The Services are behind in updating both the Acquisition Strategy and Test and Evaluation Master Plan (TEMP). Both are required to support the interim program review scheduled for January 2009.
- The Army and Air Force scheduled the Multi-Service Operational Test and Evaluation (MOT&E) as an eight-week test in FY10. Full-rate production for the Joint Cargo Aircraft (JCA) should occur in 1QFY11.
- The JCA LFT&E program has an aggressive schedule, but has been slow to get started. This has the potential to delay the completion of the LFT&E report, which may put the full-rate production decision, as scheduled, in jeopardy.

System

- The JCA is an Acquisition Category 1D joint program with Air Force and Army participation. The program had its Milestone C decision in May 2007 and awarded the low-rate initial production contract of 14 C-27J aircraft.
- The JCA is a two-engine six-blade turboprop tactical transport aircraft.
- The aircraft is designed to operate from short (2,000 feet) unimproved or austere runways. It has a 2,400 nautical mile range with a payload of 13,000 pounds.
- The JCA can carry three standard pallets, six bundles for airdrop, a minimum of 40 passengers, 34 paratroopers, or 18 litters for medical evacuation.
- A fully integrated defensive systems suite will be incorporated onto the aircraft to include radar, laser, and missile warning systems in addition to infrared countermeasures.

Mission

- Army units equipped with the JCA primarily transport time-sensitive and mission-critical cargo and personnel to forward deployed forces in remote and austere locations. The JCA must be capable of self-deployment to theater.
- The Air Force intends to use the JCA to support their intra-theater airlift operations.
- Secondary missions for the JCA include performing routine sustainment operations, airdrop of personnel and equipment, medical evacuation, support of homeland defense, and other humanitarian assistance missions.

Prime Contractors

- Alenia
- L-3 Communications

Activity

- The first flight of the C-27J that will be configured as a JCA occurred in Italy in June 2008.
- The first aircraft was ferried from manufacturing facilities in Italy to the contractor facility in Waco, Texas, for final modification in late FY08, with the second to follow in early FY09.
- Government Production Qualification testing will begin in FY09, with MOT&E planned for FY10. The full-rate production decision is slated for December 2010.
- JCA LFT&E began in September 2008, with the armor system being the first to test, followed closely by high-pressure oxygen systems.
- The Army and Air Force scheduled the MOT&E as an eight-week test in FY10. Full-rate production for the JCA should occur in 1QFY11.

Assessment

- The Services are behind schedule in updating both the Acquisition Strategy and TEMP. Both are required to support the interim program review scheduled for January 2009. The program is operating under a generic Pre-Milestone C TEMP, which does not include specific information on the aircraft, the contractor, and contractor testing. The updated TEMP will provide the test community the ability to adequately plan, fund, and support the upcoming test events.

- The JCA test community would benefit from regular meetings and teleconferences to ensure that not only Service test requirements are being met, but also that the testing is adequate and timely.
- Operational test must include test requirements from both Services. Army and Air Force missions should include time-sensitive combat delivery to austere airfields, aerial delivery of cargo and personnel, medical evacuation, and troop resupply. Operationally-realistic aircrews, missions, and support are required for the MOT&E.
- Contracting issues have slowed the start of LFT&E. The team will need to execute the remaining program efficiently to support the full-rate production decision as currently scheduled.

Recommendations

- Status of Previous Recommendations. This is the first annual report for this program.
- FY08 Recommendations.
  1. The program must submit an updated TEMP to support the interim program review scheduled for January 2009.
  2. The program should conduct regular test meetings and teleconferences.

Light Utility Helicopter (LUH)

Executive Summary

- During 2008, the Army initiated efforts to adequately address deficiencies from the 2007 DOT&E test report. In 2007, DOT&E found that the UH-72A Lakota Light Utility Helicopter (LUH) is effective in the performance of light utility missions, but is not effective for use in hot environments or for medical evacuation of two litter patients requiring critical medical care. The LUH is effective for air movement and aerial sustainment missions. The LUH demonstrated performance and mission effectiveness over the Kiowa (OH-58A/C) and Huey (UH-1H) aircraft it will replace.
- The Army is modifying all LUHs to a standard configuration with solar shades and an improved ventilation system to alleviate high cockpit and cabin temperatures on all 345 aircraft. These solutions allow the LUH to operate with acceptable internal temperatures in all mission configurations.
- DOT&E observed follow-on testing during May 2008 at the National Training Center, Fort Irwin, California. The Army will add a Medical Mission Support Kit for all 81 MEDEVAC LUHs. This kit allows for more litter space and equipment storage and vastly improves the flight medic's ability to adequately perform or sustain critical medical care on one litter patient while another litter patient is aboard.

System

- The UH-72A Lakota LUH is a commercial aircraft derived from the Eurocopter 145 aircraft, certified by the Federal Aviation Administration (FAA) for use in civil airspace. The Army intends to employ the LUH worldwide, in non-hostile operational environments.
- The Army certified the LUH for instrument flight with a GPS to operate in day, night, and adverse weather conditions.
- The LUH is compatible with night vision goggles; nuclear, biological, and chemical (NBC) gear; and the Air Warrior ensemble. The LUH mission equipment packages include a 600-pound capacity hoist, fire bucket, slings for external loads, and patient litters.
- The Army is procuring 345 systems (beginning in May 2007) to replace UH-1H and OH-58 A and C aircraft in the Active Army and National Guard inventory. On September 30, 2008, the Army accepted the 42nd LUH and plans to take delivery of an additional 43 aircraft during 2009 to complete an 85 aircraft contract. Fielded locations include Fort Irwin, California; Fort Eustis, Virginia; Fort Polk, Louisiana; Tupelo, Mississippi; and Fort Indiantown Gap, Pennsylvania.

Mission

- LUH-equipped units will provide general aviation support, respond to terrorist events, conduct civil search and rescue, support damage assessment, support test and training centers, perform medical evacuation, and provide support to counter drug operations.
- LUH units will conduct general administrative aviation and aerial sustainment missions, and execute tasks as part of an integrated effort with joint forces, government agencies, and nongovernmental organizations.
- LUH units will perform Homeland Security and medical evacuation missions in permissive environments.

Prime Contractors

- EADS North America
- Eurocopter

Activity

- During 2008, the Army initiated efforts to adequately address deficiencies from the 2007 DOT&E test report. DOT&E monitored Army modification efforts and testing to alleviate high cockpit and cabin temperatures and installation of the MEDEVAC Equipment Storage and Mounting kit.
- The Army began installation of Environmental Control Units (ECUs) on all MEDEVAC and VIP aircraft. All future MEDEVAC and VIP LUHs will have ECUs prior to delivery.
- The Army plans to modify the standard mission configuration on all 345 aircraft to include solar shades over the pilot

seats, cabin window pop-out vents, cockpit window vent air deflectors, cabin door locks, and cockpit door spoiler kits that allow flight with the cabin doors open.
- DOT&E observed follow-on testing during May 2008 at the National Training Center, Fort Irwin, California. The Army will add a Medical Mission Support Kit for all 81 MEDEVAC LUHs. This kit includes exterior lighting for the rear cabin and tail rotor area and interior night vision goggle lighting over the patient loading area; Teflon litter rails to facilitate litter loading and unloading; overhead rails to hold intravenous bags; and wall mounted provisions for medical equipment and oxygen bottles on the rear clamshell doors.
- The LUH Program Office initiated installation of ARC-231 radios in all UH-72A aircraft with certification flights scheduled for 1QFY09. The ARC-231 radio provides for simultaneous and secure communications. The Program Office will retrofit all fielded aircraft.

Assessment
- Army efforts to alleviate high cockpit and cabin temperatures and installation of the MEDEVAC Equipment Storage and Mounting Kit adequately address deficiencies.
- Installation of solar shades over the pilot seats, cabin window pop-out vents, cockpit window vent air deflectors, cabin door locks, and cockpit door spoiler kits that allow flight with the cabin doors open allow the LUH to operate with acceptable internal temperatures in all mission configurations.
- Follow-on testing during May 2008 at the National Training Center, Fort Irwin, California of the Medical Mission Support Kit adequately addressed LUH MEDEVAC deficiencies. The original DOT&E assessment concluded that there was insufficient room for providing critical medical care such as defibrillation or cardiopulmonary resuscitation for one litter-bound patient when another litter patient is aboard. This kit allows for more litter space and equipment storage and vastly improves the flight medic's ability to adequately perform or sustain critical medical care on one litter patient while another litter patient is aboard.
- LUH aircrews, wearing the Army's Air Warrior ensemble and when operating with chemical mask and night vision goggles, are afforded adequate protection in the event of an emergency. The FAA has certified that the LUH meets standards for crashworthiness.
- The Army began the Aircraft and Power Plant (A&P) certification program and has certified 18 A&P aircraft mechanics for the National Guard. The LUH Program Office conducted a logistics demonstration that validated the hybrid maintenance concept. This assessment determined that the tools, test equipment, and training provided to National Guard units would be sufficient to maintain the aircraft.
- During FY08, the Army reviewed the pilot training provided to LUH aircrew. This review validated that the LUH training program was adequate for Army operators.

Recommendations
- Status of Previous Recommendations. The Army addressed all previous recommendations.
- FY08 Recommendation.
  1. The Army should relocate the first aid kit and fire extinguisher to enhance crew access during emergency situations.

Patriot / Medium Extended Air Defense System Combined Aggregate Program (PATRIOT/MEADS CAP)

Executive Summary

- The Army conducted two major developmental Patriot flight test missions. A test in December 2007 resulted in a no-test due to target failures and a test in May 2008 of the Patriot Advanced Capability-3 (PAC-3) Missile Segment Enhancement (MSE) was a success.
- Japan Air Self-Defense Force personnel conducted a successful Tactical Ballistic Missile (TBM) intercept with their first firing of a PAC-3 missile in September 2008.

System

- The Patriot system includes:
  - C-band phased-array radars for detecting, tracking, classifying, identifying, and discriminating targets
  - Battalion Information Coordination Central, Battery Command Posts, and Engagement Control Stations for battle management
  - Communications Relay Groups and Antenna Mast Groups for communicating with battery and battalion assets
  - A mix of PAC-3 hit-to-kill missiles and PAC-2 blast-fragmentation warhead missiles for negating air and missile threats
    - The newest version of the PAC-3 interceptor is the Cost-Reduction Initiative (CRI) missile. In addition, the Army is developing the PAC-3 MSE missile with increased range and altitude capabilities and a lethality-enhanced warhead.
    - PAC-2 interceptors include the Guidance Enhanced Missile (GEM), the newest version of which is the GEM-T. The GEM-T has improved capability against aircraft including low radar cross-section cruise missiles and short-range ballistic missiles.
- Planned Medium Extended Air Defense System (MEADS) developments include:
  - Battle management, command, control, communications, computers, and intelligence elements; Ultra High Frequency-band 360-degree surveillance radars; X-band 360-degree multi-function fire control radars; and missile launchers and reloaders
  - MSE missiles developed under the Patriot program

Mission

Combatant commanders using Patriot have the capability to defend deployed forces and critical assets from missile and aircraft attack and to defeat enemy surveillance air assets (such as unmanned aerial vehicles) in all weather conditions, clutter, and electronic countermeasure environments.

Prime Contractors

- Lockheed Martin
- MEADS International

Activity

- A Patriot battery performed a tracking mission on an anti-radiation missile target.
- A planned intercept flight test in December 2007 to verify classification algorithm improvements resulted in a non-test when both targets failed.
- During the first successful flight test of the MSE missile (Flight Test 7-1A), in May 2008, Patriot fired an MSE control test missile at a simulated aircraft target.
- A Japanese Air Self-Defense Force Patriot fire unit successfully launched two PAC-3 missiles in a ripple fire from a single launching station and intercepted a Patriot-As-A-Target (PAAT) with the first interceptor. The second interceptor had an in-flight failure.

Assessment

- During an anti-radiation missile tracking test, Patriot detected and tracked a threat-representative anti-radiation missile target. The Patriot operator manually classified the target as an anti-radiation missile. The test revealed procedural errors by the operators that were corrected after the test. These corrections were planned to be validated during intercept flight tests against two anti-radiation missile targets; however, both targets failed shortly after launch.
- During Flight Test 7-1A, all required data were collected and all objectives were met. The MSE interceptor's flight events were generally in good agreement with preflight predictions. The most significant differences were that the missile had a slightly higher velocity than predicted and one attitude control motor did not fire when ordered to do so. Neither issue affected the missile's ability to complete the scripted mission successfully.
- During the Japanese intercept flight test of the Patriot system, all required data were collected and all objectives were met. However, the second interceptor experienced an in-flight failure. In addition to successfully engaging a PAAT target, Japan Air Self-Defense personnel demonstrated integration of the PAC-3 missile with the Japanese Patriot ground system and demonstrated system capability through the sequence from search, detection, track to fire, intercept, and kill of a tactical ballistic missile target.

Recommendations

- Status of Previous Recommendations. The Army resolved two of the seven recommendations from FY05-FY07.
- FY08 Recommendations. The Army should:
  1. Conduct Force Development Experimentation to test tactics, techniques, procedures, and training prior to Limited User Test operational testing.
  2. Provide probability of kill tables for all required ballistic missile, anti-radiation missile, cruise missile, and aircraft threats prior to the start of the Limited User Test. These probability of kill tables should be produced with models and simulations that have been verified, validated, and accredited by Army Test and Evaluation Command.
  3. Simulate MSE missile engagements throughout the battle space to determine the lethality-enhanced warhead contribution to effectiveness, which is necessary for planning the MSE missile LFT&E program.

Spider XM7 Network Command Munition

Executive Summary

- The Army has removed the capability for Spider to autonomously engage targets. "Man-in-the-loop" control is the only method the system uses to engage targets.
- The Army awarded a two-year Research, Development, Test and Evaluation (RDT&E) contract to investigate and develop methodologies and capabilities to mitigate the loss of the autonomous operations mode.
- The Army validated an Operational Needs Statement in August 2008 for fielding 44 Spider systems to support combat operations in Operation Enduring Freedom by April 2009.

System

- Spider is a landmine alternative that satisfies the anti-personnel munition requirements outlined in the 2004 National Landmine Policy. That policy directs DoD to:
  - End use of all persistent landmines after 2010
  - Incorporate self-destructing and self-deactivating technologies to develop alternatives to current persistent landmines
- The Army intends to achieve an Initial Operational Capability with Spider by 2009.
- A Spider munition field includes:
  - Up to 63 Munition Control Units, each housing six miniature grenade launchers
  - A remote control station, allowing the Soldier to maintain "man-in-the-loop" control of all munitions in a field
  - A communications relay device known as a "repeater" for use in difficult terrain or at extended ranges
- Units can employ Spider in all environments and in all terrains.
- Spider incorporates self-destructing and self-deactivating technologies to reduce residual risks to non-combatants after hostilities cease.

Mission

Maneuver or engineer units will employ Spider, by itself or in conjunction with other networked munition systems, to accomplish the following missions:

- Force protection
- Battlefield shaping
- Early warning
- Delay enemy forces
- Attrite enemy forces

Prime Contractors

- C2 hardware and software: Textron
- Munition Control Unit and Miniature Grenade Launcher: Alliant-Techsystems

Activity

- The Army removed the capability that allows Spider to autonomously engage targets due to congressional interest and FY08 budget actions. "Man-in-the-loop" control is the only method Soldiers can use to engage targets.
- The Army awarded a two-year RDT&E contract to investigate and develop methodologies and capabilities to mitigate the loss of the autonomous operations mode.
- The program manager rescheduled the full-rate production (FRP) contract award from 3QFY09 to 2QFY10 to allow for possible integration of capabilities resulting from the RDT&E contract.
- The program conducted extensive testing of live Munition Control Unit grenades in July and August 2008, validating the safety and feasibility of reusing and reloading Munition Control Units after it fires one or more grenades.
- DOT&E approved the updated 2006 Milestone C Test and Evaluation Master Plan (TEMP) in May 2008. The update included the FOT&E that the program must conduct prior to the FRP decision.
- The FOT&E has moved from November/December 2008 to February/March 2009 due to Munition Control Units reliability failures identified during contractor System Verification Testing in August 2008.
- The Program Office completed relocation of its Munition Control Unit production facility from Minnesota to West Virginia in 2QFY08.

- The program manager awarded a low-rate initial production modification contract to extend low-rate initial production through 2QFY10.
- The Joint Requirements Oversight Council approved the modification of Spider's Combat Casualty Key Performance Parameter in May 2008 to reflect capabilities achievable with only the "man-in-the-loop" operational mode.
- The Army validated an Operational Needs Statement in August 2008, for fielding 44 Spider systems to support combat operations in Operation Enduring Freedom by April 2009.
- The program manager validated Spider interoperability with friendly communications and counter-IED jamming equipment in October 2008.

Assessment

- Correcting the reliability failures identified during the contractor System Verification Testing and completing government Production Verification Testing prior to the FOT&E will challenge the program because of the production facility move from Minnesota to West Virginia. The current schedule has little time to analyze failures should they occur.
- DOT&E will summarize the results of both the IOT&E and the FOT&E to support an FRP decision in 3QFY09.
- The Spider system tested in the FOT&E may change as new capabilities from the RDT&E efforts are incorporated by the program manager into the system between the FRP contract decision in 3QFY09 and the actual FRP contract award in 3QFY10. Significant configuration changes will require additional testing.
- The program has sufficient time to test and confirm all system fixes and achieve Initial Operational Capability by the end of 2010 in order to comply with the 2004 National Landmine Policy. A capability gap will exist until the Army has sufficient stocks to replace all of their persistent mines.

Recommendations

- Status of Previous Recommendations. The program has addressed all previous recommendations.
- FY08 Recommendations. The Army should:
  1. Provide regular updates on the progress of the RDT&E efforts and the plan to implement those capabilities into the FRP contract award configuration as it matures beyond the FOT&E.
  2. Conduct follow-on Spider testing as the program manager incorporates technologies and capabilities from the RDT&E efforts into the system.
  3. Capitalize on the lessons learned from the fielding of Spider to Operation Enduring Freedom with "man-in-the-loop"-only technology.

Stryker – Mobile Gun System (MGS)

Executive Summary

- The U.S. Army Operational Test Command conducted the Initial Operational Test at Fort Hood, Texas, from October 20, 2007, to November 4, 2007. A Stryker - Mobile Gun System (MGS) platoon executed tactical tasks and missions in a small-scale contingency environment against a representative threat.
- DOT&E found that the MGS is operationally effective for small-scale contingency operations, is operationally suitable with deficiencies, and survivable in some operational scenarios.
- The Secretary of Defense approved the waiver required by Section 117 of the 2008 National Defense Authorization Act on July 15, 2008, stating the expenditure of FY08 funds appropriated for procurement of the Stryker MGS is in the national security interest of the United States. He directed that full-rate production of the MGS will not be approved until the identified deficiencies are corrected.
- The Secretary of the Army declined to certify the program as operationally effective, suitable, and survivable. The Defense Acquisition Executive approved an extended low-rate production.
- Correction of deficiencies identified during the operational and live fire tests are ongoing.

System

- The Stryker Family of Vehicles consists of two variants: the Infantry Carrier Vehicle and the MGS.
- The MGS is a separate acquisition decision because the system needed additional development.
- The MGS mission equipment includes:
  - M68A1E7 105 mm cannon system with an ammunition handling system
  - Coaxial 7.62 mm machinegun and a secondary M2HB, .50-caliber machinegun
  - Full solution fire control system with two-axis stabilization
  - Low-profile turret designed to provide survivability against specified threat munitions
- The system integrates the Driver's Vision Enhancer and Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance components as government-furnished equipment.
- The MGS provides the three-man crew with levels of protection against small-arms, fragmenting artillery, mines, and rocket-propelled grenades. Rocket-propelled grenade protection is provided by add-on Slat armor (flat steel stock arranged in a spaced array) not shown in photo.

Mission

- The Stryker Brigade Combat Team uses MGS to create openings in walls, destroy bunkers and machinegun nests, and defeat sniper positions and light armor threats. The primary gunnery systems are designed to be effective against a range of threats up to T-62 tanks.
- The MGS operates as a three-vehicle platoon organic to the Stryker infantry company or as a single vehicle in support of a Stryker infantry platoon.

Prime Contractor

- General Dynamics

Activity

- The Army conducted the Initial Operational Test at Fort Hood, Texas, from October 20, 2007, to November 4, 2007. An MGS platoon executed realistic operations and missions in a small-scale contingency environment against a representative threat.
- The Army completed final elements of the LFT&E Strategy in early FY08.
- DOT&E published a Beyond Low-Rate Initial Production (BLRIP) Report for the MGS based on results from the Initial Operational Test, observations from Iraq, and live fire testing in February 2008.
- The Secretary of Defense approved the waiver required by Section 117 of the 2008 National Defense Authorization Act on July 15, 2008, stating the expenditure of FY08 funds appropriated for procurement of the Stryker MGS is in the national security interest of the United States. He directed that full-rate production of the MGS will not be approved until the identified deficiencies are corrected.

- The Secretary of the Army declined to certify the program as operationally effective, suitable, and survivable. The Defense Acquisition Executive approved an extended low-rate production.
- The Army was directed to undertake actions to mitigate all the deficiencies identified during operational and live fire testing of the Stryker MGS.

Assessment

- DOT&E found that the MGS is operationally effective for small-scale contingency operations, is operationally suitable with deficiencies, and survivable in some operational scenarios. DOT&E provided a list of 43 recommendations to improve operational effectiveness, suitability, and survivability. Significant findings are listed below:
- Operational Effectiveness:
  - MGS is operationally effective for small-scale contingency operations.
  - MGS is effective when MGS-equipped crews were able to maneuver in order to provide direct supporting fires to assaulting infantry in open terrain.
  - Operational effectiveness was reduced in urban and in high-threat environments when T-62 tanks and BMP infantry carrier vehicles were present.
  - Direct and supporting fires, transportability, and interoperability Key Performance Parameters were demonstrated:
    - Provides lethal direct fire to assaulting infantry
    - 105 mm main gun and 7.62 mm machine gun are accurate
    - C-130 transportability was demonstrated – labor intensive, arrives with reduced combat capability, second aircraft is needed; this is a costly design trade for a marginal capability
  - MGS has excellent speed on roads, although it does not match the mobility and ride quality of tracked vehicles in wet and soft soils.
  - The vehicle commander is exposed to enemy fire when standing erect in the turret when firing the .50 caliber machine gun.
  - Commander's Panoramic Viewer and the Commander's Display Unit are not effective as they limit crew performance and situational awareness.
  - MGS is not operationally effective in the degraded or manual mode.
- Operational Suitability:
  - MGS is operationally suitable with deficiencies.
  - MGS chassis is reliable. It demonstrated 1,580 Mean Miles Between System Abort (MMBSA) during its mission rehearsal exercise and 1,612 MMBSA during developmental testing (requirement is 1,000 MMBSA).
  - Mission Equipment Package (MEP) is not reliable.
    - MEP reliability has improved
    - Demonstrated 53 Mean Rounds Between System Abort (MRBSA) in the IOT and 63 MRBSA in DT (81 MRBSA required)
    - Continued to discover new MEP failure modes in IOT and developmental testing
    - MEP experiences a high number of Essential Function Failures
  - MGS is supportable and maintainable with Contractor Logistics Support.
    - IOT operational availability was 91 percent.
    - Mean Time to Repair and Maintenance Rate were low.
    - MGS was easily fixed if parts are on hand.
    - Operational Readiness Rate demonstrated in Operation Iraqi Freedom was 69 percent (Non-mission Capable due to Essential Function Failures).
    - Chassis and MEP Essential Function Failures rate remain high and constant.
    - Increases maintenance burden and life-cycle cost.
  - High vehicle temperatures adversely affect crew performance and may contribute to electronic component failures.
  - Commanders Panoramic Viewer failed frequently in Iraq and parts were in high demand.

Recommendations

- Status of Previous Recommendations. There were no previous recommendations.
- FY08 Recommendations. The Army should:
  1. Correct the 43 deficiencies noted in the BLRIP Report to Congress and verify that the corrections are effective.
  2. Improve Mission Equipment Package Reliability.
  3. Increase ballistic protection for the vehicle commander from sniper fire and IED fragmentation/blast while operating the .50 caliber machine gun and increase the basic load.
  4. Improve the Commander's Panoramic Viewer by:
     - Increasing reliability and spare parts availability
     - Making improvements in order to facilitate wide area scanning to allow the vehicle commander to effectively detect and identify targets and improve vehicle commander situational awareness
  5. Improve the Commander's Display Unit resolution so the vehicle commander can effectively identify targets or IEDs
  6. Modify MGS environmental control to allow Soldiers to conduct missions in temperatures above 125 degrees Fahrenheit and to keep electronic components from failing
  7. Improve situational awareness by providing 360-degree day and night observation around the vehicle
  8. Schedule follow-on operational and live fire testing in order to validate solutions to deficiencies.

Stryker – Nuclear, Biological, and Chemical Reconnaissance Vehicle (NBCRV)

Executive Summary

- The 2006-2007 IOT&E demonstrated that the Stryker Nuclear, Biological, and Chemical Reconnaissance Vehicle (NBCRV) platoon in a Stryker Brigade Combat Team (BCT) is operationally effective for chemical surveillance and chemical route reconnaissance missions. Operational effectiveness for chemical surveillance and chemical route reconnaissance missions resulted from redundancy among the three NBCRVs in the platoon. The NBCRV platoon was not operationally effective for chemical area reconnaissance missions. Single NBCRV teams were not operationally effective. The Stryker NBCRV is not operationally suitable because the base vehicle and its mission equipment package are not yet reliable. The Stryker NBCRV needs performance, safety, and reliability improvements, which the Army will evaluate in a Reliability Growth Test. The project managers for the NBCRV and its Mission Equipment Package are implementing reliability corrective actions including verification.
- The Stryker NBCRV LFT&E program found the NBCRV has similar vulnerabilities as other Stryker variants, but its Mission Equipment Package is more vulnerable to ballistic damage than other Stryker variants.
- The Army expanded its plan to field Stryker NBCRVs, increasing from 39 to support Stryker BCTs to 355 to include the support of Heavy BCTs and Chemical Companies.
- The Defense Acquisition Executive made an Extended Low-Rate Initial Production (LRIP) decision, authorizing 95 additional LRIP vehicles, in December 2007.
- The Army will begin a Reliability Growth Test in 2QFY09, which will continue until FY10. The Army scheduled IOT&E II for 4QFY10.

System

- The NBCRV is one of 10 variants of the Stryker family of vehicles. The NBCRV uses a modified Infantry Carrier Vehicle chassis.
- Chemical, biological, and radiological sensors and communications are integrated with the Stryker vehicle to perform chemical, biological, radiological, and nuclear (CBRN) detection, identification, marking, sampling, and reporting of these hazards.
- The NBCRV's armor provides ballistic protection to the crew against small arms, mines, and artillery fragments. The armor has been enhanced with slat armor. The vehicle is also equipped with a filtering and over-pressure system that provides protection from CBRN threats.
- The CBRN mission equipment package includes:
  - Joint Biological Point Detection System
  - Joint Service Lightweight Standoff Chemical Agent Detector
  - Chemical and Biological Mass Spectrometer to detect liquid chemical warfare agents on the ground collected by a Surface Contamination Sampler
  - Chemical Vapor Sampling and Storage System
  - NATO standard markers and deployment system
  - Automatic Chemical Agent Detector Alarm to provide point detection of chemical warfare agent vapors
  - Radiological detectors
- A NBCRV team consists of a Stryker NBCRV and its four-person crew. Two or more teams are organized into CBRN reconnaissance platoons. These platoons are assigned to a:
  - Stryker BCT, with one platoon of three NBCRVs
  - Heavy BCT, with one platoon of two NBCRVs
  - Division or Corps Chemical Company, with one platoon of six NBCRVs

Mission

CBRN reconnaissance platoons perform tactical route and area reconnaissance and tactical surveillance operations. A CBRN reconnaissance platoon, as part of an early entry combat force, is capable of limited independent operations.

Prime Contractor

- General Dynamics

Activity

- The Army's NBCRV LFT&E program completed in FY07.
- The Army expanded its plan to field Stryker NBCRVs to support Stryker BCTs from 39 to 355 in order to also support Heavy BCTs and Chemical Companies. Efforts to assess whether or not this new plan of employment will affect the effectiveness, suitability, and survivability of the NBCRV – and require additional testing – are ongoing. The United States Army Chemical School is staffing doctrinal changes to use two or more NBCRVs in a mission set for all NBCRV-equipped units.
- The Army will begin a Reliability Growth Test in 2QFY09, which will continue until FY10 with an IOT&E Phase II to be conducted in 4QFY10.

Assessment

- DOT&E focused its initial evaluation on the ability of the Stryker BCT CBRN reconnaissance platoon with three NBCRVs to accomplish its mission. The platoon demonstrated in the initial operational test that it is operationally effective for chemical surveillance and chemical route reconnaissance. Effectiveness resulted from redundant coverage by sensors. The platoon was not successful for chemical area reconnaissance missions. Single NBCRV team performance was not operationally effective. The Stryker NBCRV base vehicle and its Mission Equipment Package are not reliable.
- The Surface Contamination Sampler used with the Chemical Biological Mass Spectrometer was easily misaligned or damaged during off-road operations causing 10 times greater unscheduled maintenance than the user requires during the IOT&E. The Reliability Growth Test should determine whether fixes to the Surface Contamination Sampler as well as other changes to the vehicle and Mission Equipment Package were successful.
- Successful completion of the Reliability Growth Test is required before entrance into IOT&E Phase II.
- The Army's NBCRV LFT&E Integrated Product Team will reconvene to determine if additional live fire testing is required.

Recommendations

- Status of Previous Recommendations. The Army accepted all previous recommendations.
- FY08 Recommendations. None.

UH-60M Black Hawk Upgrade Utility Helicopter

Executive Summary

- UH-60M Baseline demonstrated performance during operational testing exceeded requirements for internal lift, external lift, and self deployment; is more reliable than the current UH-60A/L; and overall susceptibility to surface-to-air threats is lower when compared to the legacy UH-60A/L aircraft.
- The UH-60M Upgrade Test and Evaluation Master Plan (TEMP) is adequate to evaluate technical issues associated with pre-planned product improvements and to determine the operational effectiveness and suitability of the UH-60M Black Hawk Upgrade. The Army extended the LFT&E program during FY08 to adequately address pre-planned product improvement changes that may affect vulnerability of the aircraft.
- The Army completed a Limited Users Test (LUT) for the UH-60M Upgrade in the System Integration Laboratory at Redstone Arsenal, Alabama, during October 2008. LUT results along with limited developmental testing data are intended to inform a Low-Rate Initial Production (LRIP) cut-in decision currently scheduled for December 2008, for not more than 11 UH-60M Upgrade aircraft.
- The contractor conducted qualification ballistic testing of the new servo actuators and the composite tailcone. The Army also updated an earlier vulnerability assessment that includes the latest live fire test results of various components that have been tested during the last two years. Results of the ballistic testing identified component design shortcomings that are being addressed in the re-design. Follow-on ballistic testing will be required to evaluate the damage tolerance of the new component designs.

System

- The UH-60M Baseline and UH-60M Upgrade are modernized UH-60A or UH-60L Black Hawk medium-lift helicopters.
- The Assault Helicopter Battalion is organized as three companies of 10 aircraft each.
- The acquisition objective is for 1,806 UH-60M Black Hawks, with 1,227 projected to be UH-60M variant and the remaining to be UH-60Ls. The program projects that 199 aircraft will be UH-60M Baseline aircraft, and the remaining 1,028 will be UH-60M Upgrade aircraft.
- The UH-60M Baseline aircraft include:
  - Digital cockpit with Blue Force Tracker
  - Power and airframe improvements with the 701D engine, wide chord blades for enhanced performance, and monolithic machined parts that should provide structural improvement over the A/L model Black Hawk
  - Improved survivability with enhanced laser warning and infrared suppression for anti-missile defense
- The UH-60M Upgrade design adds:
  - Fly-by-wire (FBW) advanced flight controls
  - A Common Avionics Architecture System (CAAS) and networked digital connectivity for enhanced commonality with other Army aircraft
  - Improved handling qualities optimized for minimum pilot workload and increased safety in degraded environments
  - Composite tailcone and tail rotor drive shafts, and new main and tail rotor actuators

Mission

Assault Aviation and General Support Aviation Battalions will employ the UH-60M Upgrade to conduct the following missions:

- Air Assault lift for 11 combat Soldiers or equipment less than 9,000 pounds for mobile strike and counter mobility operations
- Sustainment Operations to resupply the force through internal and external cargo lift capability
- Casualty and medical evacuation
- Command and control

Prime Contractor

- Sikorsky

Activity

- DOT&E approved the updated UH-60M Upgrade TEMP on January 10, 2008.
- In FY08, as part of the updated Army LFT&E program, the contractor performed qualification ballistic testing of the

composite tail cone assembly, and the new servo actuators. Results of the ballistic testing identified component design shortcomings, which are being addressed in the re-design. Follow-on ballistic testing will be required to evaluate the damage tolerance of the new component designs. An updated vulnerability assessment incorporates recent ballistic test results since the earlier assessment.
- The Joint Live Fire (JLF) program conducted a series of ballistic tests in May 2008 on the main rotor mast and mast extension under static condition (no load applied) to determine the extent of damage of these components when impacted by armor piercing projectiles.
- During FY08, the Army conducted testing and integration of UH-60M Upgrade pre-planned product improvements such as the fly-by-wire advanced flight controls and CAAS cockpit integration primarily in flight simulation laboratories at the contractor's facilities.
- Both risk reduction testing using the Rotorcraft Aircrew Systems Concepts Airborne Laboratory (RASCAL) research helicopter and specific Special Operations Forces testing are complete.
- A combined contractor and government test team began developmental ground testing in June 2008 and flight testing in August 2008, on two prototype UH-60M Upgrade aircraft. Initial testing is focused on the FBW advanced flight controls and CAAS cockpit integration.
- The Army conducted a LUT for the UH-60M Upgrade in the System Integration Laboratory at Redstone Arsenal, Alabama, in October 2008. Army pilots conducted 18 tactical and non-tactical utility helicopter missions in a simulated operational environment. Primary areas of evaluation were pilot-vehicle interface, cockpit workload, and situational awareness.
- In September 2008, the Army proposed a risk reduction plan by modifying the Acquisition Strategy that would add an additional LRIP decision supported by a second LUT currently scheduled for 4QFY09.

Assessment

- LUT results along with limited developmental test data will inform a LRIP cut-in decision currently scheduled for December 2008, for not more than 11 UH-60M Upgrade aircraft. The UH-60M Upgrade IOT&E is currently scheduled for 2QFY10.
- The Army executed the UH-60M Upgrade operational and live fire testing in accordance with DOT&E-approved test plans.
- Assembly and flight control system software development delayed the first flight from February 2008 to August 2008, and the overall developmental flight test program and LUT execution, causing the cut-in initial production decision to slide from September to December 2008. This delay impacts the projected lead time required to build LRIP aircraft for instructor and key personnel training and the IOT&E. The program intends to complete 409 developmental test flights hours and 120 operator training flight hours prior to the IOT&E start.
- Approval of an additional LRIP decision supported by a second LUT will require a robust user test with production representative aircraft flying operational missions after updates to the Acquisition Strategy, TEMP, and detailed test plans.
- Qualification ballistic test results to date have provided the contractor valuable data about the damage tolerance of the new servo-actuators and composite tailcone and drive shaft components for final redesign.

Recommendations

- Status of Previous Recommendations. The May 2007 DOT&E combined OT&E and LFT&E Report for the UH-60M Baseline aircraft included a set of 14 recommendations to improve operational effectiveness, suitability, and survivability. The Army will address these 14 recommendations on the UH-60M Upgrade aircraft.
- FY08 Recommendations. The Army should continue to conduct event-driven testing as outlined in the approved UH-60M Upgrade TEMP, to include the following:
  1. Reduce the potential for transmission gearbox chip detector screen blockage resulting from ballistic hits to the main transmission assembly.
  2. Install an additional fire detector and fire suppression agent dispenser nozzle to the engine nacelle compartment, add fire detection and extinguishment to the fuel plumbing enclosure, and reinforce the latch mechanism of the engine nacelle door.
  3. Address the ballistic damage tolerance and provide structural analysis of the new monolithic structural frames.

Warfighter Information Network – Tactical (WIN-T)

Executive Summary

- The Army completed the Defense Acquisition Executive-directed integration of Joint Network Node (JNN) into the Warfighter Information Network – Tactical (WIN-T) program. WIN-T Increment 1 (formerly JNN) maintains an approved capabilities requirement, developed a DOT&E-approved Test and Evaluation Master Plan (TEMP), and completed its IOT&E in October 2008.
- The Army's delay in developing WIN-T Increment 2 capability documents slowed Increment 2 TEMP development and subsequent test planning.
- The scope of the WIN-T network requires multiple echelons to create representative test conditions. The scheduled WIN-T Increment 1 IOT&E has significant risks to test adequacy because of concerns about sufficient quantities of Increment 1a configuration items and the ability to operationally test the network from battalion through corps echelons.

System

- WIN-T is a high-speed and high-capacity backbone communications network designed to be the Army's tactical intranet.
- WIN-T is intended to provide reliable, secure, and seamless communications for theater and below initially to Modular Brigade Combat Teams and then to Future Combat Systems (FCS) Brigade Combat Teams.
- The WIN-T program consists of four Increments:
  - Increment 1 (former JNN) Networking at the Halt enables the exchange of voice, video, data, and imagery throughout the tactical battlefield using a Ku and Ka satellite-based network.
  - Increment 2 Initial Networking on the Move provides command and control on the move down to the company level for maneuver brigades and implements the colorless core network capability.
  - Increment 3 Full Networking on the Move provides full mobility command and control, to include FCS support, for division and below.

1 - Increment 1 Unit Hub Node
2 - Increment 1 Satellite Transport Terminal
3 - Increment 1 Joint Network Nodes
4 - Increment 1 Ku Satellite Trailer
5 - Operations in Shelter

  - Increment 4 Protected Satellite Communications on the Move includes access to the next generation of protected satellites while retaining all previous on the move capabilities.

Mission

Commanders at theater and below intend to use WIN-T to:

- Integrate satellite-based communications capabilities into an everything-over-Internet Protocol network to provide connectivity, while stationary, across an extended, non-linear battlefield and at remote locations (Increment 1)
- Provide division and below maneuver commanders with mobile communications capabilities to support initial command and control on the move (Increment 2)
- Provide division and below maneuver commanders with mobile communications capabilities to support full command and control on the move, support of the air tier, and support of FCS units (Increment 3)

Prime Contractor

- General Dynamics

Activity

- The Army completed documentation for WIN-T Increment 1, including establishing Increment 1a requirements and an approved Increment 1 TEMP. Development continues for the Increment 1b requirements document (as pre-planned product improvement), the Increment 2 requirements document, and the Increment 2 TEMP. The Army also conducted the Preliminary Design Review for Increment 3.
- Section 115 of the FY08 National Defense Authorization Act restricted the Army to 50 percent expenditure or obligation of FY08 amounts appropriated for WIN-T Increment 1 until DOT&E submits a certification to congressional defense committees of an approved Increment 1 TEMP and an approved Increment 1 Initial Operational Test Plan. DOT&E approved the WIN-T Increment 1 TEMP on August 4, 2008, and provided certification to Congress on October 17, 2008, upon completion of the WIN-T Increment 1 Initial Operational Test Plan.

- The Army conducted its Increment 1 Operational Assessment in 4QFY08, its Increment 1 IOT&E in 1QFY09, and plans a combined Increment 2 Limited User Test and Increment 1b Limited User Test in 2QFY09.

Assessment
- The WIN-T program completed integration of the former JNN, developed an Increment 1 Acquisition Strategy, TEMP, and operational test plan, and completed an Increment 1 IOT&E in October 2008.
- Uncertainty with the scope and capabilities for the Increment 2 program has slowed development of the TEMP and planning for future operational test events.
- The Army will field WIN-T Increment 1a (Lot 10) configuration items to one active duty Army brigade by the time of the Increment 1 IOT&E. This initial fielding of WIN-T Increment 1 will allow for interoperability testing with currently fielded JNN units and expeditious performance of the IOT&E.

Recommendations
- Status of Previous Recommendations. The Army is addressing all previous recommendations.
- FY08 Recommendation.
  1. The Army should ensure that sufficient resources including test units, configuration items, and training areas for full spectrum operations are allocated for future operational test events to satisfy WIN-T's theater and below network requirements.

XM1022 Long-Range Sniper Ammunition

Executive Summary

- The Army completed LFT&E of the XM1022 Long-Range Sniper Ammunition in FY07.
- The XM1022 exhibited significant wounding potential and the ability to defeat personnel body armor at desired ranges.

System

- The Army initiated the XM1022 program to develop .50 caliber sniper ammunition with increased accuracy over the currently fielded Mk 211 multi-purpose armor piercing round.
- Because the XM1022 is not a dud-producing round and is less expensive than currently fielded .50-caliber ammunition, it may also serve as training ammunition.
- The XM1022 cartridge consists of a 650-grain projectile loaded into a standard M33 .50 caliber cartridge case.
- The XM1022 is intended for use with the M107 Long-Range Sniper Rifle.

Mission

- Snipers will employ XM1022 Long-Range Sniper Ammunition at extended ranges against enemy personnel.
- In the event other ammunition types (i.e., armor-piercing) are not available, snipers will employ the XM1022 against lightly armored vehicles.

Prime Contractor

- Alliant-Techsystems

Activity

- The Army completed LFT&E in FY07.
- During FY08, the manufacturer of the XM1022 changed, resulting in the need for additional developmental and pre-production qualification testing (PPQT). The Army will continue that testing into 2QFY09.
- Following PPQT, a first article test will verify whether the projectiles from the new manufacturer meet the performance specification.
- Based upon first article test results, the lethality Integrated Product Team will decide if additional lethality testing is warranted, which would be the case if there exists the possibility of a significant change in lethality.

Assessment

- The XM1022 is lethal against its intended targets.
- The XM1022 demonstrated significant wounding potential, the ability to perforate personnel body armor, and anti-material capability beyond its requirement.

Recommendations

- Status of Previous Recommendations. There are no previous recommendations.
- FY08 Recommendation.
  1. The program manager should complete developmental, PPQT, and first article testing and convene the lethality Integrated Product Team to review the data.

Navy Programs

Navy Programs

Acoustic Rapid Commercial Off-the-Shelf (COTS) Insertion for Sonar AN/BQQ-10 (V) (A-RCI)

Executive Summary

- The Acoustic Rapid Commercial off-the-shelf (COTS) Insertion (A-RCI) Sonar is an improvement over the legacy sonar systems; however, insufficient test data exists to conclude that annual A-RCI Advanced Processor Build (APB) upgrades improve mission capability.
- The Navy conducted operational testing of the A-RCI APB-06 between March and December 2008. The Navy deployed the first A-RCI APB-06-equipped submarine in June 2008.
- The Navy continues to field and deploy A-RCI APB system upgrades without completing operational testing.
- DOT&E will issue a classified OT&E report covering A-RCI APB-04 and earlier systems in early FY09.

System

- A-RCI is an open architecture sonar system intended to maintain the acoustic advantage over threat submarines.
- A-RCI utilizes legacy sensors and replaces central processors with COTS computer technology and software. It includes:
  - A sonar system for the *Virginia* class submarine
  - A replacement sonar system backfit into *Los Angeles*, *Ohio*, and *Seawolf* class submarines
  - Schedule-driven annual software upgrades (APBs) and biannual hardware upgrades called Technology Insertions (TI)
- The Navy intends the A-RCI upgrades to provide expanded capabilities for anti-submarine warfare, high-density contact management, and mine warfare, particularly in littoral waters and against diesel submarines.

Mission

Submarine crews equipped with the A-RCI sonar should be able to complete the following submarine force missions:

- Search, detect, and track submarine and surface vessels in open-ocean or littoral sea environments without being counter-detected
- Search, detect, and avoid mines or other submerged objects
- Covertly conduct Intelligence, Surveillance, and Reconnaissance
- Covertly conduct Special Forces Operations missions
- Conduct under-ice operations

Prime Contractor

- Lockheed Martin

Activity

- DOT&E approved the A-RCI TI-06/APB-06 Test and Evaluation Master Plan (TEMP) on June 25, 2008. DOT&E conditionally approved the A-RCI APB-06 operational test plan based on the draft TEMP and draft Capability Production Document (CPD) on March 31, 2008, in order for testers to utilize an available fleet asset for the first operational test event.
- The Navy continues to install and deploy A-RCI upgrades on operational submarines before completing operational testing. Currently eight of the planned 11 submarines planned to receive the A-RCI APB-06 system have the upgrade installed. The Navy deployed the first A-RCI APB-06-equipped submarine in the summer of 2008 before completing all A-RCI APB-06 operational testing.
- The Navy is finishing development of A-RCI APB-07.
- The Navy conducted two OT&E events for the TI-06 APB-06 system to evaluate performance in mission areas for SSN submarines. During the planning for these tests, DOT&E urged the Navy to combine sonar, combat control, and weapons tests into single “end-to-end” tests wherever possible. The Navy combined the A-RCI and AN/BYG-1 combat

control testing. In addition to reducing costs and test assets, this provided a total mission performance evaluation.
  - The Navy tested TI-06/APB-06 in a high-density shipping area to assess the crew's situational awareness in a difficult littoral environment in March 2008. However, submarine materiel problems delayed the start of testing at sea and poor weather in the test area prevented accomplishing an adequate test. The Navy plans to reschedule the test for early 2009.
  - The Navy tested TI-06/APB-06 passive sonar search performance in an exercise with a cooperative Italian Navy diesel-electric submarine (SSK) in September 2008.
- The Navy is preparing requirements documents and a TEMP for A-RCI TI 06/APB07 and TI-08/APB-07.
- The Navy's Commander, Operational Test and Evaluation Force (COTF) issued an A-RCI APB-04 report in December 2007.
- COTF is evaluating data for the completed A-RCI tests and plans to issue a report on the A-RCI APB-06 system in 2QFY09, provided all required testing is complete.
- DOT&E will issue a classified consolidated A-RCI report on all operational test results of A-RCI for the APB-04 and prior systems in early FY09.

Assessment
- Although the Program Executive Officer introduced more discipline over the last two years into A-RCI development and testing, the majority of A-RCI requirements document and TEMP development and approval occurs in parallel with A-RCI APB development and installation. Navy testers begin some operational testing before the Service deploys the APB; however, most testing is not complete when the Navy's fleet commanders deploy the submarine. This schedule-driven process prevents determination of the system's operational effectiveness and suitability before the Navy deploys the system to forward theaters and before operators understand how to fully employ the system. This process also prevents timely feedback into the next A-RCI APB development cycle.
- The Navy implemented a Memorandum of Agreement (MOA) between all organizations involved in A-RCI development and testing, detailing the time frames for completing actions and milestones in the A-RCI TI/APB development-to-fielding cycle. Also the Navy plans to slow the insertion of new functionality into A-RCI in FY09. The MOA and slowing of the insertion rate into A-RCI should improve the Navy's ability to complete adequate test planning and execution before the A-RCI APB is fielded.
- The Navy has not completed operational testing of the A-RCI APB-06 system.
- A-RCI is a technological improvement over the legacy sonar systems; however, insufficient test data exists to conclude that annual A-RCI APB upgrades improve mission capability. In addition, despite annual APB developments, the Navy has not changed most A-RCI requirements thresholds from the original September 1999 Operational Requirements Document. Completed operational testing indicates some performance measures remain below established thresholds. DOT&E believes the new functionality in each APB should enable a trained operator's performance to improve at sea; however, operational testers have not substantiated or measured significant performance improvements in realistic operational environments.
- The DOT&E classified report on A-RCI performance for all testing conducted with TI-04 APB-04 and the preceding four APB systems concludes the following:
  - A-RCI passive sonar capability is effective against some classes of submarines in most easy to moderate acoustic environments, but not effective in more harsh acoustic environments or against modern threats of record.
  - A-RCI is not effective in supporting operator situational awareness and contact management in areas of high contact density.
  - A-RCI high-frequency sonar is effective for arctic, under-ice and ice keel avoidance operations, but has significant reliability problems.
  - A-RCI high-frequency mine performance is significantly improved and meets thresholds, but is not effective for the safe transit of a minefield.
  - Overall, A-RCI is not suitable due to problems with reliability, training, documentation, and poor performance of supporting sub-systems

Recommendations
- Status of Previous Recommendations. The Navy has made progress in addressing five of the six previous recommendations. The FY05 recommendation to develop platform level metrics with thresholds for the combat system has not been implemented.
- FY08 Recommendations. The Navy should:
  1. Complete requirements development, TEMP development, and approval for TI-08/APB-07 and for future TIs and APBs to support initiation of development.
  2. Implement the recommendations in DOT&E's A-RCI report.
  3. Follow the MOA for developing and testing A-RCI.
  4. Continue to conduct combined testing of A-RCI and AN/BYG-1 to enable a full end-to-end evaluation of submarine capability in the applicable mission areas.

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

Executive Summary

- The AGM-88E Advanced Anti-Radiation Guided Missile (AARGM) is in its second developmental test phase. In 2008, there were two successful developmental test missile firings and two successful Operational Assessment (OA) shots.
- Commander, Operational Test and Evaluation Force (COTF) characterized the AARGM as potentially effective and potentially suitable.
- DOT&E concurs with the COTF OA conclusions that AARGM testing and performance was adequate to support a Milestone C decision in September 2008.
- Missile development continues to be delayed by hardware and software technical challenges.
- The program followed a high-risk schedule to achieve a Milestone C decision resulting in deferral of some missile capabilities.
- A surrogate target program continues with a focus on developing operationally-realistic targets. The Resource Enhancement Program (REP) is funding target development.

System

- AARGM is the follow-on to the AGM-88A/B High-Speed Anti-Radiation Missile (HARM) using a modified AGM 88A/B missile body and fins.
- The AARGM changes will incorporate Millimeter Wave (MMW), GPS, digital Anti Radiation Homing (ARH), Weapon Impact Assessment (WIA) Transmitter, and an Integrated Broadcast Service Receiver (IBS-R).
  - MMW technology allows enhanced target discrimination during terminal guidance of the weapon.
  - ARH improvements include an increased field-of-view and larger frequency range.
  - The GPS allows position accuracy in location, time, and WIA transmissions on the IBS-R.
  - The IBS-R allows reception of national broadcast data and transmittal of weapon impact assessment.

Mission

- Units equipped with AARGM conduct pre-planned, on-call, and time sensitive anti-radiation targeting for the degradation and destruction of radio frequency-enabled surface-to-air missile systems.
- Commanders use the AARGM to provide real-time weapons impact assessment via a national broadcast data system.

Prime Contractor

- Alliant-Techsystems

Activity

- The program continued developmental testing in 2008 using a contracted twin engine Beech aircraft with an AARGM seeker assembly attached to the nose of the aircraft. The Beech aircraft flew 109 flight hours of developmental test for characterization of the ARH and MMW seekers. Additionally, the Program Office provided a similar aircraft to the Italian Air Force (cooperative program partner).
- The second developmental testing phase continued, with additional lab and field testing of the ARH and MMW hardware and software, executing Beech aircraft flight tests and F/A-18C aircraft captive-carry events to continue characterization of MMW and ARH seekers. The F/A-18 Advanced Weapons Laboratory (AWL) and the AARGM contractor conducted over 1,500 hours of laboratory testing in the AARGM hardware-in-the-loop and missile chamber facilities.
- Two developmental live fire tests demonstrated GPS, ARH, and MMW capabilities in target prosecution at various ranges to the target. The F/A-18 AWL flew 96 flight hours of developmental test in preparation for the COTF OA.

- The COTF OA, conducted in accordance with the DOT&E-approved test plan, consisted of 10 captive carry sorties and two live fire missile shots. The COTF OA characterized AARGM as potentially effective and potentially suitable demonstrating the program's readiness to proceed to a Milestone C decision in September 2008.
- Representative targets do not exist for this type of weapons system. REP funding provided $4.6 Million in FY07 and $2.0 Million in FY08 for target development to support AARGM operational testing. Target development continues in parallel with AARGM developmental testing.

Assessment

- Hardware and software development challenges continue to impose a risk to the program schedule. These challenges include the hardware and software integration of MMW, GPS, and ARH technologies.
- The MMW radar sensor is better characterized, but still is somewhat immature as an emerging technology.
- Pressure to maintain the Milestone C decision in September 2008 imposed limitations on the adequacy of the OA with reference to full characterization and implementation of the MMW capability.
- DOT&E concurs with the COTF OA conclusions that AARGM testing and performance was adequate to support the September 2008 Milestone C decision.

Recommendations

- Status of Previous Recommendations. The Navy addressed one of the two FY07 recommendations. The second recommendation regarding the test program remains valid.
- FY08 Recommendations.
  1. The Operational Test Agency must ensure surrogate target development, validation, and verification are finalized before formal operational testing begins.
  2. The Navy must fully characterize the MMW and ARH sensors in developmental test prior to formal operational test ensuring it is a period of confirmation vice discovery.

AIM-9X Air-to-Air Missile Upgrade

Executive Summary

- The AIM-9X program continues operational test and evaluation of a software upgrade to the fielded missile. The upgrade addressed a previous deficiency in performance against aircraft employing countermeasures against heat-seeking missiles, and added new interim capabilities to the baseline missile to reduce future developmental risk.
- Analysis and evaluation is ongoing. Modeling and simulation analysis indicates that the new software provides measurable increases in acquisition and track ranges, and greater capability against aircraft employing countermeasures. Initial feedback from the captive flights indicates slightly better performance than the currently fielded missile.

System

- AIM-9X is the latest generation short-range, heat-seeking, air-to-air missile that reduces the gap in short-range combat capability between U.S. aircraft and primary enemy threat aircraft. The currently fielded version of the missile software is 8.019.
- AIM-9X is highly maneuverable, day/night capable, and includes the warhead, fuse, and rocket motor from the previous AIM-9M missile.
- AIM-9X added a new imaging infrared seeker, vector controlled thrust, digital processor, and autopilot. F-15C/D, F/A-18 C/D, and F/A-18 E/F aircraft can carry the AIM-9X, and the missile includes a container for storage and maintenance.
- 8.2XX (the latest software version) includes a rudimentary air-to-ground attack mode; limited lock-on-after-launch; full envelope high off-boresight capability without a helmet-mounted cueing system; and increased flare rejection performance.

Mission

Air combat units use the AIM-9X to:

- Conduct short-range offensive and defensive air-to-air combat
- Engage multiple enemy aircraft types using passive infrared guidance in the missile seeker, using external cues (other than the missile seeker itself) from multiple aircraft systems, including radar and the Joint Helmet-Mounted Cueing System
- Seek and attack enemy aircraft at large angles away from the launch aircraft

Prime Contractor

- Raytheon

Activity

- The AIM-9X program continued operational test and evaluation of a software upgrade (8.2XX) to the fielded missile. The upgrade addressed a previous deficiency in performance against aircraft employing countermeasures against heat-seeking missiles, and added new interim capabilities to the baseline missile to reduce future development risk.
- The program executed the operational test for 8.2XX from May through October 2007, using a DOT&E-approved test plan. The test program consisted of 105 captive carriage flights using F-15, F-16, and F/A-18 aircraft, and three live shots against target drones evaluating end-to-end system performance in varying scenarios.
- The AIM-9X program had to extend 8.2XX operational testing due to technical problems found late in the test. The latest version of 8.2XX, version 8.212, began operational test in September 2008. Eight captive carry and two live fire tests are planned. Pending successful completion of testing, the scheduled software release is planned for early 2009.
- The Program Office began developmental testing of version 9.2XX in September 2008. Version 9.2XX consists of hardware upgrades as a result of parts obsolescence.
- The Program Office recently divided software enhancements to the new missile hardware (Block II) into two versions, 9.3XX and 9.4XX. Air Force and Navy approval for this division of capabilities is pending.

Assessment

- Analysis and evaluation is ongoing. Modeling and simulation analysis indicates the new software provides measurable increases in acquisition and track ranges, and greater capability versus aircraft employing countermeasures. Initial feedback from the captive flights varies indicating slightly better performance than the currently fielded missile. There may be insufficient information in the limited test program to date to fully characterize performance or confirm new capability.
- The three version 8.2 shots to-date were marginally successful. Of the three shots, one successfully killed the target drone. The other two were failures, one due to the pilot shooting beyond intended range, and the other failing to track. In all cases, the missile appeared to function nominally, but did not achieve the expected performance increase over the current software.
- The increase in performance of the 8.2XX variants is not readily discernable when applying comparative analysis. DOT&E believes, in these cases, side-by-side testing is warranted.

Recommendations

- Status of Previous Recommendations. All of the FY06 and FY07 recommendations remain valid.
- FY08 Recommendations.
  1. The Navy and Air Force requirements offices should establish the requirements for versions 9.3XX and 9.4XX and approve as soon as possible allowing adequate test planning for those increments. Testing should have sufficient captive carry and live shots to demonstrate the new capabilities.
  2. Testing of future versions of the AIM-9X should ensure side-by-side testing against the prior version to validate performance improvements when an increase in performance is not discernable via comparative analysis.

AN/BYG-1 Combat Control System

Executive Summary

The Navy deployed AN/BYG-1 with the latest upgrades before completing OT&E during 2008. This is a change for the program, which had a record of completing OT&E before fielding upgrades. Additionally, the limited test and evaluation completed is not sufficient to confirm expected performance improvements. The overall OT&E strategy needs attention to provide the right information to decision-makers before the Navy fields and deploys the system upgrades.

System

- AN/BYG-1 is an open architecture submarine combat control system for analyzing and tracking submarine and surface ship contacts, enabling crew situational awareness, and for targeting and employing tactical torpedoes and missiles.
- AN/BYG-1 replaces central processors with commercial off-the shelf (COTS) computer technology and software. The Navy installs improvements to the system via a spiral development program. It includes:
  - A combat control system for the *Virginia* class submarine
  - A replacement combat control system backfit into *Los Angeles*, *Ohio*, and *Seawolf* class submarines
  - Schedule-driven annual software upgrades (Advanced Processor Builds (APBs)) and biannual hardware upgrades called Technology Insertions (TI)
- The Navy intends improvements to provide expanded capabilities for anti-submarine and anti-surface warfare, high-density contact management, and the targeting and control of submarine weapons.
- The Navy is also developing AN/BYG-1 for use on the Royal Australian Navy *Collins* class diesel electric submarines.

Mission

Submarine crews equipped with the AN/BYG-1 combat control system are able to complete the following submarine force missions:

- Analyze submarine sensor contact information to track submarine and surface vessels in open-ocean or littoral sea environments
- Employ heavyweight torpedoes against submarine and surface ship targets
- Receive strike warfare tasking, plan strike missions, and employ Tomahawk land attack cruise missiles
- Receive and synthesize all organic sensor data and external tactical intelligence to produce an integrated tactical picture

Prime Contractors

- General Dynamics
- Raytheon

Activity

- DOT&E conditionally approved the AN/BYG-1 TI-06/APB-06 Test and Evaluation Master Plan (TEMP) on June 26, 2008. The Navy approved the TI-06/APB-06 Capabilities Development Document (CDD) in July 2008. Due to delays in developing and approving the TI-06/APB-06 CDD and TEMP, DOT&E conditionally approved the Navy's TI-06/APB-06 test plan on April 1, 2008, based on the draft requirements. This enabled the Navy to utilize available test assets to conduct the first APB-06 operational test.
- The Navy deployed the AN/BYG-1 TI-06/APB-06 system on an operational submarine in June 2008. This is a reversal of previous acquisition trends, where the Navy successfully completed operational testing before fielding AN/BYG-1 systems.
- The Navy conducted three OT&E events for the AN/BYG-1 TI-06/APB-06 system to evaluate performance in mission areas for *Los Angeles* class submarines. During the planning for these tests, DOT&E urged the Navy to combine sonar, combat control, and weapons tests into single "end-to-end" tests wherever possible. As discussed below, the Navy combined the Acoustic Rapid COTS Insertion (A-RCI) and BYG-1 testing. In addition to reducing costs and test assets, this provided a total mission performance evaluation.
  - The Navy tested TI-06/APB-06 target motion analysis performance in an exercise with a cooperative Italian diesel-electric submarine (SSK) in September 2008. This was a combined test with the AN/BQQ-10 A-RCI sonar system.
  - The Navy tested TI-06/APB-06 in a high-density shipping area to assess the crew's situational awareness in a difficult littoral environment in April 2008. This was a combined test with the A-RCI sonar system.

  - The Navy successfully conducted two Tomahawk missile launches with the AN/BYG-1 TI-06/APB06 system in May 2008.
- The Navy conducted an initial AN/BYG-1 information assurance vulnerability assessment in July 2008. The Navy is planning information assurance penetration (Red Team) testing in early 2009.
- The Navy's Commander, Operational Test and Evaluation Force is evaluating data from the 2008 tests and plans to issue a report on the APB-06 system in 2QFY09, provided all required testing is complete.

Assessment

- Navy operational testers evaluated previous versions of AN/BYG-1, prior to the fielding or deployment of the system. However, Navy operational commanders deployed the submarine with the APB-06 upgrade installed before operational testing could be completed – this is due in part to the effort to combine testing with the A-RCI submarine sonar program and the related testing delays of that program. Additionally, the limited test and evaluation completed is not sufficient to confirm expected performance improvements. The overall OT&E strategy needs attention to provide the right information to decision-makers before the Navy fields and deploys the system upgrades.
- Two of the APB-06 test events were inadequate for fully evaluating AN/BYG-1 APB-06 performance. A material problem on the test submarine and bad weather in the test area prevented execution of the complete test plan during the April 2008 crew situational awareness in a high-contact density environment test. Due to test limitations and acoustic conditions in the test area, the target motion analysis performance test with the Italian SSK did not provide sufficient data to fully evaluate the system. Testers are analyzing event data to determine the extent of the additional testing needed.
- AN/BYG-1 is a technological improvement over the legacy combat control systems; however, insufficient test data exists to conclude that AN/BYG-1 APB upgrades improve mission capability between APBs. DOT&E believes the new functionality in each APB should enable a trained operator's performance to improve at sea; however, the Navy has not substantiated or measured significant performance improvements in realistic operational environments.
- AN/BYG-1 continues to demonstrate above-threshold reliability, maintainability, and availability. This is due in part to the separation of tactical software development and the weapons-control interface and hardware.
- AN/BYG-1 TI-06/APB-06 is effective in employing Tomahawk missiles.

Recommendations

- Status of Previous Recommendations: This is the first annual report for this program.
- FY08 Recommendations: The Navy should:
  1. Continue to conduct combined testing of A-RCI and AN/BYG-1 to enable a full end-to-end evaluation of submarine capability in the applicable mission areas.
  2. Develop platform-level metrics with thresholds for the entire combat system (segregated requirements result in inadequate evaluations of the system).
  3. Implement an event-based vice schedule-based methodology for developing and testing AN/BYG-1 upgrades, to ensure adequate testing before fielding.

AN/WLD-1(V)1 Remote Mine-hunting System (RMS)

Executive Summary

- Following suspension of the Remote Minehunting System (RMS) IOT&E in June 2007, the Navy implemented hardware and software improvements to correct deficiencies identified during testing. The Navy conducted additional developmental testing in the summer of 2008.
- After evaluating the results of the 2008 developmental testing, the Navy determined that RMS reliability was insufficient to support the scheduled September 2008 IOT&E. The Navy canceled the IOT&E and, with DOT&E concurrence, Commander, Operational Test and Evaluation Force (COTF) conducted an operational assessment in lieu of the planned IOT&E.
- The Navy intends to focus further RMS development on the Littoral Combat Ship (LCS) and complete IOT&E on the LCS in FY10 or FY11.

System

- RMS is a naval mine detection and identification system.
- RMS includes an unmanned, diesel-powered, semi-submersible vehicle called the Remote Mine-hunting Vehicle (RMV). The RMV tows an AN/AQS-20A variable depth sonar mine sensing subsystem.
- For the current RMS, the Navy launches and remotely controls the RMV from a DDG 51 Flight IIA class ship outfitted with a launch and recovery subsystem. Although the Navy originally outfitted six ships to host the RMS, only one ship retains this capability. The Navy plans to adapt the RMS for use on the LCS as part of the mine warfare mission package.
- A data link subsystem provides continuous, real-time communications between the host ship and the RMV for command and control and transmission of sensor data.
- The RMV is controlled and RMS data is processed, displayed, and recorded using a remote mine-hunting functional segment integrated into the DDG 51 combat system.

Mission

- The host platform Commanding Officer can employ RMS to detect, classify, and identify moored and bottom mines in shallow and deep water, allowing Naval forces to determine whether potential sea routes and operating areas contain mines.
- The Maritime Force Commander can use the organic or "in stride" mine countermeasures capability of an RMS equipped ship to make mine avoidance decisions without waiting for dedicated mine countermeasures ships or helicopters.

Prime Contractor

- Lockheed Martin

Activity

- Following suspension of IOT&E in June 2007, the Navy implemented hardware and software improvements to correct deficiencies identified during testing. The Navy conducted additional developmental testing in the summer of 2008.
- DOT&E approved Change 1 to the RMS Test and Evaluation Master Plan in July 2008. This change provided for the additional developmental testing and a planned resumption of IOT&E in September 2008.
- After evaluating the results of the 2008 developmental testing, the Navy determined that RMS reliability was insufficient to support the scheduled September 2008 IOT&E. With DOT&E concurrence, COTF conducted an operational assessment in lieu of the planned IOT&E.

Assessment

- The Navy intends to focus further RMS development on the LCS and complete IOT&E on the LCS in FY10 or FY11.
- RMS reliability and availability remain below the requirements established by the Navy. Based on 2008 reliability performance, the current system on the DDG 51

host ship is not likely to support mine-hunting operations without frequent repair or replacement of the RMV.

- Preliminary analysis indicates that, when the RMS is operational, a proficient crew can utilize the system to detect and classify moored mines in deep water. The data also indicates a detection capability in shallower minefields, containing both moored and bottom mines, when the bottom is smooth and the clutter density is low. The RMS is less capable of detecting mines under other conditions.
- The Navy intends to implement a reliability growth program for the RMS. DOT&E strongly endorses this initiative.
- Although the DDG 51 host ship can only carry one RMV, the Navy plans to outfit each LCS with two RMV's. When combined with the planned reliability growth program, this added redundancy may provide adequate operational availability to support extended mine-hunting operations.
- Radiated noise measurements collected during developmental testing indicate that the current RMV may be vulnerable to one current threat mine. The Navy has identified, but not yet implemented, RMV configuration changes to reduce the RMV acoustic signature.
- DOT&E is working with the Navy to ensure the IOT&E on the LCS will be adequate to fully evaluate effectiveness and suitability.

Recommendations

- Status of Previous Recommendations. The Navy satisfactorily addressed all previous DOT&E recommendations.
- FY08 Recommendations. The Navy should:
  1. Re-evaluate RMS requirements, particularly reliability and availability, to reflect planned operation from the LCS. The Navy should formally revise RMS requirements if necessary.
  2. Revise the RMS Test and Evaluation Master Plan to reflect the Navy's plan to implement a reliability growth program and conduct IOT&E on the LCS.

Armored Tactical Wheeled Vehicles – Navy

Executive Summary

- The Logistic Vehicle System Replacement (LVSR) program completed operational and live fire testing for the cargo variant in FY08.
- The Medium Tactical Vehicle Replacement (MTVR) is a key Marine Corps vehicle in the Operation Iraqi Freedom theater of operation. In June 2008, DOT&E placed the MTVR program on oversight because it had reached the Acquisition Category (ACAT) IC threshold requirement. The Navy is nearly complete with the operational and live fire testing on the MTVR.

System

- The Services are adding armor protection kits to the cabs of tactical wheeled vehicles. The urban and non-linear battlefields of Iraq and Afghanistan made crews of tactical wheeled vehicles susceptible to small arms fire, mines, IEDs, and rocket-propelled grenades.
- The following tactical wheeled vehicle systems have applied and tested an armor protection kit in the last fiscal year:
  - The LVSR is a heavy tactical truck with a 22.5-ton capacity. The Marine Corps uses it as a heavy tactical logistics distribution system for the transport of bulk liquids and cargo, ammunition, containers, and tactical support equipment.
  - The MTVR is a family of medium trucks with an increased capacity of 7 tons off-road and 12 tons on-road.

Mission

The Marine Corps employs truck systems as multi-purpose transportation and unit mobility vehicles in combat, combat support, and combat service support units. The threat to tactical wheeled vehicles has increased, which created a need for augmented and flexible mission ballistic protection.

- The LVSR-equipped unit is capable of completing its missions utilizing a series of variants to include a cargo variant, a wrecker variant, and a fifth-wheel variant. The LVSR cargo variant can self-load, transport, and self-unload its payloads, including standardized containers, fuel and water, palletized cargo, and heavy equipment.
- The Marine Corps uses the MTVR as their prime mover for the howitzer, fuel and water assets, troops, and a wide variety of equipment. This vehicle is a key Marine Corps vehicle in the Operation Iraqi Freedom theater of operation.

Prime Contractor

- LVSR and MTVR: Oshkosh

Activity

- All the truck programs are taking a common building block approach to live fire testing. It begins with ballistically characterizing the armor solutions, followed by a series of ballistic cab exploitation shots against the base armor and armor protection kits of prototype cabs. The focus is on armor and door seams, windows, latches, and seals using small arms threats. Final testing includes full-up and system-level tests against production vehicles using realistic threats such as mines, IEDs, explosively formed penetrators, and rocket-propelled grenades.
- DOT&E approved the LVSR Test and Evaluation Master Plan (TEMP), which included the LFT&E Strategy in July 2006.
- The Marine Corps completed all LVSR cargo variant live fire testing, including full-up and system-level testing, in November 2008 at the Aberdeen Test Center, Maryland.
- The Marine Corps Operational Test and Evaluation Activity (MCOTEA) intends to release the LVSR Cargo Variant Report in October 2008. The Marine Corps conducted testing at Camp Lejeune, North Carolina; Fort Greely, Alaska; and the Marine Corps Air-Ground Combat Center at Twentynine Palms, California. The Marine Corps scheduled follow-on LVSR Wrecker and Tractor variants' IOT&E for FY09/FY10.
- In June 2008, DOT&E placed the MTVR program on oversight because it had reached the ACAT IC threshold requirement. The program office is currently updating the MTVR TEMP.
- The MTVR program completed Follow-on Production Testing, which included 10,000 miles of durability testing in addition to a full-up performance test.

- The Marine Corps conducted MTVR LFT&E in FY07, and will conduct any additional LFT&E in FY09 to ensure all upgrades are survivable.

Assessment

- DOT&E submitted the LVSR LFT&E Report to Congress in 1QFY09.
- The LVSR provides armor protection to the crews against the likely threats while still maintaining mission capability.
- The Marine Corps completed nearly all of the operational and live fire testing on the MTVR.
- Since the Marine Corps conducted live fire testing prior to being on DOT&E oversight, MCOTEA is evaluating data from all of the MTVR live fire tests to ensure that testing was thorough.
- Results from this evaluation may lead to additional testing of the new reducible armor package and troop carrying upgrades.

Recommendations

- Status of Previous Recommendations. This is the first annual report for these programs.
- FY08 Recommendations.
  1. The Marine Corps should require additional live fire testing to assess if changes to the current LVSR cab armor transpire.
  2. Once MCOTEA assesses the live fire data, they may require additional testing to evaluate the upgraded armor for cab vulnerability and crew protection capabilities.

Common Aviation Command and Control System (CAC2S)

Executive Summary

- The DoD designated the Common Aviation Command and Control System (CAC2S) a Major Automated Information System (MAIS) program in FY08.
- The Marine Corps canceled an IOT&E, replacing it with an Operational Assessment (OA), which completed during FY08.
- CAC2S performed poorly during the OA.

System

- CAC2S will be the primary air operations planning and command and control tool for commanders and staff within the Marine Aircraft Wing. CAC2S should also provide the Marine Corps a common command and control system for their air operations.
- CAC2S will consist of tactical shelters, hardware, and software that will provide operators with planning and execution capabilities for aviation operations, enabling the integration of the aviation and ground Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance (C4ISR) networks.
- CAC2S Increment I is designed to replace the Marine Air Command and Control System (MACCS), the functionality of the current Tactical Air Operations Center, Direct Air Support Center, and portions of the Tactical Air Command Center in preparation for transition to the future Marine Air/Ground Task Force (MAGTF) command and control Combat Operations Center.
- Follow-on CAC2S Increments will incorporate additional elements of the MAGTF command and control strategy, to include those for Air Traffic Control, Airborne command and control, and command and control of ground-based defenses and unmanned aerial systems.

Mission

- The MAGTF commander will use CAC2S to provide connectivity to the Joint Command and Control Communications System and Intelligence Command Information Architecture throughout the operational environment, specifically providing the following capability increases to the MAGTF:
  - Display a common near real-time integrated tactical picture with the timeliness and accuracy necessary to facilitate the control of friendly assets and the engagement of threat aircraft and missiles
  - Access to theater and national intelligence sources from a single, multi-function C2 node
  - Standardized Air Tasking Order (ATO) and Airspace Control Order (ACO) generation, parsing, interchange, and dissemination throughout the MAGTF and theater forces by using the joint standard for ATO interoperability
  - Implementation of Theater Air and Missile Defense (TAMD) Joint Data Network (JDN) message sets and intelligence capabilities, providing the MAGTF with a theater-wide source of missile defense information

Prime Contractors

- General Dynamics
- Raytheon

Activity

- The Navy approved the CAC2S Milestone C decision on December 20, 2007.
- The DoD designated CAC2S as an Acquisition Category (ACAT) IAC on December 26, 2007.

- The Marine Corps conducted developmental testing during December 2007.
- The Marine Corps conducted an OA at Yuma, Arizona, during April 2008.

Assessment

- Following developmental testing in December 2007, DOT&E identified the following deficiencies:
  - CAC2S did not receive Joint Interoperability Test Command approval/certification and did not meet the Net Ready Key Performance Parameter.
  - CAC2S could not receive the ATO or ACO using the joint standard for ATO interoperability.
  - The Marine Corps did not successfully develop the CAC2S Global Command and Control System interface.
- Following a preliminary analysis from the CAC2S OA, DOT&E identified the following deficiencies:
  - The Marine Corps made no significant improvements in Information Assurance Posture with over 500 network vulnerabilities corrections required.
  - CAC2S software is unstable. The Mean Time Between Operational Failure rate during the April 2008 OA was 5 hours and 25 minutes, which is significantly less than the threshold requirement of 228 hours. While system availability showed an improvement from the 2006 OA of 30.7 percent to 72 percent, it is still below the 90 percent availability threshold requirement.
  - CAC2S failed to meet the following requirements:
    - Basic C4ISR
    - Voice communications
    - Organic MAGTF radar integration
    - Tactical data link integration
    - Demonstrate MAGTF communications compatibility with joint systems
  - The Marine Corps has not integrated many technical requirements or tested in an operationally-representative environment.

Recommendations

- Status of Previous Recommendations. This is the first annual report for this program.
- FY08 Recommendations.
  1. As the current CAC2S is currently at high risk for successful fielding, the Marine Corps should revisit alternatives for meeting the requirement in the CAC2S Capabilities Production Document.
  2. The Program Office should update the Acquisition Strategy to reflect the MAIS status of the program as well as the findings of the FY08 OA. Additionally, the Acquisition Program Baseline schedule is no longer achievable and requires updating.
  3. The Program Office should update the Test and Evaluation Master Plan and test and evaluation strategy to reflect the updated Acquisition Strategy and schedule.

Common Submarine Radio Room (CSRR) (Includes Submarine Exterior Communications System (SubECS))

Executive Summary

- The Navy is conducting operational testing of the *Virginia* class variant of the Common Submarine Radio Room (CSRR) in conjunction with IOT&E of the *Virginia* class submarine. Testing will not be complete until 2009.
- The Navy should re-evaluate the Extremely High Frequency (EHF) communications infrastructure and system architecture in light of the increased importance of EHF communications to submarine operations.

System

CSRR/Submarine Exterior Communications System (SubECS) is an umbrella program that integrates modern antennas, radios, cryptographic equipment, and messaging systems into a submarine communications network.

- It is intended to provide a common communication system across all classes of submarines and is designed to support the steady infusion of new technology with incremental modernization and replacement of obsolete equipment.
- It establishes common hardware and software baselines.
- *Virginia* class CSRR (designated SubECS) is developed and integrated as part of new construction. Other submarine class radio rooms are replaced with CSRR variants to establish a common radio room baseline.
- The Navy intends future CSRR improvements to address obsolescence issues and add new communications capabilities as they mature.

Mission

The Submarine Commanding Officer utilizes the CSRR/SubECS for communications and information dissemination in order to accomplish assigned missions. The Navy intends to use the CSRR capabilities to:

- Manage, control, and disseminate command, control, communications, computers, and intelligence information routed to and from submarines in an open architecture
- Enable Net-Ready communications and operations

Prime Contractor

- Lockheed Martin

Activity

- The Navy is conducting operational testing of the *Virginia* class variant of the CSRR in conjunction with IOT&E of the *Virginia* class submarine. The Navy will not complete testing until 2009.
- DOT&E approved Revision 3 to the CSRR Test and Evaluation Master Plan in November 2007. This revision addresses the FOT&E for planned FY08 and FY09 upgrades to the baseline CSRR.
- The Navy plans to accelerate fielding of the CSRR on older *Los Angeles* class submarines, installing the first *Los Angeles* class variant in 2011 rather than 2015.

Assessment

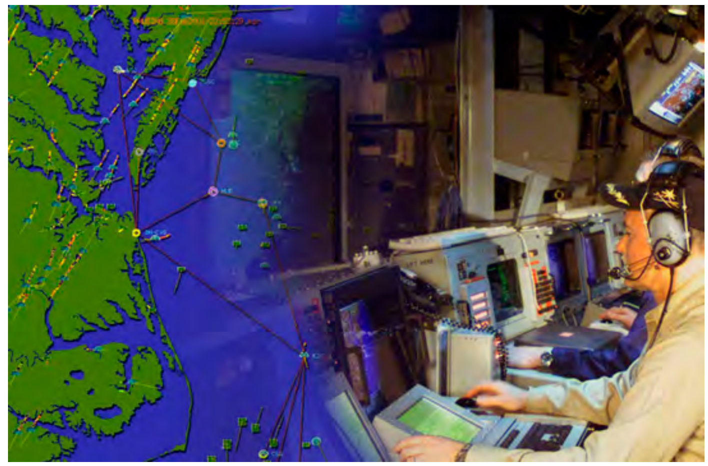
- As reported in the FY07 Annual Report, the baseline CSRR is effective and suitable for current submarine communication requirements. The Navy has planned adequate operational testing for FY08 and FY09 CSRR upgrades.
- The baseline CSRR adequately implements EHF, but successful EHF communications are highly dependent upon satellite availability and adequate shore support. The testers observed, and the crews reported, frequent problems conducting EHF communications. Contributing to these problems, the Navy's EHF architecture does not appear to be optimized to support rapid restoration of communications

following an inadvertent interruption. In recent years, EHF connectivity has become increasingly important to submarine operations.

Recommendations

- Status of Previous Recommendations. The Navy has adequately addressed two of the three FY07 DOT&E recommendations. The recommendation regarding EHF remains valid.
- FY08 Recommendations. None.

Cooperative Engagement Capability (CEC)



Executive Summary

The surface ship version of Cooperative Engagement Capability (CEC) remains operationally effective and suitable. However, deficiencies in target tracking and engagement have been identified that will not be corrected until an improved track correlation system, currently under development, is available.

System

- The CEC is a system of hardware and software that allows surface ships (USG-2 variant) and E-2 aircraft (USG-3 variant) to share radar data. It consists of two main hardware pieces:
  - Cooperative Engagement Processor (CEP) to collect and fuse radar data
  - Data Distribution System (DDS) to exchange the CEP data with other CEC-equipped units
- An open architecture upgrade using commercial off-the-shelf (COTS) components is under development.

Mission

Ships and aircraft equipped with CEC:

- Accomplish air defense missions by sharing a comprehensive situational awareness of all air contacts
- Have a higher likelihood of air defense mission accomplishment because a CEC-equipped ship can fire missiles at a hostile air contact without that ship having actual radar contact

Prime Contractor

- Raytheon

Activity

- Commander, Operational Test and Evaluation Force (COTF) conducted FOT&E of CEC in February 2008 in USS *Ronald Reagan* (CVN 76) and USS *New Orleans* (LPD-18). Testing examined the integration of CEC with the Ship Self-Defense System (SSDS) Mark 2 Mod 1 (installed in USS *Ronald Reagan*) and with the SSDS Mark 2 Mod 2 (installed in USS *New Orleans*). COTF accomplished the FOT&E in accordance with a DOT&E-approved test plan. COTF has not yet published a report on results of this testing.
- COTF initiated planning for FOT&E of CEC equipped with a new signal data processor that the Navy will install on the E-2D aircraft.

Assessment

- The USG-2 variant of CEC remains operationally effective and suitable; however, deficiencies in target tracking and engagement continue to occur and will not be corrected until an improved track correlation system is successfully developed and available.
- Initial indications show that limited CEC operator proficiency did not support a complete evaluation of end-to-end combat system interoperability with a strike group composed of ships equipped with SSDS-based combat systems operating with CEC-equipped Aegis destroyers.
- Initial indications show that testers did not gather enough data during the FOT&E period to allow for a complete evaluation of CEC reliability when integrated with the SSDS Mark 2 Mod 2.

Recommendations

- Status of Previous Recommendations. The Navy satisfied one of the two recommendations from FY05, but did not address any of the FY06 recommendations.
- FY08 Recommendations. The Navy should:
  1. Update the Test and Evaluation Master Plan to include details of CEC FOT&E testing with the Joint Lightweight Elevated Sensor System and the Navy Integrated Fire Control – Counter Air capability.
  2. Ensure testers gather required data for a complete evaluation of CEC reliability when integrated with the SSDS Mark 2 Mod 2.

CV-22 Osprey

Executive Summary

- There are two variants of the V-22: the Marine Corps MV-22 and the Air Force and U.S. Special Operations Command (USSOCOM) CV-22.
- The CV-22 IOT&E took place in four phases from August 2007 through April 2008. The testing included a validation phase for special operations tactics, end-to-end missions with Special Operations teams, simulator missions, and electronic warfare testing. The CV-22 Block 20/B aircraft demonstrated that it is operationally capable of supporting the required Special Operation Forces (SOF) missions. Deficiencies with the Suite of Integrated Radio Frequency Countermeasures, Directional Infrared Countermeasures, ice protection system, and Multi-Mission Advance Tactical Terminal system should be addressed as soon as possible.
- The CV-22 FOT&E will address: installation of a new high-power jammer and the remaining threat systems, deferred testing for cold weather operations, strategic refueling capability and self-deployment, mission planning system, and fixes to the ice protection system and engine sub-assemblies.

System

- The CV-22 is the replacement for aging Special Forces MH-53D helicopters.
- It is a tilt-rotor aircraft capable of conventional fixed-wing flight and vertical takeoff and landing over the entire range of Special Operations missions.
- Its speed and range enable the ability to support Special Operations mission demands that were not possible with legacy rotary or fixed-wing aircraft.
- It can carry 18 combat-ready Special Operators 228 nautical miles (nm) and return.
- The CV-22 can self-deploy up to 2,100 nm with one aerial refueling.
- The CV-22 will augment Air Force Special Operations MC-130 aircraft. It has terrain-following, terrain-avoidance radar, an advanced multi-frequency communication suite, and a more robust electronic defense suite.
- Future capability includes engine sub-assembly upgrades, strategic refueling capability, and various fixes to shortfalls identified in IOT&E.

Mission

Special Forces detachments equipped with the CV-22 provide high-speed, long-range insertion and extraction of SOF to and from operational objectives across the full range of military operations, from operations other than war to major theater campaign support.

Prime Contractors

- Bell Helicopter and Boeing Joint Venture

Activity

- The CV-22 testing has been in accordance with the DOT&E-approved Test and Evaluation Master Plan.
- Air Force Operational Test and Evaluation Center (AFOTEC) executed CV-22 IOT&E from September 2007 through April 2008. AFOTEC performed USSOCOM missions with the CV 22-unique radar and defensive electronic countermeasures systems. The IOT&E included a robust set of end-to-end SOF missions at Eglin AFB, Florida, that incorporated participation of operational Army, Navy, and Air Force Special Forces troops in a wide range of realistic simulated missions.
- The IOT&E also included a dedicated electronic warfare phase conducted at the Nellis Air Force Base, Nevada, and China Lake, California, range complexes.
- AFOTEC conducted an Operational Utility Evaluation to develop operational tactics and included the initial electronic warfare assessments.
- The IOT&E included a simulation phase to evaluate aircrew ability to execute missions in a high-threat environment that were not feasible for open-air testing.
- AFOTEC planned to conduct cold-weather testing in Alaska, as well as a long-range deployment outside the continental

United States. AFOTEC cancelled both deployments with DOT&E concurrence in order to maximize test productivity. The test objectives will be incorporated into FOT&E. The cold-weather deployment was cancelled due to performance and reliability issues with the ice protection system. The long-range deployment was cancelled due to operational scheduling conflicts.

Assessment

- The speed and range of the CV-22 enable the SOF to expand the operational ability to support troops at much greater ranges and in scenarios that are not possible with legacy aircraft. The ability of the Osprey to reach compromised teams or injured troops and extract them is a capability increase and is unique to the V-22.
- The turbo-prop class maneuverability and cruise speeds enable deployment options and scenarios previously not reachable with legacy helicopters and greatly expands options for covert and clandestine action.
- The CV-22 demonstrated the ability to support troop high-altitude parachute, water, fastrope, and airland infiltration tactics, as well as hoist recovery from various day and night scenarios and troop resupply.
- The ability of the CV-22 to perform Special Operations missions from a ship will be limited. Gross takeoff weight restrictions will limit its ability to perform long-range missions. Directed Infrared Countermeasure (DIRCM), Suite of Integrated Radio-Frequency Countermeasures (SIRFC), and radar system restrictions in the vicinity of the ship will limit overwater missions (such as search and seizure events). The missile warning sensor was found to have electromagnetic compatibility problems with the shipboard environment and must be reconfigured to operate at the ship. This deficiency is under investigation.
- The electronic warfare defensive suite is still facing challenges. Flight testing in Nova Scotia during FY05 showed that the SIRFC antenna accumulates ice when the aircraft is flown in icing conditions. A redesign to correct the problem has still not been identified. The interim solution was to install a flat plate in place of the radome during a portion of the CV-22 IOT&E.
- The IOT&E testing documented significant problems with: ice protection system, engine air particle separator assembly, DIRCM performance, SIRFC performance, communication reliability, and several small hardware issues. In addition, the lack of a strategic refueling capability from KC-135 and KC-10 tankers demands operational support from limited MC-130/KC-130 aircraft.

Recommendations

- Status of Previous Recommendations. The program addressed four of the seven previous V-22 annual report recommendations. Two from FY06 and one from FY07 remain valid.
- FY08 Recommendations. The program should:
  1. Work to ensure that the CV-22 defensive suite problems are fully corrected and tested before the aircraft reaches Initial Operational Capability.
  2. Address the deficiencies documented in IOT&E.
  3. Plan and demonstrate long-range deployment and cold-weather operational capability.

CVN 21 – Next Generation Nuclear Aircraft Carrier

Executive Summary

- The Navy began an operational assessment in March 2008, which will provide Experienced Fleet Operators a review of CVN 21 design and technologies. This assessment will be conducted until February 2009.
- The Navy is continuing development of the Virtual Carrier model that will be used to supplement live testing during IOT&E for the Sortie Generation Rate (SGR) Key Performance Parameter (KPP).
- The Navy is continuing to build and operate land-based test sites for the dual band radar (DBR), electromagnetic aircraft launch system (EMALS), and advanced arresting gear (AAG).

System

- The CVN 21 program is designing and building the new CVN 78 class of nuclear powered aircraft carrier. It has the same hull form as the *Nimitz* class, but many ship systems inside the hull and on the flight deck are new.
- The newly designed nuclear power plant will reduce reactor department manning by 50 percent and produce significantly more electricity when compared to a current CVN 68 class ship.
- CVN 78 will incorporate electromagnetic catapults (instead of steam powered) and have a smaller island with a Dual Band Phased Array Radar.
- Weapons stowage, handling spaces, and elevators have all been redesigned to reduce manning, increase safety, and increase throughput of weapons.
- The Integrated Warfare System will be adaptable to technology upgrades and varied missions throughout the ship's projected operating life.
- CVN 21 is designed to increase the sortie generation capability of embarked aircraft and have increased self-defense capabilities when compared to current aircraft carriers.

Mission

- Carrier Strike Group Commanders will use the CVN 21 to:
  - Conduct power projection and strike warfare missions using embarked aircraft
  - Provide force protection of friendly units
  - Provide a sea base as both a command and control platform and an air-capable unit
- Initial Operational Capability for CVN 78 is planned for FY16. Full Operational Capability is planned for FY18 after Milestone C.

Prime Contractor

- Northrop Grumman

Activity

- Commander, Operational Test and Evaluation Force (COTF) began an operational assessment (OT-B2) in March 2008. It is currently scheduled to complete in February 2009. This assessment should inform the planned program review in FY11, but does not support a specific acquisition decision.
- The Navy is continuing to develop the Virtual Carrier model for analyses of the SGR capability of the ship, and will complete a SGR assessment during FY09.
- The Navy is currently performing high-cycle testing and highly accelerated life testing of the EMALS equipment at various labs.
- The Navy is building land-based test sites for both EMALS and the AAG in Lakehurst, New Jersey.
- The Navy has built a land-based test site to continue testing the DBR for both DDG 1000 and CVN 78 ship classes at the Surface Combat Systems Center, Wallops Island, Virginia.
- The Navy did not conduct live fire testing in FY08; however, the program did participate in the LPD-19 Full Ship Shock Trial (FSST) to support a study to develop an alternative to FSST. The alternative to FSST will be defined in the FY09 Test and Evaluation Master Plan (TEMP) revision with the caveat that if sufficient confidence in the alternative is not

obtained, a FSST will take place in FY18. A Memorandum of Understanding (MOU) is being developed between NAVSEA 05, NAVSEA 08, and Program Executive Officer Carriers documenting the process.

Assessment

- The electromagnetic environmental effects of the DBR are not completely understood with respect to embarked aircraft and carrier operations. Large phased array radars in use aboard destroyers and cruisers typically prohibit radar transmission in the astern sectors during helicopter operations. The impact of DBR transmissions on fixed-wing aircraft, personnel, ordnance, and aviation support equipment are unknown.
- Final design of the Integrated Warfare System (IWS) is not complete, allowing recommendations from the OT-B2 to be considered in final IWS design. The Program Office is using current and projected threat analyses to examine requirements for the next update of the Test and Evaluation Master Plan.
- DOT&E assess that a comprehensive CVN 21 LFT&E plan is based on:
  - CVN Survivability Studies
  - Lessons learned from battle damage and flight deck accidents (e.g., the fire that occurred on the CVN 73)
  - Relevant weapon effects tests and extensive surrogate testing
  - Probability of kill versus probability of hit studies
  - Damage scenario-based engineering analysis of specific hits
  - A total ship survivability trial
  - A full ship shock trial, or cost effective acceptable alternative.

Recommendations

- Status of Previous Recommendations. The Navy satisfactorily addressed all FY07 recommendations.
- FY08 Recommendations. The Navy should:
  1. Continue the OT-B2 operational assessment until the results of the SGR Assessment are known.
  2. Capture the preliminary design review issues of the IWS in OT-B2.
  3. Perform a comprehensive ship-wide electromagnetic environmental effects study to include effects on personnel, ordnance, aircraft fueling, and aircraft avionics.

DDG 51 *Arleigh Burke* Aegis Destroyer

Executive Summary

- DDG 51 is operationally effective in open ocean battle space, although its execution of the anti-air warfare mission is limited by Standard Missile-2 reliability and performance problems.
- DDG 51 is less effective in littoral waters where it may encounter asymmetric, high-speed surface threats.
- Preliminary indications show that human systems integration, documentation, and training deficiencies found during Aegis Weapon System (AWS) Baseline 7.1.1.1 testing have not been resolved in AWS Baseline 7.1.2.1.

System

- The DDG 51 Guided Missile Destroyer is a combatant ship equipped with:
  - The AWS AN/SPY-1 three dimensional (range, altitude, and azimuth) multi-function radar
  - SQQ-89 Undersea Warfare suite that includes the AN/SQS-53 sonar, SQR-19 passive towed sonar array, and the SH-60B or MH-60R Helicopter (DDG 79 and newer have a hangar to allow the ship to carry and maintain its own helicopter)
  - Five-inch diameter gun
  - Harpoon anti-ship cruise missiles
  - The Vertical Launch System that can launch Tomahawk land attack missiles, Standard surface-to-air missiles, Evolved SeaSparrow Missiles, and Vertical Launch Anti-Submarine Rocket missiles

Mission

The Maritime Component commander can employ DDG 51 to:

- Conduct Anti-Air Warfare, Anti-Surface Warfare, and Anti-Submarine Warfare
- Conduct Strike Warfare when armed with Tomahawk missiles
- Conduct offensive and defensive warfare operations simultaneously when necessary
- Operate independently and with Carrier or Expeditionary Strike Groups as well as with other joint or coalition partners

Prime Contractors

- Bath Iron Works
- Northrop Grumman

Activity

- Commander, Operational Test and Evaluation Force (COTF) conducted operational testing of ships with AWS Baseline 7.1.2.1 software in USS *Gridley* (DDG 101) from February to August 2008. COTF conducted operational testing in accordance with a DOT&E-approved test plan.
- COTF has not yet issued a final report of this testing.
- The DDG 51 Test and Evaluation Master Plan (TEMP) 801 has been replaced by the Aegis Enterprise TEMP 1669 (approved October 2008) which covers testing of the AWS 7.1R software baseline planned for DGG 51 class hulls 103 and above in addition to testing of modernized Aegis cruisers and destroyers. This TEMP includes testing of the Navy Integrated Fire Control – Counter Air capability, Single Integrated Air Picture capability, the Standard Missile-6 program, and the Aegis Ballistic Missile Defense program.

Assessment

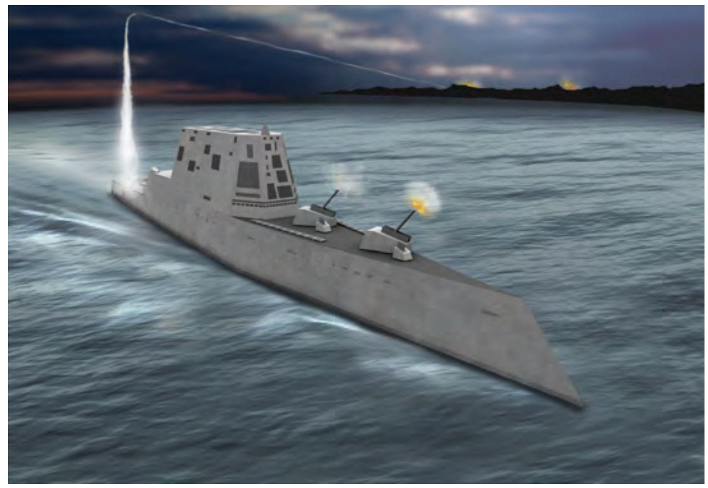
- Initial indications are that COTF testers were unable to complete several key tests of AWS Baseline 7.1.2.1. Tests not completed included the following:
  - Testing of the air/surface logic of the Close-In Weapon System (CIWS) due to test time constraints
  - Testing of fratricide issues between CIWS and the Vertical Launching System due to test time constraints
  - Surface tracking capability of the SPY-1D(V) Radar due to inadequate crew training

  - Testing against high-speed surface threats due to equipment failures and inadequate crew training
- Initial indications from the FOT&E testing are that the AWS 7.1.2.1 software baseline continues to have limited effectiveness in littoral waters against high-speed surface threats. Results also indicate that the Navy has not corrected the human systems integration, documentation, and training deficiencies found during AWS Baseline 7.1.1.1 testing.

Recommendations

- Status of Previous Recommendations. The Navy has closed three of the four FY05 recommendations and one of the four FY06 recommendations.
- FY08 Recommendation.
  1. The Navy should complete all planned key operational tests of AWS software baseline 7.1.2.1 in accordance with the DOT&E-approved test plan.

DDG 1000 *Zumwalt* Class Destroyer



Executive Summary

- The program continued detailed design, systems integration, and technology risk reduction in FY08. Developmental testing and an operational assessment (OT-B1) examined a range of major warfare mission and ship support areas, which identified potential ship design and performance risks.
- The Navy shifted the Acquisition Strategy, reducing the DDG 1000 total procurement from seven to two or three. This, coupled with awarding a contract for the Threat D target, has created a great deal of uncertainty within the production and testing communities regarding schedule.
- The Navy is delaying an update to the Test and Evaluation Master Plan (TEMP) until after the submission of the FY10 budget and the program gains more stability.
- Although no LFT&E activity occurred in FY08, an active and robust program is in place to gain survivability insights.

System

DDG 1000 is a new combatant ship with a wave piercing efficient hull form designed both for endurance and to be difficult to detect on radar. It is equipped with:

- Two 155 mm Advanced Gun Systems (AGS) that fire the Long-Range Land Attack Projectiles
- Dual Band (X-Band and S-Band) Radar capable of performing all search and fire control functions for both air and surface
- Eighty vertical launch cells that can hold a mix of Tomahawk missiles, Standard Missiles, Vertical Launch Anti-Submarine Rockets, or Evolved SeaSparrow Missiles
- Integrated Undersea Warfare system with a dual frequency bow mounted sonar and multi-function towed array sonar to detect submarines and assist in avoiding mines
- An ability to embark and maintain MH-60R helicopters and vertical take-off unmanned aerial vehicles

Mission

- The Joint Force Maritime Component Commander can employ DDG 1000 to accomplish:
  - Land Attack Warfare - Joint Surface Strike and Joint Surface Fire Support
  - Anti-Surface Warfare
  - Anti-Air Warfare (self-defense)
  - Undersea Warfare (self-defense)
- DDG 1000 can operate independently or in conjunction with an Expeditionary or Carrier Strike Group as well as with other joint or coalition partners in a Combined Expeditionary Force environment.

Prime Contractors

- Bath Iron Works
- BAE Systems
- Northrop Grumman
- Raytheon

Activity

- Significant developmental testing occurred on the Dual Band Multi-function Radar, Total Ship Computing Environment/Infrastructure, and hull form in FY08.
- The Navy began an operational assessment (OT-B1) in March 2008. The final report is expected in March 2009.
- The Navy awarded a contract to proceed with the development and production of a surrogate target to address a specific Anti-Ship Cruise Missile threat referred to as Threat D, thus paving the way for DOT&E's approval of the TEMP update.
- The Navy is reassessing their Acquisition Strategy for DDG 1000 and has decided to reduce production and delivery from seven to only two or three. Due to acquisition and anticipated production schedule changes, the Navy is

postponing the TEMP update until Congress acts on the president's FY09 defense budget and the Navy submits their FY10 budget.

Assessment

- Initial impressions from the operational assessment (OT-B1) identified the following:
  - Navy training and shore-side logistics plans do not currently support DDG 1000's small crew size and the expectation of immediate qualification upon reporting aboard.
  - Ship operations require a large number of Top Secret/Special Compartmental Information (TS/SCI) clearances, which could impact the ability to sustain manning.
  - Important software functionality has been delayed to later builds, thereby increasing risk.
  - The electronic support system has not yet been identified, also increasing risk.
  - AGS operations may not be sustainable in rough weather.
- Planned testing on the Self-Defense Test Ship only includes Evolved SeaSparrow Missile engagements. Without advanced testing of Standard Missile (SM)-2 prior to lead ship delivery, the program risks potential cost and schedule delays.
- The Navy has not identified adequate facilities for measuring the ship's magnetic, acoustic, infrared, and radar signatures. While there are Navy efforts with respect to facilities for operational testing, long-term life-cycle facilities are not being addressed.
- The DDG 1000 supports a robust LFT&E program providing a comprehensive survivability evaluation of the new technologies employed by this new generation of destroyers.
- The Navy identified a potential land-based range for conducting operational end-to-end testing of Land Attack Warfare, one of the ship's major mission areas, using the AGS against realistic targets. The Integrated Production Team continues to assess the feasibility of the end-to-end test capability and the impact of that upon the previously approved LFT&E lethality strategy.

Recommendations

- Status of Previous Recommendations. One of the four FY05 recommendations and one of the two FY07 recommendations remain valid.
- FY08 Recommendations. The Navy should:
  1. Conduct developmental SM-2 firings using the DDG 1000 combat system on the Self-Defense Test Ship. These firings would reduce risk if conducted earlier than the lead ship firings.
  2. Develop a test approach (including range resources) for at-sea testing of the AGS against threat-representative targets.
  3. Develop and fund the shore-based logistics and maintenance infrastructure for the upkeep of the DDG 1000 class.

Department of the Navy Large Aircraft Infrared Countermeasures (DoN LAIRCM)

Executive Summary

- The Marine Corps intends to equip operational CH-53E aircraft by January 2009 and CH-46E aircraft by May 2009 with a directional, laser-based self-protection system. For the CH-53E, the Marine Corps chose to use a derivative of the latest variant of the Air Force's Large Infrared Countermeasures (LAIRCM) System, which is based on newer infrared warning sensors and an upgraded laser jammer (the Guardian Laser Transmitter Assembly (GLTA)) as opposed to the ultraviolet warning sensors and the small laser transmitter assembly (SLTA) used on earlier versions of LAIRCM.
- The Department of the Navy (DoN) LAIRCM completed an ambitious, accelerated test program in August 2008. Testing consisted of live fire missile shots against the system at the White Sands Missile Range, New Mexico, and Tonopah Test Range, Nevada; an integrated developmental and operational test (DT/OT) flight test program; and a Quick Reaction Assessment (QRA) by the Navy's Operational Test and Evaluation Force (COTF) on both the CH-53E and CH-46. The results of these tests will inform an Early Operational Capability Decision by October 2008 and initial aircraft installations in January 2009. Because of the accelerated test schedule, the Navy completed only minimal suitability testing and evaluation. The Navy conducted a maintenance demonstration in September 2008.
- The Navy/Marine Corps plan to continue the test and evaluation of the system in the CH-53E and the CH-46 in order to obtain a full-rate production (FRP) decision. The IOT&E will emphasize suitability and additional effectiveness testing. The Service plans to conduct an operational assessment in December 2008 to support the February 2009 Milestone C decision and an IOT&E for the CH-53E in March to April 2009 to support the June 2009 FRP decision. The test plan calls for FOT&E on the CH-46 and the CH-53D in July and September 2009, respectively.

System

- DoN LAIRCM is a defensive system for Marine Corps helicopters against surface-to-air infrared missile threats that combines an ultraviolet or two-color infrared Missile Warning Sensor (MWS) with the GLTA.
- This system is a spin-off of the Air Force's LAIRCM program, which is a defensive system for large transport and rotary wing aircraft that combines AAR-54 MWS and infrared laser jammers.
- The CH-53E is the lead platform, followed by the CH-46.
- The Navy intends to field an Early Operational Capability (EOC) DoN LAIRCM in the fall of 2008 with one squadron to U.S. Central Command.

- Procurement includes quantities for 156 aircraft to include CH-53E, CH-46, and CH53D.
- DoN LAIRCM has an evolutionary incremental Acquisition Strategy:
  - Increment 1 features the AAQ-24 ultraviolet MWS on the CH-46
  - Increment 2 features a two-color infrared MWS upgrade for the CH-53E, CH-46, and the CH-53D, in that order.

Mission

Combatant Commanders will use DoN LAIRCM to provide automatic protection of rotary wing aircraft against shoulder-fired, vehicle-launched, and other infrared-guided missiles. Aircrew need such protection during normal take-off and landing, assault landing, tactical descents, re-supply, rescue, forward arming and refueling, low-level flight, and aerial refueling.

Prime Contractor

- Northrop Grumman

Activity

- The test program from November 2007 through August 2008 consisted of evaluation of the DoN LAIRCM system against live missile shots at the White Sands Missile Range, New Mexico, and Tonopah Test Range, Nevada; and developmental/operational flight tests for both aircraft at Eglin AFB, Florida, from March through August 2008. The Navy evaluated suitability during these tests and during a maintenance demonstration held in September 2008.
- The Navy conducted live fire tests against several infrared missile types in November 2007 and March 2008, primarily to evaluate the performance of the two-color MWS as part of the overall LAIRCM system.
- Subsequent to successful aircraft integration, the Navy/Marine Corps initiated accelerated developmental/operational flight testing in March 2008. The Service conducted more extensive testing on the CH-53E because it used the newer, two color infrared MWS. DoN LAIRCM has conducted 100 flight hours of DT and OT testing at the time of this report.
- The tests on both aircraft encompassed several operationally-representative scenarios which the Navy anticipates in Operation Iraqi Freedom and Operation Enduring Freedom. To expedite the operational assessment of the two systems, the Navy's Operational Test Agency (OTA) participated in the tests throughout. The OTA provided an early assessment of the two configurations, which provided for timely modifications during the tests to improve system performance.
- Subsequent to the completion of the developmental tests in July 2008, the Navy's OTA provided a QRA for both aircraft to support the EOC decision planned for November 2008.

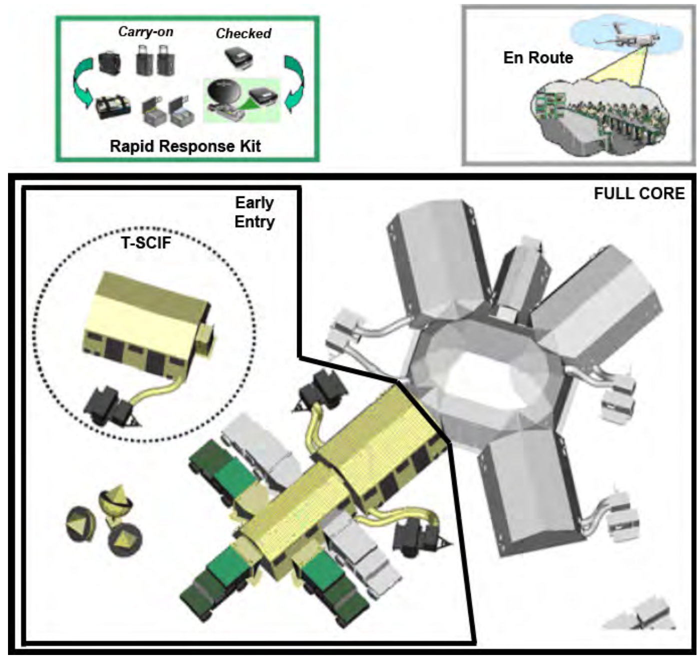
Assessment

- The test team faced a difficult challenge to perform the extensive flight testing in a very short timeframe. DOT&E's initial assessment of the DoN LARICM systems on the CH-53E and the CH-46 indicated that the systems should be operationally effective. A comprehensive analysis and assessment of the DT/OT tests should be complete before the EOC decision in November 2008.
- The live fire tests were useful, and the DoN LAIRCM system performed satisfactorily during these tests. However, the two-color MWS system needs more live fire data to fully characterize performance. The Navy scheduled additional live fire tests for November to December 2008.
- Because of the abbreviated test period, suitability evaluations were minimal. There were two hardware failures during the tests, both with the GLTA. The only substantive suitability test conducted prior to the EOC decision was the Maintenance Demonstration (M-Demo) performed in September 2008. The M-Demo evaluated the logistical support (i.e., technical publications, training) needed to sustain the system in the field and the required maintenance procedures (i.e., remove and replace black boxes, software reloadability, use of diagnostic tools).
- Although the flight tests were adequate for a QRA, more flight testing is required to fully assess the operational effectiveness and suitability of the DoN LAIRCM system on the CH-53E and the CH-46. Additional operational testing planned for the IOT&E in 2009 is required prior to a FRP decision.

Recommendations

- Status of Previous Recommendations. This is the first annual report for this program.
- FY08 Recommendations. The Navy/Marine Corps should:
  1. Ensure that the IOT&E planned for 2009 encompasses a comprehensive suitability evaluation as well as a correction of deficiencies found during the recent QRAs.
  2. Continue to conduct live fire missile shots to obtain a more robust database on the system's capability to counter all types of passive infrared missiles.
  3. Attempt to obtain field data from the deployed units once the EOC aircraft deploy.

Deployable Joint Command and Control (DJC2)



Executive Summary

- The Deployable Joint Command and Control (DJC2) program completed a series of tests in 2007 on the Spiral 1.1 Early Entry/Core system, the Rapid Response Kit configuration, and the Internet Protocol Convergence Suite upgrade.
- In 2008, the DJC2 program completed testing on the Spiral 1.2 Early Entry/Core system and the En Route configuration.
- As a result of this testing, the Milestone Decision Authority authorized the program in 2008 to field Spiral 1.1 Early Entry/Core systems to the Pacific Command and upgrade previously fielded systems, field the Rapid Response Kit to Combatant Commands having DJC2, and field the Internet Protocol Convergence Suite upgrade.
- The Air Force's 46th Test Squadron and the Navy's Commander, Operational Test and Evaluation Force (COTF) performed analysis of Spiral 1.2 Early Entry/Core configurations and the En Route configuration resulting in an authorization to field by the Milestone Decision Authority in September 2008.

System

- DJC2 is a deployable family of systems consisting of shelters, generators, environmental control, and communications systems integrated with an information technology system comprised of software applications, databases, and networks.
- DJC2 consists of four basic configurations:
  - A 2- to 15-position Rapid Response Kit reach-back capability which is transit-cased
  - A 6- to 12-position En Route configuration located on an aircraft
  - A 20- to 40-position Early Entry configuration with separate Top Secret Sensitive Compartmented Information Facility (T-SCIF)
  - A 60-position Core configuration with T-SCIF
- The Early Entry configuration is integrated with and becomes part of the larger Core configuration.
- Selected Combatant Commands (COCOMs) will receive one or two Core configurations. For each Core configuration, a COCOM also receives four Rapid Response Kits and one En Route configuration.
- Two spirals are being fielded to update and enhance the baseline configuration. Spiral 1.1 updates various information and communications technologies within the DJC2. Spiral 1.2 introduces a two-man deployable Rapid Response Kit for first responders and small control teams that can be carried on commercial aircraft, and containerizes all the communications and network equipment previously mounted on five High Mobility Multi-purpose Wheeled Vehicles (HMMWV).

Mission

- The Joint Task Force commander and the Joint Enabling Capabilities staff use DJC2 to plan, control, coordinate, execute, and assess operations across the spectrum of conflict.
- The Commander and staff use DJC2 tools and environments for collaborative planning, predictive battlespace situational awareness, dynamic asset synchronization and oversight, and executive battle management and control.
- Commanders use:
  - The Rapid Response Kit for communications and information exchange with small first responder teams
  - The En Route configuration to maintain situational awareness and perform limited command and control as they transit into the theater of operations
  - The Early Entry configuration to establish communications and command and control capabilities for a small 20-person forward element immediately upon arrival in the theater of operations
  - The Core configuration for command and control using temporary communications to support continued planning and execution tasks; more robust communications capabilities are supplied by the Joint Communications Support Element, or other communications element, to sustain operations as the staff size increases

Prime Contractor

- Government Integrator

Activity

- The February 2007 Acquisition Decision Memorandum permits the DJC2 Program Office to field the remaining Increment I products upon DOT&E notifying the Assistant Secretary of Defense for Networks and Information Integration that testing is complete and Category 1 deficiencies are corrected.
- In May 2008, the 46th Test Squadron and COTF completed developmental testing with associated Level I operational testing of the Spiral 1.2 Early Entry/Core configuration.
- The 46th Test Squadron conducted developmental testing of the En Route configuration from January through April 2008 with two flights on an appropriately configured C-17 aircraft in April 2008.
- COTF completed operational testing of the En Route configuration aboard a C-17 aircraft in April 2008. The Joint Program Office conducted follow-on events in May and June 2008 to further characterize performance of the International and Maritime Satellite system components.
- The 46th Test Squadron and COTF completed developmental testing with associated Level I operational testing of the En Route configuration aboard an appropriately configured C-130 aircraft in August 2008.
- Based on this follow-on testing of the DJC2 En Route Configuration, COTF published a Verification of Correction of Deficiencies in September 2008. The testing verified corrections of the two major deficiencies identified during the operational test in April 2008 – loss of Secure Internet Protocol Router Network and the inability of the DJC2 System Support Team to establish user profiles during flight. COTF concluded the En Route configuration is now operationally effective and suitable, and recommended for fleet introduction.

Assessment

The DJC2 program fulfilled conditions of the Acquisition Decision Memorandum and, based on input from DOT&E, the Milestone Decision Authority authorized the fielding of:

- Spiral 1.1 Early Entry/Core configurations to Pacific Command and to upgrade fielded systems in January 2008
- The Rapid Response Kit in February 2008
- The Internet Protocol Convergence Suite in April 2008
- Spiral 1.2 and the En Route Configuration in October 2008

Recommendations

- Status of Previous Recommendations. The Joint Program Office took effective action on the FY07 DOT&E recommendations.
- FY08 Recommendations. None.

EA-18G Growler (Electronic Attack Variant of F/A-18)

Executive Summary

- In support of the 3QFY08 second Low-Rate Initial Production (LRIP) decision, DOT&E concurred with the Acquisition Decision Memorandum (ADM) LRIP II entry on May 2, 2008, for the delivery of 18 Airborne Electronic Attack (AEA) aircraft kits. This brings the total number of LRIP approved aircraft kits to 26 out of the required 85 for the program.
- Developmental and operational testing demonstrated that the maturity of the Growler's mission capabilities met planned expectations for this stage of system development. Operational Assessment 2 (OA-2) (October 3, 2007, to February 5, 2008) included full functionality of the following capabilities that were not available for OA-1: the communications countermeasures receiver set (CCS) functionality, low band transmitter integration, precision threat locating, complex threat identification, and jamming across all frequency bands.
- For OA-2, the Navy accumulated 92.4 operating hours over a 134-day test period, successfully demonstrating the EA-18G's end-to-end capability, highlighting the crews ability to detect, identify, and jam simple and complex threats in-flight.
- The Navy's application of integrated testing of EA-18G mission capabilities allowed early identification of areas of risk. This early identification of risk allowed the Navy more time to aggressively pursue resolution of risk issues.
- IOT&E initiation slipped four weeks to allow additional time for resolution of risk issues and began on October 1, 2008.

System

- The EA-18G Growler is a carrier-based radar and communication jammer aircraft.
- The two-seat EA-18G replaces the Navy's four-seat EA-6B. The new ALQ-218 receiver, improved connectivity, and linked displays are the primary design features implemented to reduce the operator workload in support of the EA-18G's two-person crew.
- Integration of AEA capability into the F/A-18F includes:
  - Modified EA-6B Improved Capability (ICAP) III ALQ-218 receiver system
  - Advanced crew station
  - Legacy ALQ-99 jamming pods
  - NewCCS
  - Expanded digital Link 16 communications network
  - Electronic Attack Unit
  - Interference Cancellation System (INCANS) which supports communications while jamming
  - Satellite receive capability via the Multi-mission Advanced Tactical Terminal (MATT)
- Additional systems include:
  - Active Electronically Scanned Array (AESA) radar
  - Joint Helmet-Mounted Cueing System
  - High-Speed Anti-radiation Missile (HARM)
  - AIM-120 Advanced Medium-Range Air-to-Air Missile (AMRAAM)

Mission

- Combatant commanders use the EA-18G to support friendly air, ground, and sea operations by suppressing enemy radar and communications.
- Commanders use the EA-18G capabilities to:
  - Jam integrated air defenses
  - Support non-integrated air defense missions and emerging non-lethal target sets
  - Enhance crew situational awareness and mission management
  - Enhance connectivity to national, theater, and tactical strike assets
  - Provide enhanced lethal suppression through more accurate HARM targeting
  - Provide the EA-18G crew air-to-air self-protection with AMRAAM

Prime Contractor

- Boeing

Activity

- Since the first OA was completed in 2QFY07, the Navy has continued testing the EA-18G AEA system's Core Block I functionality, which includes both hardware (CCS, INCANS, and MATT) and software (Build 3.0 and higher releases), which incorporated planned functionality necessary for the IOT&E.
- The Navy completed the second OA of the EA-18G between October 3, 2007, and February 5, 2008, to assess the progress of the Growler's Weapons System development and integration, in support of a 3QFY08 LRIP II decision.
- The OA accumulated 92.4 operating hours over a 134-day test period that successfully demonstrated the EA-18G's end-to-end capability, highlighting the crew's ability to detect, identify, and jam simple and complex threats in-flight. Flight test events were flown at the Atlantic Test Range, Naval Air Warfare Center, Patuxent River, Maryland; the Electronic Combat Range at the Naval Air Weapons Center, China Lake, California; and the Nevada Test and Training Range, Nellis AFB, Nevada.
- The EA-18G supported mission employment large force exercises (LFE) in December 2007 and June 2008. The next LFE occurs in December 2008. The LFEs provide operational environments to better assess interoperability with other Services and agencies. In particular, Multi-functional Information Distribution System/Link 16 information on targeting and threat radar site locations was passed to/from various other participants of the LFE.
- OSD approved a third revised Test and Evaluation Master Plan (TEMP) (Revision C) to support the EA-18G program's entry into LRIP II and IOT&E. OSD's approval was based on entry criteria that were included in the Milestone-C/LRIP I ADM.
- The Navy's FY08 Integrated Test and Evaluation (IT&E) planning incorporated EA-18G effectiveness data products that simultaneously supported DOT&E's Live Fire Analysis of EA-18G susceptibility to radar-guided threats.
- The Navy commenced Integrated Test (IT-C2), the developmental test period following the OA-2. IT-C2 has included live launches of an AMRAAM AIM-120 air-to-air missile and the HARM AGM-88 air-to-ground missile in July 2008.
- The Navy conducted testing in accordance with the DOT&E-approved TEMPs.

Assessment

- The Navy's application of integrated testing of EA-18G mission capabilities resulted in early discovery of technical risks, allowing the Navy more time to mitigate these risks.
- Observations made in IT-C1 along with Commander, Operational Test and Evaluation Force (COTF) comments indicate that there is a susceptibility-related concern for situational awareness limitations associated with the lack of radar warning receiver capabilities in the EA-18G. The operations test team will assess this more thoroughly in the operational evaluation.
- For OA-2, COTF recommended the EA-18G/AEA system continue development but continue to mitigate the following risks:
  - AEA system stability and mission reliability
  - ALQ-218 threat geolocation capabilities
  - Tactical Situational Display clutter and Weapon System Operator workload
  - Selective Reactive Jamming Response timeliness
  - Mission planning environment anomalies
- Based on a successful second OA, the Milestone Decision Authority and USD(AT&L) approved entry into EA-18G LRIP II for the second phase (18 kits) of 26 total LRIP EA-18G AEA kits. Total EA-18G production is planned for 85 aircraft kits.
- DOT&E concurred with the LRIP II ADM decision, stating that testing was adequate to identify system capabilities and limitations in support of the second LRIP decision.
- DOT&E approved a third revised TEMP (Revision C) that is aligned with the Capability Production Document. This document incorporates the entry criteria for the IOT&E.

Recommendations

- Status of Previous Recommendations. The Navy has taken effective action on the FY07 DOT&E recommendations.
- FY08 Recommendations. None.

EA-6B Upgrades / Improved Capability (ICAP) III and Low Band Transmitter (LBT)

Executive Summary

ICAP III Block 2

- The Navy demonstrated significant improvement to the EA-6B aircrew's battle-space awareness in the Improved Capability (ICAP) III Block 2 FOT&E. This included assessment of the ICAP III's digital link/Multi-functional Information Distribution System (MIDS).

Low Band Transmitter (LBT)

- DOT&E reported that Low Band Transmitter (LBT) is operationally effective against communications targets. IOT&E data used to assess LBT operational effectiveness against threat representative early warning radars were not adequate due to test range and frequency availability limitations.
- The LBT system is operationally suitable. The Navy augmented the test data collected during IOT&E with data collected during the early operational release of this system. The data indicates that LBT reliability is improving. LBT will provide a more reliable asset to the Navy than the legacy transmitters this system is designed to replace. The LBT underwent system integration testing on the ICAP III Block 3 Prowler Configuration.

System

EA-6B

- The EA-6B aircraft is a four seat, carrier/land-based, tactical jet aircraft with an onboard receiver, external jamming pods, a communication jammer, and a High-Speed Anti-Radiation Missile (HARM).
- The EA-6B is currently the Navy's fielded Airborne Electronic Attack (AEA) platform.

ICAP III Block 1 design improvements provide:

- Enhanced reliability
- A new receiver, processor, and antenna system (ALQ-218)
- New tactical displays/interfaces
- Baseline new joint mission planner
- Better external communications

ICAP III Block 2 adds the following to Block 1:

- Improved battle space management capabilities with the MIDS/digital link
- Improved joint mission planner

ICAP III Block 3 adds the following to Block 2:

- Upgraded messaging capability for MIDS/digital link
- Capability to employ LBT
- Upgraded end-to-end automatic reactive jamming capability
- Improved joint mission planner
- Improved software to introduce corrections and enhancements previously integrated in older EA-6B systems

ICAP III Block 4 adds the following to Block 3:

- An upgraded Digital Flight Control System and new Power Trim Indicators
- Control Display Navigation Unit-900A
- Digital G Meter
- Dual frequency USQ113 (V) 4 communications jammer
- ALE-47 countermeasures dispensing system
- A Phase 1 Litening Pod for Marine Corps Prowlers only

Low Band Transmitter (LBT)

- LBT improvements over legacy low-band pods are designed to:
  - Expand frequency coverage
  - Provide better reliability as the simplified design replaces three low-reliability transmitters

USQ-113

- The intent of the USQ-113 (V) 4 design is to provide more capability against emerging threats and to improve operator utility compared to the fielded USQ-113 system.

Mission

EA-6B

- Combatant commanders use the EA-6B to support friendly air, ground, and sea operations by suppressing enemy radars and communications.
- Commanders use the EA-6B capabilities to suppress enemy radar-guided threats with HARM and to jam integrated air defenses, in addition to supporting emerging asymmetric missions.

ICAP III
- Units equipped with EA-6B ICAP III use its improvements to provide:
  - Counters to emerging threats
  - More flexible and effective protection of strike aircraft
  - More accurate HARM targeting
  - Enhanced situational awareness via MIDS for improved battle management plus enhanced connectivity to national, theater, and tactical strike assets
  - Selective reactive jamming capability to allow automatic detection and jamming of threats as they become active
  - Streamlined mission planning and post flight analysis

LBT
- Commanders use LBT and other EA-6B assets to jam radars and communications.

Prime Contractor
- Northrop Grumman

Activity

EA-6B
- Commander, Operational Test and Evaluation Force (COTF) conducted EA-6B ICAP III testing in FY08 in accordance with the DOT&E-approved Test Evaluation and Master Plan (TEMP) (FY06 Revision B) and test plans.

ICAP III Block 3
- The Navy initiated TEMP Revision C to support planned FY08 ICAP III Block 3 operational testing that COTF completed in August 2008.

ICAP III Block 4
- The program submitted TEMP Revision D for ICAP III Block 4 for coordination in early 2008.
- In order to arrive at a common fleet-wide configuration, the program plans to incorporate Operational Flight Program improvements currently embodied in ICAP II into Block 4. Block 4 will also incorporate the USQ 113 (V) 4 dual-frequency communications jammer, and provide further improved crew vehicle interface performance.

LBT
- COTF completed their assessment of the LBT IOT&E and issued their final report in 2QFY08. The COTF report stated that LBT was operationally effective and suitable. The Navy awarded a full-rate production decision for LBT in 3QFY08.
- DOT&E issued a Beyond Low-Rate Initial Production (BLRIP) report for LBT in 3QFY08.
- The Service conducted ICAP III Block 3 LBT system integration testing in FY08 in accordance with DOT&E-approved TEMP and test plans.

USQ-113
- To support a Rapid Deployment Capability, the Navy began a Quick Reaction Assessment of the USQ-113 (V) 4 communications jammer in FY07 and completed it in FY08.
- The Navy began operational test planning for the EA-6B's upgrades to the USQ-113 (V) 4 communications jammer in FY07, in preparation for system integration testing on ICAP III Block 4 aircraft.

Assessment

ICAP III Block 3
- Navy test planners applied ICAP III Block 2/MIDs operational experience to improve testing of new battle space management capabilities for ICAP III Block 3. ICAP III Block 3 testing was a total system evaluation in mission-oriented scenarios, as opposed to a test of discrete subsystems on the first two increments of ICAP III. Problems with LBT integration and testing hindered ICAP III Block 3 operational testing as well as lack of stable Operational Flight Program performance prior to completing development testing. Aircraft availability before and during operational testing caused testing delays.
- Although the Navy's dedicated testing of Joint Mission Planning System (JMPS) in FY07 indicated JMPS functionality on the ICAP III was adequate, ICAP III Block 3 testing revealed additional deficiencies related to the complex ICAP III mission planning environment as compared to the simpler mission planning environment for older EA-6B systems
- The Service will not be able to provide ICAP III Block 3 Operational Test results before 1QFY09.

LBT
- There is a lack of modeling and simulation capability against threat types not available at open-air test ranges. This lack of capability severely hampers realistic operational testing to fully evaluate LBT and other AEA platforms in their operational environment.
- The BLRIP report stated that LBT is operationally effective against communications targets, but that data for fully assessing LBT operational effectiveness against threat-representative early warning radars were not adequate due to lack of available threat radars to test against. The report also stated that LBT was operationally suitable, with substantially improved reliability over the system it replaces.
- The open-air low band jamming test resource limitations and non-availability of specific threat radars severely limited the ability to completely evaluate LBT during IOT&E.

- The Navy augmented data collected during IOT&E with over 8,000 hours of data provided by deployed squadrons using the Quick Reaction Capability version of the LBT for the reliability assessment.
- Emerging results of the IOT&E for LBT indicate that this new jamming pod will provide improved flexibility and reliability, while providing comparable operational effectiveness to the multiple legacy low band pods it replaces.
- The lack of open-air threat resources to support testing of the full end-to-end mission capabilities of LBT and AEA platforms and subsystems limited the Navy's ability to fully evaluate LBT. The Navy relied heavily on subjective side-by-side comparisons of LBT to legacy jamming pods.
- Federal constraints on jamming frequencies and the lack of specific threat systems drove the LBT open-air low band jamming test resource limitations.

USQ-113

- The USQ113 (V)4 tested during 2007 and 2008 on an ICAP II Prowler revealed sporadic performance in its dual jam mode associated with updated "E" model radios. The program reports a fix for this and other anomalous performance is available. The Operational Test Agency will need to conduct operational testing to confirm better performance.

Recommendations

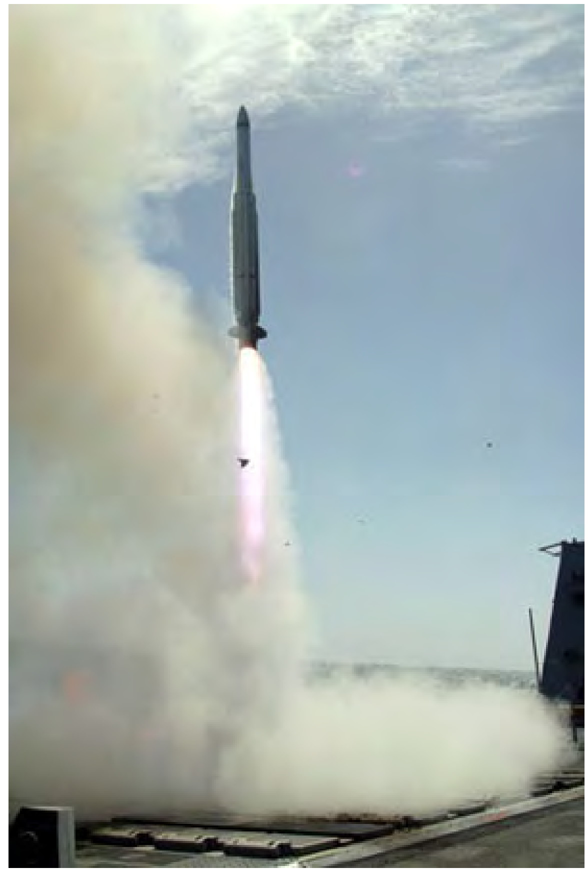
ICAP III

- Status of Previous Recommendations. Two of the six issues from previous DOT&E recommendations remain unresolved.
- FY08 Recommendations.
  1. The Navy should complete the analysis of, and provide recommendations on, ICAP III Block 3 testing in the 1QFY09 as a total system evaluation in a mission environment. Deficiencies revealed during Block 3 testing need to be corrected under Block 4 tests during FY09. Additional Block 4 capabilities such as the Litening Pod and USQ 113 (V) 4 communications jammer need to be integrated with crew vehicle interfaces.
  2. The Navy should complete an operational test of the dual jam USQ113 (V) 4 system integrated with the ICAP III Block 4 Prowler during FY09. An updated requirements document is needed to form the basis of this test phase.

LBT

- Status of Previous Recommendations. The recommendation about providing adequate test resources remains unresolved. The Services addressed the other three previous recommendations.
- FY08 Recommendations.
  1. The Navy should investigate means by which the aircrew receives positive in-flight indication that the LBT is actually radiating energy.
  2. In order to mitigate the limitations observed during IOT&E, the Navy should invest in early warning radar threats to fully assess LBT capabilities against realistic threats and operationally-representative scenarios.
  3. The Navy should re-evaluate LBT effectiveness testing against early warning radars. Once complete, they should ensure that lessons learned are integrated into the EA-6B ICAP III FOT&E and EA-18G developmental and operational testing.
  4. The Navy should continue to track and use LBT suitability metrics using data from deployed squadrons to inform the reliability growth program.

Evolved SeaSparrow Missile (ESSM)



Executive Summary

- The January 2004 DOT&E Beyond Low-Rate Initial Production Report stated that the Evolved SeaSparrow Missile (ESSM) was operationally suitable on DDG 51 Class Destroyers with the Aegis 6.3 software baseline, that operational effectiveness was undetermined, and that the ESSM warhead was lethal. The Navy proceeded to full-rate production and fielding of ESSM without demonstrating the missile's operational effectiveness.
- Results of FOT&E testing in 2005 and 2008 have not demonstrated the operational effectiveness of ESSM against a number of anti-ship cruise missile (ASCM) classes, small surface threats, and low velocity air threats. The FOT&E identified significant problems regarding the integration of ESSM into Ship Self-Defense System (SSDS)-based combat systems.

System

- The ESSM is a medium-range, ship-launched guided missile designed for self-defense against ASCMs.
- The ESSM is a cooperative development among 13 nations.
- The ESSM is currently installed on DDG 51 Flight IIA Destroyers and on aircraft carriers equipped with the SSDS Mk 2 Mod 1 Combat System. The Navy is planning for future ESSM installations in CG 47 Class Cruisers, LHA 6 Class Amphibious Assault Ships, and the DDG 1000 Class Destroyers.

Mission

The Navy surface forces use the ESSM for self-protection primarily against supersonic, low-altitude ASCMs. A secondary mission for ESSM on ships equipped with the SSDS Mark 2 Mod 1/4 is self-protection against small surface craft and low velocity air threats.

Prime Contractor

- Raytheon

Activity

- Commander, Operational Test and Evaluation Force conducted FOT&E of ESSM in February 2008 on the USS *Ronald Reagan* (CVN 76) in accordance with a DOT&E-approved test plan. Due to reduced availability of Fleet assets, reduced availability of test assets, weather issues that compromised test safety, and problems with other SSDS combat system elements, the FOT&E test period was not completed. Tests not completed include the following:
  - Testing against supersonic, high-diving ASCMs
  - Testing against low velocity air threats
  - Testing against a raid of several simultaneous, subsonic ASCMs
  - Testing against a maneuvering surface craft
- The Navy awarded a development contract for a Threat D surrogate target in August 2008.

Assessment

- ESSM operational effectiveness against supersonic high-diving ASCMs, a single supersonic sea-skimming maneuvering ASCM, a stream raid of supersonic sea-skimming maneuvering ASCMs, raids of several simultaneous subsonic ASCMs, low velocity air threats, and maneuvering surface craft remains undetermined.
- Initial indications are that significant problems regarding integration of ESSM into SSDS-based combat systems exist.

- ESSM operational effectiveness in the presence of electronic jamming remains undetermined.
- ESSM operational suitability on SSDS Mk 2 Mod 1-equipped platforms is undetermined.
- FOT&E is planned for FY09 with an Aegis combat system to demonstrate missile performance:
  - Against a stream raid of supersonic, low-altitude, maneuvering ASCMs
  - Against supersonic, high-diving ASCMs
  - In the presence of electronic jamming
  - After the missiles have undergone shipboard storage for the requisite duration

Recommendations

- Status of Previous Recommendations. The Navy closed one of the two recommendations from FY06 and has made progress towards resolving the other.
- FY08 Recommendations. The Navy should:
  1. Complete all planned FOT&E tests in accordance with the DOT&E-approved test plan.
  2. Acquire credible supersonic high-diving and supersonic sea-skimming ASCM surrogate targets in time to support FOT&E of ESSM with the Aegis combat system in FY09.
  3. Acquire a credible Threat D surrogate target to support future ESSM FOT&E testing.

Expeditionary Fighting Vehicle (EFV)

Executive Summary
- The Marine Corps has restructured the Expeditionary Fighting Vehicle (EFV) program to:
  - Extend System Development and Demonstration (SDD) by five years
  - Redesign the vehicle for reliability
  - Build second-generation SDD prototype vehicles
- Prior to entering production, the program will conduct an operational assessment using the second-generation SDD vehicles.

System
- The EFV is an amphibious combat vehicle for the Marine Corps.
- The Marines intend the EFV to be capable of high-speed water transit at over 20 knots and have land mobility capabilities comparable to the M1A1 tank after transitioning out of the water.
- The EFVC (command variant) is operated by a crew of three and transports a commander and his staff of eight Marines.
- The EFVP (personnel variant) is operated by a crew of three and carries a reinforced rifle squad of 17 Marines.
- The EFVP has a stabilized 30 mm chain gun and coaxial machine gun in the turret.

Mission
Units equipped with EFVs will transport elements of an amphibious assault force from ships over the horizon to inland objectives.

Commanders will use the:
- Personnel variant as an armored fighting vehicle ashore in support of land combat providing transportation, protection, and direct fire support
- Command variant to provide command, control, and communications capabilities to support ground combat tactical command posts

Prime Contractor
- General Dynamics

Activity
- In July 2008, DOT&E approved an updated Test and Evaluation Master Plan (TEMP) reflecting the restructured program.
- The restructured plan delays Milestone C low-rate initial production decision five years (from January 2007 to December 2011) to allow time to design and construct a second generation of SDD prototypes. The program will conduct a second operational assessment that would use these redesigned vehicles.
- The restructured program will provide 14 production representative vehicles for IOT&E and three for full-up system-level LFT&E.
- In July 2008, DOT&E approved the test plan for the first of two EFV waterborne directional stability combined developmental and operational test events. The first event is scheduled for November 2008.
- The first waterborne directional stability developmental test and operational test event was completed before the critical design review in November 2008. The event to assess the effectiveness of turret design modifications that are intended to improve the reliability of the EFVP weapon system will not be completed until 4QFY09, after the critical design review.
- Live fire testing conducted during this period included ballistic and watertight integrity testing of a sponson section with advanced composite armor and new panel fasteners and seals. The Program Office also conducted underwater explosion shock testing of an SDD-1 prototype vehicle.

Assessment
- The restructured program contains adequate government developmental and operational testing to determine the system reliability prior to Milestone C in FY12.
- The second operational assessment will repeat the mission scenarios from the first assessment to facilitate evaluation of demonstrated performance and system reliability.

Recommendations

- Status of Previous Recommendations. The Marine Corps partially incorporated the FY07 recommendation to conduct two developmental test and operational test events before the critical design review for the second generation SDD-phase vehicles.
- FY08 Recommendation.
  1. Following completion of the assessment of the redesigned turret, the program should revisit the critical design review to incorporate the results of that assessment.

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

Executive Summary

- The first FOT&E of the APG-79 Active Electronically Scanned Array (AESA) occurred November 2007 through July 2008 concurrent with FOT&E and Software Qualification Testing for the F/A-18E/F Super Hornet. Testing was adequate to assess operational effectiveness and suitability. This analysis is ongoing.
- After the 2006 Operational Evaluation (OPEVAL), both Commander, Operational Test and Evaluation Force (COTF) and DOT&E found the APG-79 radar system as installed in the F/A-18E/F not operationally effective and not operationally suitable for combat – noting numerous deficiencies, immature modes of operation, and software instability. COTF did not recommend routine deployment of the system, but recommended the system be used for training pending correction of deficiencies.
- The Navy deployed the first APG-79 AESA-equipped squadron in May 2008 prior to the completion of the FOT&E period. COTF promulgated an interim report stating that the program manager made significant progress, but certain deficiencies have not been corrected.

System

- The Super Hornet is replacing earlier F/A-18 variants in the Navy's carrier air wings. The F/A-18E is a single-seat aircraft and the F model has two seats.
- The H3E software upgrade provides functionality essential to the integration and operation of all Super Hornet Block 2 hardware upgrades. These upgrades provide capabilities including:
  - Single pass multiple targeting for GPS weapons
  - Use of all AIM-9 series infrared-guided missiles, AIM-120, and AIM-7 radar-guided missiles
  - Off-board target designation
  - Improved data link target coordinate precision
  - Implementation of air-to-ground target points
- The APG-79 radar is one of several sub-systems that comprise the F/A-18E/F planned common avionics suite upgrade (Block 2), which will be integrated into Lot 26 aircraft and beyond.
- The aircraft carries the Advanced Targeting Forward Looking Infrared (ATFLIR) system that the aircrew uses in order to locate surface and airborne targets. The ATFLIR will have an infrared marker and laser target designator/ranger capability in addition to being able to provide infrared and/or electro-optical streaming video via data link. The laser target designator/ranger provides the F/A-18E/F with the ability to obtain GPS-guided weapons-quality target coordinates. The Navy can also use the laser designator/ranger for delivery of laser-guided bombs, while the infrared marker provides air-to-ground cueing to both ground and aerial observers equipped with night vision devices.
- The Super Hornet is also fitted with the Shared Reconnaissance Pod, the Multi-Functional Information Distribution System for Link 16 tactical data link connectivity, the Joint Helmet-Mounted Cueing System, and the Integrated Defensive Electronic Countermeasures system. The Joint Mission Planning System-Maritime is the fleet mission planning system.

Mission

Carrier Strike Group Commanders and Joint Force Air Component Commanders use the F/A-18E/F to:

- Conduct air combat missions
- Attack ground targets with most of the U.S. inventory of GPS-guided, laser-guided, and free-fall weapons, as well as the 20 mm cannon
- Fire the High-Speed Anti-Radiation missile at enemy radar systems
- Provide in-flight refueling for other tactical aircraft
- Provide the fleet with an organic tactical reconnaissance capability available for tasking by the Carrier Strike Group Commander and supported Joint Task Force

Prime Contractor

- Boeing

Activity

- The Navy conducted the first FOT&E of the APG-79 AESA concurrent with the Software Configuration Set (SCS) H4E Software Qualification Test (SQT) from November 2007 through July 2008. F/A-18E/F aircraft with H4E software installed with APG-79 AESA radars flew 154 flight hours in 111 sorties.
- FOT&E included a detachment to Eglin AFB, Florida, where the F/A-18E/F flew against Air Force F-15C aircraft.
- H4E testing intended to address the last two remaining capability waivers from the F/A-18E/F OPEVAL - Advanced Navigation Accuracy and Electronic Protection. Testing included aircraft with Advanced Navigation, Digital Memory Devices, BRU-55 Smart Rack (for smart and conventional weapons), AIM-120 High-Off Boresight (HOBS) capability, and Type 3 Advanced Mission Computers. The ATFLIR targeting pod and the APG-79 AESA radar were two major subsystems also under test.
- The Program Office conducted two AIM-120 live fire events to demonstrate APG-73 HOBS capability.
- The Navy intended the APG-79 AESA testing to support the first fleet deployment of this system by verifying correction of deficiencies identified in OPEVAL, evaluating Anti-Tamper capability, and the inherent electronic protection capability of the radar. The Program Office deferred development of the full electronic warfare capability of the radar to subsequent SCS iterations.

Assessment

- COTF submitted an interim report to support the fleet deployment of the APG-79 prior to the completion of FOT&E. COTF stated that significant progress had been made, but certain deficiencies had not been corrected.
- The COTF assessment concluded that routine operational deployment, specifically the use of air-to-ground ordnance in Operations Iraqi and Enduring Freedom was low risk. COTF also assessed that employment in other classified threat environments remained high risks.
- The Navy acquired the APG-79 radar to improve capability over the legacy APG-73 radar in terms of independent cockpits, detection range, and electronic protection. The APG-79 has shown capability in these three areas; detailed results are classified. APG-79 system reliability remains below expected thresholds, with both hardware and software failures.
- DOT&E concurs with both COTF assessments stated above.
- The program did not demonstrate the APG-79's ability to support multiple AIM-120 missiles in-flight with data link. This capability for the warfighter must be demonstrated.
- The Navy's test squadron has made significant advances in data collection and analysis. Data provided from this FOT&E period represents a major improvement relating to data collection, reduction, and analysis.

Recommendations

- Status of Previous Recommendations. The Navy has yet to complete either of the two FY07 recommendations.
- FY08 Recommendation.
  1. The Navy should correct the major deficiencies identified in the COTF interim and final FOT&E reports.

H-1 Upgrades – U.S. Marine Corps Upgrade to AH-1W Attack Helicopter and UH-1N Utility Helicopter

Executive Summary

- The Navy restructured the program to add a fourth low-rate initial production (LRIP) lot and second phase of operational evaluation (OPEVAL) in FY08. Phase 2 of the IOT&E was adequate for the UH-1Y utility variant. The AH-1Z attack variant did not complete the IOT&E.
- The UH-1Y is operationally effective, suitable, and survivable.
- All scheduled live fire tests on both aircraft are complete.

System

- This program upgrades two Marine Corps H-1 aircraft:
  - The AH-1W attack helicopter becomes the AH-1Z
  - The UH-1N utility helicopter becomes the UH-1Y
- The aircraft have identical twin engines, drive trains, four-bladed rotors, tail sections, digital cockpits, and helmet-mounted sight displays (HMSD). They are 84 percent common.
- The AH-1Z has a new high-fidelity targeting sensor for delivery of air-to-ground and air-to-air missiles, rockets, and guns.
- The UH-1Y has twice the payload and range of legacy UH-1N aircraft, and it can deliver eight combat-ready Marines 118 nautical miles and return without refueling.

Mission

- Marine light/attack helicopter squadron detachments are typically deployed with a mixture of UH-1 and AH-1 helicopters.

- Detachments equipped with the AH-1Z attack helicopter conduct rotary-wing close air support, anti-armor, armed escort, armed and visual reconnaissance, and fire support coordination missions.
- Detachments equipped with the UH-1Y utility helicopter conduct command, control, assault support, escort, air reconnaissance, and aeromedical evacuation missions.

Prime Contractor

- Bell Helicopter

Activity

- In FY08, Commander, Operational Test and Evaluation Force (COTF) conducted IOT&E Phase 2 at China Lake, Camp Pendleton, Coronado, Twentynine Palms, California; Yuma, Arizona; White Sands Missile Range, and aboard USS *Dubuque* (LPD-8) at sea. IOT&E Phase 2 followed from February through May 2008 in accordance with a DOT&E-approved Test and Evaluation Master Plan and test plan.
- COTF used two UH-1Y and two AH-1Z helicopters for the test. As planned, test operations were restricted to mostly daytime and land-based operations during Phase 1. Phase 2 included shipboard and more night testing.
- The LFT&E program for both aircraft is complete, comprising nearly 300 shots at components, subsystems, and full-up aircraft.
- Because of problems encountered with the weapon system performance, the Navy truncated the AH-1Z testing, with DOT&E concurrence. The Navy will finish development and integration of the AH-1Z and complete a third phase of IOT&E in FY10.

Assessment

- The testing in IOT&E Phases 1 and 2 was adequate to evaluate operational effectiveness, suitability, and survivability of the UH-1Y.
- The UH-1Y is operationally effective.
  - It provides twice the range and payload of the UH-1N aircraft, and improved speed.

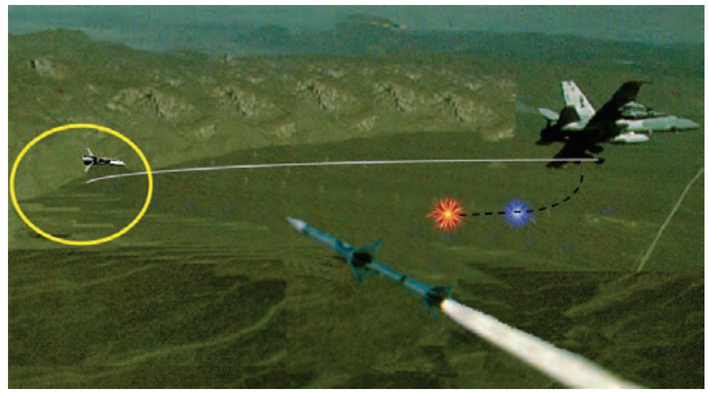
- The UH-1Y essentially met the planning goal for utility helicopter mission success (73 percent attained versus 75 percent goal).
- The UH-1Y successfully completed all required types of missions.
- The UH-1Y is not operationally effective at very high gross weights when operating above 6,000 feet density altitude because of maneuver restrictions imposed to avoid structural failure in the rotor blade attaching cuffs.
- A 571-pound weight restriction on the mounting points for the Improved Defensive Armament System (IDAS) limits the number of rockets or the amount of external fuel the aircraft can carry. The IDAS itself is rated for 1,000 pounds. The IDAS limits the field of fire in order to prevent the defensive gun from impacting the external fuel tanks. The field of fire is limited whether the tanks are present or not.

• The UH-1Y is operationally suitable.
  - It exceeded reliability thresholds for mean flight hours between failure and mean flight hours between abort. The UH-1Y requires less unscheduled maintenance but slightly more overall maintenance than the UH-1N.
  - Deficiencies in the design of the rotor blade attaching cuffs causes cuff replacement in the UH-1Y at less than one-tenth of the planned service life of these components.
• Deficiencies for both aircraft include the following:
  - Poor helmet performance limits operations in the expected low-light operational conditions.
  - Both aircraft had poor reliability, numerous human factors issues, and failed to provide over-the-horizon communications.
  - The paucity of repair parts delayed replacement of composite rotor system components in the supply system.
  - Main rotor gearbox vulnerability to certain ballistic impacts did not meet requirements.
• Deficiencies unique to the AH-1Z include:
  - AH-1Z target sight system reliability was poor and had performance deficiencies.
  - AH-1Z rocket and Hellfire missile delivery was not effective.

Recommendations

• Status of Previous Recommendations. The program is making satisfactory progress complying with the FY07 recommendations.
• FY08 Recommendations. The Navy should:
  1. Plan AH-1Z IOT&E Phase 3 to complete required OT&E. Phase 3 should include the following:
     ▪ Ship-based operations, to include take-off and landing in low light levels
     ▪ Assault support operations, with the majority of those operations taking place at night
     ▪ Improved instrumentation for evaluation of gun and rocket engagement accuracy
     ▪ Adequate numbers of flight hours to evaluate aircraft reliability
  2. Mitigate the flight restrictions for firing rockets from the AH-1Z.
  3. Increase the load capacity of the IDAS, and expand the gun field of fire.
  4. Improve the main rotor gearbox and test it in additional LFT&E.

Integrated Defensive Electronic Countermeasures (IDECM)



Executive Summary

- In early FY08, USD(AT&L) designated Integrated Defensive Electronic Countermeasures (IDECM) as an Acquisition Category (ACAT) 1C program when it exceeded the Major Defense Acquisition Program (MDAP) threshold for Research Development Test and Evaluation costs (RDT&E).
- The Navy decertified the IDECM Block 3 (IB-3) from operational testing in FY07 pending resolution of significant reliability problems related to the decoy deployment that appeared in the FY06 IOT&E.
- The Navy flight tested corrections to mitigate the IB-3 launcher installation and decoy production issues in FY07 and confirmed they were corrected.
- IOT&E resumed in FY08 following production of a sufficient number of decoys to complete the test. DOT&E will report the results of the test in a FY09 Beyond Low-Rate Initial Production (BLRIP) report.
- A new block upgrade to IDECM, Block 4 began in FY08 to develop a lightweight repackaged onboard jammer for the F/A-18E/F and the F/A-18C/D aircraft.

System

- The IDECM system is a radio frequency, self-protection electronic countermeasure suite on F/A-18 E/F aircraft. The system is comprised of onboard components, which receive radar signals, and employ onboard and off-board electronic jammers.
- There are four IDECM variants: Block I (IB-1), Block II (IB-2), Block III (IB-3), and Block IV (IB-4). All four variants combine an onboard radio frequency self-protection receiver and jammer installed on the F/A-18 with an expendable towed decoy that functions as an off-board self-protection radio frequency jammer.
  - IB-1 combined the legacy onboard system (ALQ-165) with the legacy (ALE-50) off-board towed decoyed (fielded FY02).
  - IB-2 combined the improved onboard system (ALQ-214) with the legacy (ALE-50) off-board towed decoy (fielded FY04).
  - IB-3 combines the improved onboard jammer (ALQ-214) with the new (ALE-55) off-board fiber optic towed decoy that is more integrated with the advanced onboard receiver/jammer (ALQ-214).
  - IB-4 replaces the onboard jammer (ALQ-214(V)3) with a lightweight repackaged onboard jammer for the F/A-18E/F and the F/A-18C/D aircraft.

Mission

- Combatant commanders will use IDECM to improve the survivability of Navy F/A-18 E/F strike aircraft against radio frequency guided threats while on air-to-air and air-to-ground missions.
- The warfighters use IB-3's complex off-board jamming capability to increase survivability against modern radar-guided threats.

Prime Contractors

- ALE-55: BAE Systems
- ALQ-214: ITT

Activity

- In early FY08, USD(AT&L) designated IDECM as an ACAT 1C program when it exceeded the MDAP threshold for RDT&E costs.
- The Navy decertified IB-3 from operational testing in FY07 pending resolution of significant reliability problems related to the decoy deployment that appeared in the FY06 IOT&E. The IOT&E restarted in 2QFY08; DOT&E will report results in an FY09 BLRIP report.
- The Navy completed the IB-4 Analysis of Alternatives in FY08. It supported a lightweight variant of the ALQ-214 to allow IDECM installation on F/A-18C/D aircraft, with potential for future upgrades to sophisticated countermeasure

techniques. Preparation of an updated IDECM Test and Evaluation Master Plan (TEMP) to describe the test and evaluation of this update began in late FY08.
- The Service conducted IDECM testing in FY08 in accordance with the DOT&E-approved TEMP and test plans.

Assessment

- The Navy's IDECM IB-3 fiber optic towed decoy demonstrated improved operational effectiveness compared to the legacy ALE-50 towed decoy. Reliability during the FY08 IOT&E appears to have improved over the FY06 results, but some problems persist.
- The IB-3 IOT&E test design allows for the evaluation of operational effectiveness and suitability of the system as installed in the F/A-18E/F while performing representative missions; it will support a 2QFY09 full-rate production decision.
- Only two thirds of key threats are available for realistic testing due to the lack of test resources on open-air ranges and in hardware-in-the-loop facilities. However, the four main categories of threats will be adequately represented in development and operational testing prior to the full-rate production decision.
- The primary test resource limitation is the lack of a modern threat using a complex guidance system; which is necessary for a full quantitative assessment of the primary IB-3 key performance parameter. The approved TEMP notes this limitation. An adequate alternative method of test was used to generate a qualitative assessment.

Recommendations

- Status of Previous Recommendations. The Navy partially addressed one of the two recommendations from FY06. The other recommendation regarding a validated end-to-end advanced radio frequency guided threat test capability remains valid.
- FY08 Recommendations.
  1. The Navy should complete an update to the IDECM TEMP describing test and evaluation of IDECM Block 4 prior to the critical design review.
  2. The Navy should update their acquisition strategy for IDECM Block-4.

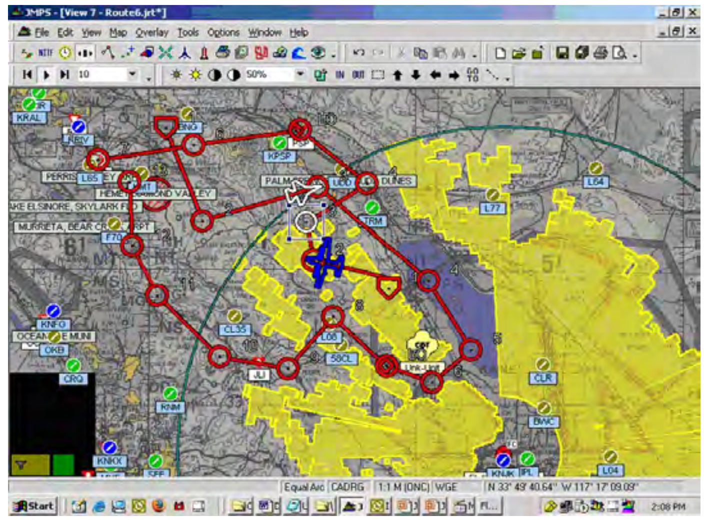
Joint Mission Planning System – Maritime (JMPS-M)

Executive Summary

- The Navy and Marine Corps Joint Mission Planning System - Maritime (JMPS-M) for host platforms has demonstrated improved results during developmental and operational tests.
- PMA-281 Mission Planning Systems, the Navy JMPS-M Program Manager, is modifying Framework 1.2 to integrate new mission planning features and federated applications, and is planning to re-host MPEs to the new Joint Framework 1.4.
- PMA-281 is developing JMPS-Expeditionary (JMPS-E) as a Force-Level Planning tool to support amphibious operations.

System

- JMPS-M is a Windows XP, PC-based common solution for aircraft mission planning. It is a system of common and host platform unique mission planning applications for Navy and Marine Corps host platforms. The operating system is modified with the Defense Information Infrastructure – Common Operating Environment (DII-COE) core.
- A Mission Planning Environment (MPE) is a total set of developed applications built from modules. The basis of an MPE is the Framework, to which a Unique Planning Component (UPC) is added for the specific aircraft type (e.g., F-18 or EA-6B). Other common components that can support multiple users are added as well (e.g., GPS-guided weapons, navigation planner, etc.) to complete the MPE. Additional UPCs (Joint Direct Attack Munition) required for planning are included in aircraft specific MPEs to support specific mission requirements.
- Each JMPS-M MPE consists of a mixture of stand-alone, locally networked, and domain controlled Windows XP computers
- Although the JMPS-M software is being co-developed among DoD components, JMPS-M is not a joint program.



Mission

- Aircrews use JMPS-M MPEs to plan all phases of their missions and then save required aircraft, navigation, threat, and weapons data on a data transfer device so they can load it into their aircraft before flight. They also use JMPS-M to support post-flight mission analysis.
- Amphibious planners will use the Joint Mission Planning System-Expeditionary (JMPS-E) to plan the movement of personnel, equipment, and logistics support between the amphibious fleet and the shore.
- As Framework 1.4 is implemented, JMPS-M users will eventually be able to collaborate on mission planning, even when operating from different bases.

Prime Contractor

- Framework: BAE Systems

Activity

- DOT&E hosted a JMPS-E test strategy planning meeting with Navy and Marine Corps user requirements, program management, and operational test representatives.
- Commander, Operational Test and Evaluation Force (COTF) continued to execute the MV-22 MPE test in conjunction with the platform operational test that began in late FY07. COTF conducted the test onboard an amphibious ship while en route to the Operation Iraqi Freedom theater of operations and while deployed to the theater.
- Detachment 5, Air Force Operational Test and Evaluation Center (AFOTEC) conducted a CV-22 platform test that also included the test of the supporting JMPS-M MPE version 1.0.5 at Hurlburt Field AFB, Florida, and Nellis AFB, Nevada.
- PMA-281 Mission Planning Systems conducted a developmental test of the C-130T MPE version 1.0. DOT&E monitored test execution at Naval Air Station (NAS) Point Mugu, California, in order to collect data to identify risks to a successful operational test outcome and fleet release.
- PMA-281 Mission Planning Systems conducted a developmental test of the EA-18G MPE version 2.2.
- PMA-281 Mission Planning Systems conducted a developmental test of the E-2C MPE version 3.0.

- PMA-281 Mission Planning Systems conducted a developmental test of the AV-8B MPE version 2.1, and Air Test and Evaluation Squadron NINE collected MPE data during a separate AV-8B Operational Test. Testing took place at NAS China Lake, California, and Marine Corps Air Station Yuma, Arizona.
- PMA-281 Mission Planning Systems experienced funding shortfalls in the development of several Operational Requirements Document (ORD)-mandated JMPS-M common components, including Anti-Submarine Warfare (ASW), Collaboration, and Mission Rehearsal.
- All operational testing was conducted in accordance with a DOT&E-approved Test and Evaluation Master Plan (TEMP) and test plan.

Assessment

- The Services have not clarified all of the applicable JMPS-M ORD requirements for JMPS-E. An approved set of requirements is needed to develop the test strategy and the JMPS-E TEMP.
- COTF has completed their test report for the MV-22 MPE and evaluated the MPE version 1.0 as operationally effective and suitable. Critical deficiencies in training, aircrew documentation, and information assurance were documented.
- AFOTEC has not completed their test report for the CV-22 platform, including the MPE. DOT&E analysis of emerging MPE test data shows improved software stability; however, mission planning computer crashes still occur. The flight performance model is also immature requiring aircrew to manually calculate fuel burn.
- C-130T MPE developmental testing results showed the MPE was stable, but numerous deficiencies indicate it is not ready for OT&E. PMA-281 decided to delay operational testing until these deficiencies are corrected. Early tests indicate incompatibility with Optimum Path Aircraft Routing System due to the system's inability to easily import pre-planned flight routes. The MPE does not support direct data transfer to K/C-130J host computer load media and does not contain the airdrop mission planning application essential for the Marine Corps C-130T and K/C-130J fleet. This developmental test did not include loading the completed mission plans into the C-130T aircraft in order to verify accurate data transfer.
- Results from the EA-18G MPE developmental test indicate it provides EA-18G aircrew with new features and tools useful for electronic warfare mission planning, but it is unstable and results in frequent computer crashes. Aircrews require improved in-depth training to effectively use the many features of this complex MPE.
- Results from the E-2C MPE test indicate the MPE was acceptable to over half of the participating aircrew; however, they identified deficiencies with training, checklists, cluttered displays, controls, and order of battle files. There was no test loading the completed mission plans into the E-2C to verify accurate data transfer. This aircraft data transfer test will be conducted by PMA-281 when a suitable aircraft is available.
- COTF has not yet completed testing of the AV-8B MPE. Emerging results from the tests of the MPE indicate that the MPE was more stable than legacy mission planning systems and transfer of mission planning data to the AV-8B host computer was complete and accurate.
- PMA-281 funding volatility has negatively impacted development of several ORD-mandated common components, including ASW, Collaboration, and Mission Rehearsal. This funding volatility caused JMPS-M program instability, which resulted in delays in the operational testing and fielding of MPEs. A contributing factor is the organizational complexity of having two resource sponsors. JMPS-M is sponsored by the Office of the Chief of Naval Operations for Communications Networks, Warfare Integration (OPNAV N6F) within the Naval NETWAR FORCEnet Enterprise (NNFE). However, all JMPS-M MPEs are used in Navy and Marine Corp aircraft within the Naval Aviation Enterprise (NAE) and sponsored by Office of the Chief of Naval Operations, Air Warfare Division, Integration of Capabilities and Resources (OPNAV N88).

Recommendations

- Status of Previous Recommendations. This is the first annual report for the JMPS-M program.
- FY08 Recommendations.
  1. The Navy should identify the unique requirements for the JMPS-Expeditionary Force Planner and document the test strategy in a TEMP.
  2. The Navy should develop and test updated software to resolve MV-22 MPE information assurance deficiencies and provide improved training and documentation to the users.
  3. The Navy should ensure that developmental test of MPEs include a test of the transfer of mission planning data to host platform computers.
  4. The developer must improve JMPS-M MPE software stability to reduce the incidence of mission planning computer crashes.
  5. The Navy should fully fund development of JMPS-M common components, including ASW, Collaboration, and Mission Rehearsal.

Joint Standoff Weapon (JSOW) Baseline Variant and Unitary Warhead Variant

Executive Summary

- The Navy completed operational testing of the Block II Unitary variant of the Joint Standoff Weapon (JSOW). Testing included live weapon testing in a realistic threat environment to assess survivability. Analysis and assessment of testing is in progress.
- The Air Force and Navy completed formal test reporting on FY07 operational testing of both the Baseline and Unitary variant of JSOW with new Operational Flight Program (OFP) Version 10.3 software in support of decisions to field the upgraded weapon software.
  - The Air Force fielding decision for the JSOW Baseline with OFP Version 10.3 software was limited for the B-2 platform due to capability mismatch between the software and B-2 displays.
  - The Air Force plans additional testing in FY09 on B-2 platforms with upgraded capabilities in support of a desired unrestricted fielding decision.
- The Air Force Weapon System Evaluation Program (WSEP) conducted testing of the JSOW Baseline with the fielded OFP Version 10.3 software. Testing did not resolve JSOW Baseline submunitions pattern placement inconsistencies observed in previous JSOW Baseline testing.

System

- JSOW is a family of 1,000-pound class, air-to-surface glide bombs intended to provide low observable, standoff precision engagement with launch and leave capability. JSOW employs a tightly coupled GPS/Inertial Navigation System.
- The JSOW Baseline payload consists of 145 BLU-97/B combined effects submunitions.
- JSOW Unitary utilizes an imaging infrared seeker and its payload consists of an augmenting charge and a follow through bomb that can be set to detonate both warheads simultaneously or sequentially.

Mission

- Combatant commanders use JSOW Baseline to conduct pre-planned attacks on soft point or area targets such as air defense sites, parked aircraft, airfield and port facilities, command and control antennas, stationary light vehicles, trucks, artillery, and refinery components.
- Combatant commanders use JSOW Unitary to conduct pre-planned attacks on point targets vulnerable to blast and fragmentation effects and point targets vulnerable to penetration such as industrial facilities, logistical systems, and hardened facilities.

Prime Contractor

- Raytheon

Activity

- The Navy conducted operational testing in accordance with the DOT&E-approved Test and Evaluation Master Plan for the JSOW Unitary variant throughout FY08. The Air Force conducted operational testing through WSEP for the operationally-fielded JSOW Baseline variant using OFP Version 10.3 software in May 2008.
- FY08 test activity included the execution of the Navy IOT&E of the JSOW Unitary Block II weapon, including live weapon testing in a realistic threat environment to assess survivability. Formal test reporting is still in progress.
- The Navy and the Air Force completed formal test reporting of both the Baseline and Unitary JSOW with OFP Version 10.3 software.

Assessment

- JSOW Unitary successfully completed Block II operational testing. This testing addressed needs identified in DOT&E's 2004 Beyond Low-Rate Initial Production Report on IOT&E and FOT&E of JSOW Unitary to adequately address weapon survivability in realistic threat environments. Analysis and assessment of JSOW Block II FY08 testing is in progress.

- FY07 JSOW OFP 10.3 testing supported Navy and Air Force decisions in FY08 to field the upgraded weapon software. The Air Force fielding decision for JSOW Baseline was limited for the B-2 platform due to a capability mismatch between the software and B-2 displays. The Air Force will conduct additional operational testing in FY09 on upgraded B-2 platforms in support of a desired unrestricted fielding decision.
- FY05 test results indicated JSOW Baseline weapons did not achieve consistent target area payload placement in the presence of winds in the target area. OFP 10.3 incorporated software changes to mitigate weapons guidance factors that contribute to submunitions pattern accuracy inconsistency. At the end of FY07 OFP 10.3 testing, aggregate results for Navy and Air Force testing showed JSOW Baseline accuracy was within Operational Requirements Document threshold specifications, but anomalies in submunitions pattern accuracy continued during this testing and the FY08 WSEP testing. Current Air Force programs have no additional weapon buys and Navy deferred Baseline purchases until FY16.
- JSOW Baseline submunitions pattern placement inconsistencies remain largely unexplained in testing. Potential factors that affect pattern placement relative to the desired aim point include differences in weapon release ranges relative to the target, target elevation, wind effects, and/or inherent limitations in JSOW Baseline guidance capabilities. Predictable JSOW Baseline submunitions pattern placement is critical to weapon effectiveness and determines the number of weapons needed to ensure success against a given target. Operational units may compensate for pattern placement variation by employing multiple weapons with combinations of overlapping and offsetting patterns and/or vary the weapon attack axis to ensure target area weapons saturation. Force planners will need to consider this to achieve combat success with JSOW Baseline.

Recommendations

- Status of Previous Recommendations. The Navy and Air Force satisfactorily addressed all previous recommendations from FY05-FY07.
- FY08 Recommendation.
  1. DOT&E recommends continued monitoring of Baseline submunition dispersal for factors causing dispersal inconsistencies. As OFP Version 10.3 did not resolve submunitions inconsistencies, operational users should balance submunitions dispersal with additional munitions on target for desired weapon effects.

LHA 6 (formerly LHA(R))
New Amphibious Assault Ship

Executive Summary

- Preliminary results from Commander, Operational Test and Evaluation Force's (COTF) operational assessment (OT-B1) indicates that the ship will likely meet aircraft land/launch requirements and amphibious lift capacities requirements for aircraft, vehicle, and cargo, and will better support future aircraft mixes.
- The Navy has not provided analyses to address concerns from an Early Operational Assessment conducted in FY05 that indicated the removal of the well deck, the reduction in vehicle stowage, and the decrease in medical facilities will compromise LHA 6's capability to execute Expeditionary Strike Group (ESG) and Marine Expeditionary Unit (MEU) missions. It is critical to resolve these concerns through analysis before contracting for additional ships with this design.
- Adequate IOT&E of the LHA 6 combat system self-defense capability against anti-ship cruise missiles and small boat attacks will require threat-representative targets, means for real-time evaluation of gun engagements, as well as installation of an AN/SPS-48 radar on the Self-Defense Test Ship (SDTS).
- LFT&E analysis completed to date identified potential problems in the susceptibility and vulnerability of the LHA 6 primary mission areas.

System

LHA 6 is a large-deck amphibious ship designed to support a notional mix of 12 MV-22s, six F-35B Joint Strike Fighters (Short Take-Off, Vertical Landing variant), four CH-53Es, seven AH-1s/UH-1s, and two embarked H-60 Search and Rescue (SAR) aircraft, or an F-35B load-out of 20 aircraft and two H-60 SAR aircraft.

- It does not have a well deck, which is traditionally used for amphibious operations. Instead, the space will allow for greater aviation stores capacity and an increase in the size of the hangar bay to accommodate two MV-22 high-hat areas for maintenance. Shipboard medical spaces were reduced by approximately two-thirds compared to contemporary LHDs to expand the hangar bay.
- Hangar facilities will better accommodate MV-22s and F-35Bs, in addition to all Navy and Marine Corps helicopters.
- The combat system includes the Ship Self-Defense System (SSDS) Mk 2 and the Close-In Weapon System Block 1B for defense against air threats and small surface craft. The SSDS Mk 2 integrates the AN/SPS-48E long-range air search radar, AN/SPQ-9B horizon search radar, Cooperative Engagement Capability, Rolling Airframe Missiles, Evolved SeaSparrow Missiles, and AN/SLQ-32B(V)2 electronic warfare systems with Mk 53 NULKA electronic decoys into a single command and control system for both hard and soft kill.
- Propulsion is provided by two marine gas turbine engines, two electric auxiliary propulsion motors, and two controllable pitch propellers. Six diesel generators provide electric power.
- Command, control, communications, computers, and intelligence (C4I) facilities and equipment to support Marine Corps Landing Force operations are part of the program of record.

Mission

The Joint Maritime Component Commander will employ LHA 6 to:

- Act as the centerpiece ship of an ESG; it will be the primary aviation platform, with space and accommodations for Marine Corps vehicles, cargo, ammunition, and more than 1,600 troops
- Serve as an afloat headquarters for a MEU, Amphibious Squadron, or other Joint Force commands using its C41 facilities and equipment
- Accommodate elements of a Marine Expeditionary Brigade when part of a larger amphibious task force
- Participate in aerial assaults by embarked Marine Corps aircraft
- Carry and discharge combat service support elements and cargo to sustain the landing force
- Conduct non-combatant evacuation operations (NEO) and other crisis response missions such as humanitarian assistance/disaster relief (HA/DR)

Prime Contractor

- Northrop Grumman

Activity

- The Navy conducted an operational assessment (OT-B1) per the DOT&E-approved Test and Evaluation Master Plan. Experienced fleet operators (Navy and Marine Corps) reviewed ship plans and specifications, data on fielded systems, and previous testing conducted on systems that will be installed on LHA 6.
- The Navy conducted a variety of LFT&E test and analyses using surrogate ship platforms or scale models to develop an understanding of vulnerabilities of LHA 6 design against typical weapons effects. The largest test used the ex-*Saipan* (LHA 2) and measured the ships response to underwater explosions with the intent to improve the Navy's ability to build computer-based models to predict the LHA 6 response.

Assessment

The final report for the operational assessment (OT-B1) is not expected until early FY09, but preliminary results indicate the following:

- The Navy has not adequately addressed findings and recommendations from the FY05 Early Operational Assessment.
- The ship provides required increases in aircraft carrying capacity, fuel/cargo capacity, and hangar/maintenance spaces; however, the lack of a surface connector capability limits the ship to carrying only small vehicles and cargo adequate for air transport and will have implications on the ESG as a whole to provide sufficient vehicle stowage to meet MEU lift requirements.
- Experienced fleet operators concluded that air department manning is insufficient to support the surge flight deck requirement to simultaneously operate six aircraft landing areas, 24 hours per day, for six consecutive days.
- Compared to current LHA and LHD-class ships, LHA 6 provides substantially reduced medical capabilities. No other ship in an ESG has the medical capacity to offset this reduction.
- Chemical, biological, radiological, and nuclear weapon survivability is compromised because the ship's Collective Protection System (CPS) is not designed to protect critical operational and medical spaces.
- Elimination of two of the four NULKA launchers to better accommodate MV-22 and F-35B operations and the decision to use a passive vice active electronic attack (EA) system found on legacy LHAs and LHDs increases risk in the capability to defend against anti-ship cruise missile attacks.
- Adequate operational testing of the combat system self-defense capability against anti-ship cruise missiles will require the Navy to install an AN/SPS-48 radar on the SDTS, and acquire threat missile surrogates (GQM-163A Coyote) modified to represent a high-diving anti-radiation missile.
- Testing the ship's capability to defend against a coordinated small boat attack will be hindered because there is no capability for real-time evaluation of weapons systems effectiveness during engagements.
- Locations of proposed cargo and weapon elevators and design of internal ramps make them single points of failure in loading and unloading of the ship during amphibious operations.
- Compared to current MEU aircraft, MV-22 and F-35B operations are expected to greatly increase noise and heat levels on and below the flight deck. Joint Strike Fighter (F-35B) compatibility is an area of risk that requires continued attention to ensure that essential engineering changes are incorporated before the start of IOT&E.
- The ship is built to the legacy LHD 1-class habitability standards rather than the improved 1996 standards.
- The LFT&E program is robust and designed to provide data to support a comprehensive evaluation of the survivability of the LHA 6 class of ships using surrogate testing, damage-based scenario engineering analysis, modeling and simulation, and Total Ship Survivability Trials in time to support completion of operational testing currently scheduled for FY14.

Recommendations

- Status of Previous Recommendations. The Navy still needs to address two previous recommendations: one of the four from FY05 and one of the two from FY06. There were no FY07 recommendations.
- FY08 Recommendations. The Navy should:
  1. Conduct analyses that fully consider the end-to-end embarkation, debarkation, and back loading process. The principal concern remains whether and how ESG operating concepts can be revised to adequately compensate for the LHA 6's lack of a surface connector capability and reduced lift capability.
  2. The ship's manning concept should also be reviewed with respect to the surge aviation operations requirement and the ability of the air department to simultaneously support six aircraft landing areas, 24 hours per day, for six consecutive days.
  3. Conduct a detailed analysis of whether the ship's reduced medical capabilities will be sufficient to support contemporary and future ESG/MEU missions to include HA/DR missions.
  4. Continue to study what effects F-35Bs and MV-22s – particularly aircraft exhaust/noise and required logistic support – will have on the ship and make appropriate adjustments to the design.
  5. Reexamine the decision to reduce the ship's electronic decoy capability to only two NULKA launchers.
  6. Install an AN/SPS-48 radar on the SDTS for the IOT&E and provide resources to procure enough targets (including backups) for IOT&E.
  7. Develop a capability to provide real-time feedback on weapon system effectiveness against small boat attacks for use during both testing and training.

Littoral Combat Ship (LCS)

Executive Summary

- The Navy restructured the Littoral Combat Ship (LCS) program to include two “Flight 0” ships (one of each seaframe design) and five “Flight 0+” ships (mix of seaframes under negotiation). The Navy’s long-term strategy is to acquire 55 LCS; however, no final decision has been made beyond these first seven platforms.
- The Navy accepted delivery of LCS 1 in September 2008. Delivery of LCS 2 has slipped to the second half of FY09.
- The Integrated Product Team completed the Test and Evaluation Master Plan (TEMP) and it is in the review process.

System

- The LCS is a new class of ship designed to operate in the shallow waters of the littorals where larger ships cannot maneuver as well. It can accommodate a variety of individual warfare systems (mission modules) assembled and integrated into interchangeable mission packages.
- There are two competing basic ship (seaframe) designs:
  - The Lockheed Martin design (LCS 1) is a steel monohull.
  - The General Dynamics design (LCS 2) is an aluminum tri-maran style hull.
- The designs propose different combat systems for self-defense against anti-ship cruise missiles.
- Both designs use combined diesel and gas turbine engines with waterjet propulsors.
- More than a dozen individual programs of record, involving sensor and weapon systems and other off-board vehicles, have been chosen to make up the individual mission modules. All but three are Acquisition Category (ACAT) II and ACAT III programs.
- The Navy plans to acquire a total of 55 LCS, but the mix of platforms is undecided.

Mission

- The Maritime Component Commander can employ LCS to conduct Mine Warfare (MIW), Anti-Submarine Warfare (ASW), or Surface Warfare (SUW), based on the mission package fitted into the seaframe. Mission packages are designed to be interchangeable, allowing the Maritime Component Commander flexibility to reassign missions.

LCS 1

LCS 2

- Commanders can employ LCS in a maritime presence role regardless of the installed mission package based on capabilities inherent to the seaframe.
- The Navy can deploy LCS alone or in conjunction with other ships.

Prime Contractors

- LCS 1: Lockheed Martin
- LCS 2: Bath Iron Works
  General Dynamics

Activity

- LCS 1 completed acceptance trials on August 22, 2008. The Navy’s Board of Inspection and Survey recommended that the Chief of Naval Operations accept delivery, provided that designated deficiencies were either corrected or waived.
- The Navy restructured the LCS program to include two Flight 0 ships (one of each seaframe design) and five Flight 0+ ships (mix of seaframes under negotiation). A Milestone

A-prime decision is expected to approve procurement and determine the mix of the five Flight 0+ ships.

- Although the Navy accepted delivery of LCS 1 in September 2008, LCS 2 has slipped to 3QFY09. Shipyard work will continue for several months after delivery.
- The Navy began IOT&E of the Organic Airborne Mine Countermeasures (OAMCM) variant of the MH-60S, which will deploy and operate Airborne Mine Countermeasure (AMCM) mission modules from LCS. These systems are part of the LCS Mine Countermeasures Mission Package. During the first operational test of the OAMCM MH-60S and the AN/AQS-20A towed sonar sensor, multiple problems associated with the deployment and retrieval of the AN/AQS-20A sensor caused the Program Office to de-certify the system, suspending the IOT&E pending investigation and remedial action.
- The Remote Mine-hunting System (RMS), another key element of the Mine Warfare Mission Package, conducted an operational assessment (OA) in September 2008 aboard USS *Bainbridge* (DDG 96). RMS IOT&E, originally scheduled for June 2007, has been postponed because of performance and reliability issues and may now occur in conjunction with LCS operational testing.
- Other mission systems in support of ASW and SUW modules are in various stages of developmental testing.
- The IOT&E strategy for the first of each of the two seaframes received concurrence from the Integrated Product Team and a final version of the TEMP is in coordination for approval. However, test planning beyond Flight 0+ is unfeasible until the Navy solidifies a future acquisition strategy.

Assessment

- The LCS program endures a great deal of uncertainty due to the unknown mix of future ships and organizational complexity related to monitoring mission module test and development in addition to component integration with both seaframes.
- The IOT&E strategy is constructed to allow operational testing of both LCS seaframes with each mission package. Under the strategy, all three mission packages will be tested as spiral developments on both seaframes, and ship self-defense testing is integrated into the Navy's Ship Self-Defense Test and Evaluation Enterprise effort.
- LCS is designed to have a small crew, and the operational concept relies heavily on shore-based support. Navy plans for this support are still maturing. Shore-based support will be assessed during IOT&E.

Recommendations

- Status of Previous Recommendations. The Navy satisfactorily addressed all but two of the previous eight recommendations. The remaining two recommendations merit additional emphasis.
- FY08 Recommendation.
  1. The Navy needs to solidify the LCS Acquisition Strategy to allow for realistic long-range planning. Program uncertainty has cascading effects on production and testing management.

LPD-17 *San Antonio* Class Amphibious Transport Dock

Executive Summary

- The Navy began IOT&E in February 2007 and a number of key test events remain outstanding prior to completion. Testing thus far has demonstrated that the ship possesses considerable amphibious lift capacity; aviation support; command, control, communications, computers, and intelligence (C4I) capabilities; and habitability improvements.
- Operational testing revealed reliability problems with critical ship systems; self-defense and Information Assurance shortcomings; Chemical, Biological, Radiological Defense (CBRD)-related vulnerabilities; and significant hull, mechanical, and electrical (HM&E) problems. The Navy's Board of Inspection and Survey identified similar HM&E problems in their inspections of follow-on ships in the class.
- Completion of IOT&E has been delayed by deficiencies in the ship's material condition, deferred self-defense testing, unaccomplished developmental testing, and planning and coordination difficulties.
- The Navy completed the Full Ship Shock Trial on LPD-19 and the Total Ship Survivability Trial on LPD-18 in September 2008. The LFT&E analyses of the data to assess vulnerability and survivability of the LPD-17 class will continue into FY09. The conduct of these trials highlighted some survivability improvements; however, the trials were impeded by reliability issues with critical ship systems.

System

An LPD-17 class ship is diesel engine powered and designed to embark, transport, and deploy ground troops and equipment. The troops and equipment move ashore by air-cushion landing craft (LCAC), displacement utility landing craft (LCU), amphibious assault vehicles (AAVs), MV-22 tiltrotor aircraft, or helicopters.

- A floodable well deck is used for LCAC, LCU, and AAV operations.
- A flight deck and hangar accommodate Navy and Marine Corps helicopters and MV-22s.
- Installed C4I facilities and equipment support Marine Corps Landing Force operations.
- For air warfare ship self-defense, the Ship Self-Defense System Mark 2 Mod 2 (SSDS Mk 2 Mod 2) with Cooperative Engagement Capability (CEC) is the combat system that integrates Rolling Airframe Missiles, the AN/SLQ-32B (V)2 (with Mk 53 NULKA electronic decoys) electronic warfare system, and radars (AN/SPQ-9B horizon search radar and AN/SPS-48E long-range air search radar).
- Two Mk 46 30 mm gun systems and smaller caliber machine guns provide defense against small surface threats.
- The Shipboard Wide Area Network (SWAN) serves as the data backbone for all electronic systems. LPD-17 is the first ship built with a fully integrated data network system.

Mission

A commander will employ LPD-17 class ships to conduct Amphibious Warfare. In this role, the ship will:

- Transport combat and support elements of a Marine Expeditionary Unit or Brigade
- Embark, launch, and recover LCAC, LCUs, and AAVs for amphibious assault missions
- Support aerial assaults by embarking, launching, and recovering Marine Corps aircraft
- Carry and discharge cargo to sustain the landing force
- Conduct non-combatant evacuation operations and other crisis response missions

Prime Contractor

- Northrop Grumman

Activity

- The Navy resumed LPD-17 class IOT&E in November 2007 in conjunction with an SSDS Mk 2 Mod 2 FOT&E event. Due to poor weather, one of the two planned missile-firing events was not completed.
- IOT&E continued on LPD-18 in December 2007 with tracking exercises against high-diving Anti-Ship Cruise Missile (ASCM) targets and subsonic and supersonic sea-skimming ASCM surrogates and targets.

- The Navy deployed LPD-19, the third ship of the LPD-17 class, to support fleet operations before the completion of the program's IOT&E. DOT&E provided an Early Fielding Report to Congress in May 2008 regarding the demonstrated performance of LPD-17 based on the Navy's testing to date. LPD-17 also deployed in August 2008 as part of the USS *Iwo Jima* Expeditionary Strike Group, and LPD-18 deploys in January 2009 with the USS *Boxer* Expeditionary Strike Group.
- The Navy conducted LPD-17's IOT&E phases for amphibious warfare, surface warfare, and air warfare between February 29 and March 27, 2008. Several planned events not completed during this underway period were later completed during subsequent scheduled training events.
- Testing of LPD-17's combat system onboard the Self-Defense Test Ship (SDTS) is scheduled to continue in 1QFY09 against threat representative ASCM targets.
- IOT&E continued onboard LPD-18 in September 2008 to assess "soft-kill engagements" using the NULKA electronic decoy system against ASCM surrogates.
- The final IOT&E phase is a modeling and simulation effort to support an assessment of the ship's capability to defend against an attack by multiple ASCMs. This phase is expected to complete in FY09.
- The Navy completed two major LFT&E tests, the Full Ship Shock Trial and the Total Ship Survivability Trial, in September 2008. Analyses of the results are expected in FY09.

Assessment

Although the IOT&E is not yet complete, the following are DOT&E's observations from preliminary data and assessments:

- LPD-17 provides considerable amphibious lift. The ship is able to meet its amphibious lift requirements for landing force vehicles, cargo, personnel, fuel, hangar space, well-deck capacity, and flight-deck landing areas.
- The ship is capable of supporting C4I requirements in an Expeditionary Strike Group (ESG) environment; however, reliability problems observed in the SWAN and the Interior Voice Communications System degraded command and control of Marine forces. The Navy still needs to validate Information Exchange Requirements per the approved IOT&E test plan, and pursue a formal Information Support Plan approved by the Joint Staff.
- Information assurance testing revealed vulnerabilities to LPD-17 systems and networks, and the ship was unable to effectively demonstrate network detection, reaction, and restoration until installation of a shipboard Intrusion Detection System designed to help defend against network attacks.
- The ship is vulnerable against specific air and surface threats likely to be encountered by LPD-17 class ships. Testing also identified integration deficiencies with the AN/SPS-48E radar in the Advanced Enclosed Mast Structure as well as other SSDS combat system elements.
- The lack of interface between the real-time SSDS Mk 2 tactical display and the near real-time displays from the Amphibious Assault Direction System and Global Command and Control System-Maritime degrades situational awareness and increases the likelihood of misclassified contacts and potential blue-on-blue engagements.
- Major elements of LPD-17's SSDS Mk 2 Mod 2 combat system collectively have a large number of high severity software trouble reports, increasing the likelihood of occurrence of one or more during operations.
- During the amphibious warfare phase of the IOT&E, the ship experienced system failures that significantly affected its operations and survivability.
  - The SWAN experienced faults, one of which resulted in a loss of the crew's capability to control and monitor ship equipment including navigation, propulsion, and steering in the normal mode for approximately 18 hours. Off-ship contractor technical assistance was necessary to restore the system.
  - The engineering control system (ECS) and fire detection alarm system exhibited excessive false alarms and completely failed twice, resulting in the need to man additional engineering watch stations until restoration. The requirement for the crew to man additional watch stations revealed manning and training shortfalls that have implications on the ship's capability to sustain combat operations.
  - The electrical distribution system exhibited uncommanded opening of breakers and experienced a total loss of electrical power . This highlighted a continuing problem with uninterruptible power supplies, which do not provide power when required.
- The Navy's CBRD In-Service Engineering Activity documented significant design and installation deficiencies with the Collective Protection System and Casualty Decontamination Stations. Realistic CBRD testing has not yet been accomplished.
- LPD-17 has yet to complete dynamic interface testing for the AV-8 Harrier and is therefore unable to conduct operational testing or receive certification to land and service the aircraft.
- The survivability of the *San Antonio* class ships appear to be improved over the LPD class ships they will replace. However, problems encountered with critical systems during testing (particularly with the SWAN and ECS) may offset some of the survivability improvements and have highlighted serious reliability shortcomings.

Recommendations

- Status of Previous Recommendations. Two recommendations made in FY07 are being addressed; however, the modified target (GQM-163A Coyote) intended to represent the high-diver ASCM threat has not been flight-tested.
- FY08 Recommendations. The Navy should:
  1. Complete remaining IOT&E elements, including: modeling and simulation effort to support an assessment of the ship's probability of raid annihilation requirement, an end-to-end test of the ship's CBRD capabilities, and a demonstration of the ship's capability to satisfy its information exchange requirements. A test of the ship's interoperability with AV-8

aircraft should be conducted as FOT&E after completion of prerequisite developmental testing.
2. Continue installing the AN/SPS-48E radar antenna corrective shroud on remaining ships of the class and complete operational testing needed to demonstrate the radar's effectiveness inside the Advanced Enclosed Mast Structure.
3. Conduct comprehensive information assurance testing during FOT&E, including testing to address privilege escalation and an assessment of LPD-17's susceptibility to internal threats. Additionally, the Navy should re-examine protection, detection, reaction, and restoration capability after installation of an Intrusion Detection System.
4. Develop, test, and field fixes to critical systems including the SWAN, ECS, and fire detection and alarm systems.
5. Review the problems repeatedly identified in the Navy's Board of Inspection and Survey inspections of the LPD-17 class ships to establish which problems are design issues and which are quality assurance failures and develop corrective action plans for both.
6. Review the impact of the ship's manning, training, and logistics support on the reliability and maintainability of ship systems.

MH-60R Multi-Mission Helicopter

Executive Summary

- MH-60R completed IOT&E on the baseline airframe in September 2005.
- Mission system complexity and software deficiencies increase operator workload significantly. However, a recent software configuration update and Pre-Planned Product Improvement (P3I) integration is expected to mitigate this burden.
- Combined MH-60R/S FOT&E (OT-IIIA) on P3I commenced in FY08 and is expected to continue into the latter half of FY09.
- The MH 60R is a covered system for purposes of LFT&E. P3I component integration is not expected to affect the approved LFT&E Strategy.

System

The MH-60R is a ship-based helicopter designed to operate from Cruisers, Destroyers, Frigates, Littoral Combat Ships, or Aircraft Carriers. It is designed to replace the SH-60B and SH-60F.

- It incorporates dipping sonar and sonobuoy acoustic sensors, multi-mode radar, electronic warfare sensors, a forward looking infrared sensor with laser designator, and an advanced mission data processing system.
- It employs torpedoes, Hellfire air-to-surface missiles, and crew-served mounted machine guns.
- It has a three-man crew: two pilots and one sensor operator.

Mission

The Maritime Component Commander employs the MH-60R from ships or shore stations to accomplish:

- Under Sea Warfare, Anti-Surface Warfare, Area Surveillance, Combat Identification, and Naval Surface Fire Support missions that previously required two different (SH-60B or SH-60F) helicopters
- Support missions such as Search and Rescue at sea and (when outfitted with necessary armament) maritime force protection duties

Prime Contractor

- Sikorsky

Activity

- Combined MH-60R/S FOT&E (OT-IIIA) on P3I commenced in FY08. Operationally-led Integrated Testing combines OT&E and Carrier Strike Group training events until independent operational testing begins, scheduled to commence 2QFY09.
- The Navy conducted Electronic Surveillance Measures (ESM) systems testing at Eglin AFB, Florida, from May 17 to June 3, 2008, and Mk 54 Torpedo interface testing on the Atlantic Undersea Test and Evaluation Center range, Andros Island, Bahamas, June 8-19, 2008.

Assessment

- MH-60R is effective, suitable, and survivable for fleet operations according to the IOT&E in September 2005.
- Early results from P3I ESM testing indicated problems with bearing ambiguity and spurious false bearing lines generated on the display screen. A planned software upgrade scheduled prior to independent operational testing is expected to correct the problems.
- The H-60 aircraft has a demonstrated survivability record; however, the system could be enhanced by improvements in the fuel system, main transmission, and rotor dampener lines.

Recommendations

- Status of Previous Recommendations. The Navy addressed two of the three previous recommendations. The recommendation regarding the correction of software deficiencies remains valid.
- FY08 Recommendations. None.

MH-60S Fleet Combat Helicopter

Executive Summary

- The Navy's operational test agency, Commander, Operational Test and Evaluation Force (COTF), reported results of the MH-60S Armed Helicopter (Block 3A) variant IOT&E in October 2007. Those results, supplemented by a Navy Verification of Correction of Deficiencies (VCD) phase and a DOT&E-requested follow-up phase were adequate to determine operational effectiveness and suitability in all Armed Helicopter missions except for operational effectiveness in the Surface Warfare (SUW) mission.
- DOT&E released the Beyond Low-Rate Initial Production (BLRIP) report in October 2008 and found the Armed Helicopter operationally effective and suitable for the Combat Search and Rescue (CSAR), Aircraft Carrier Plane Guard/Search and Rescue (CVPG/SAR), Special Warfare Support (SWS) (Overland) missions, and the newly added Maritime Interdiction Operations (MIO) mission. For the Surface Warfare (SUW) mission, the Armed Helicopter is not suitable and operational effectiveness is yet to be determined. The Armed Helicopter is operationally survivable in all missions.
- IOT&E for the Block 2A Airborne Mine Countermeasures (AMCM) variant commenced in 2QFY08. Testing of the AN/AQS-20 Sonar Mine Detection Set, the first of five major AMCM systems planned for operation from the MH-60S, encountered significant reliability issues so the Program Office decertified the system and suspended testing until resolution of the problems.
- The Navy began combined MH-60R/S FOT&E of a group of newly installed systems called Pre-Planned Product Improvements (P3I) designed to enhance mission capability.

System

- The MH-60S is a helicopter modified into three variants (Blocks) from the Army UH-60L Blackhawk. It is optimized for operation in the shipboard/marine environment.
- The Blocks share common cockpit avionics and flight instrumentation with the MH-60R.
- Installed systems differ by Block based on mission:
  - Block 1 – Vertical Replenishment: Precision navigation and communications, maximum cargo, or passenger capacity
  - Block 2 – Airborne Mine Countermeasures (AMCM): AMCM systems operator workstation, tether/towing system, any one of five available mine countermeasure Systems
  - Block 3 – Armed Helicopter: Tactical moving map display, forward looking infrared with laser designator, crew-served side machine guns, Hellfire air-to-surface missiles, and defensive electronic countermeasures
- P3I components add tactical data link (Link 16) and various communication, navigation, and command and control upgrades.

Mission

The Maritime Component Commander can employ variants of MH-60S from ships or shore stations to accomplish the following missions:

- Block 1: Vertical replenishment, internal cargo and personnel transport, medical evacuation, Search and Rescue, and Aircraft Carrier Plane Guard
- Block 2: Detection, classification, and/or neutralization of sea mines depending on which AMCM systems are installed on the aircraft
- Block 3: Combat Search and Rescue, Anti-Surface Warfare, Aircraft Carrier Plane Guard, Maritime Interdiction Operations, and Special Warfare Support

Prime Contractor

- Sikorsky

Activity

- The Navy completed IOT&E for the MH-60S Armed Helicopter in June 2007 and released its report in October 2007. Despite the limitation of not conducting operations from a ship at sea, testing was in accordance with

the DOT&E-approved Test and Evaluation Master Plan and test plan.
- COTF conducted an initial Verification of Correction of Deficiencies (VCD) period from January to March 2008 and recommended full fleet introduction of the Armed Helicopter.
- DOT&E requested a follow-up phase to clarify VCD results to include additional testing, data collection, and confirmation of analyses. The Navy reported those findings in a VCD Addendum Message issued in July 2008.
- The Navy began IOT&E of the Block 2A Airborne Mine Countermeasures (AMCM) variant in March 2008 but, due to reoccurring problems associated with the deployment and retrieval of the primary sensor (AN/AQS-20A), the Program Office de-certified the system in April 2008, suspending the IOT&E for investigation of reliability issues.
- In September 2008, the Navy began FOT&E on P3I components designed to enhance aircraft mission capability, and on the Armed Helicopter to specifically address deficient Hellfire engagements and determine SUW effectiveness.
- The execution of the MH-60S LFT&E program was in accordance with the approved Alternative LFT&E Strategy contained in the Test and Evaluation Master Plan. The available data were adequate to assess the survivability of the MH-60S in its baseline configuration missions.

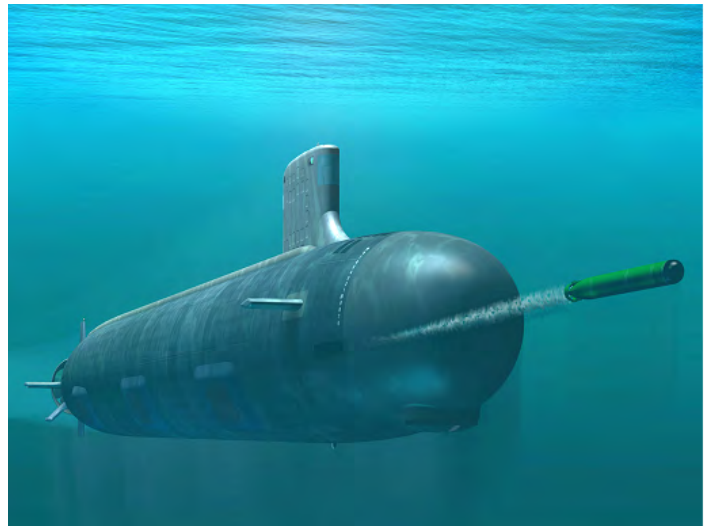
Assessment

- The Navy's initial evaluation of the Block 3A Armed Helicopter in October 2007 found it operationally not effective in CSAR and SWS (Overland) missions. Additionally, the Navy found the Armed Helicopter not suitable in CSAR, SWS, and SUW missions. For effectiveness, the IOT&E report noted problems meeting mission radii and multiple mission planning deficiencies. Regarding suitability, the Navy noted various safety, compatibility, and human factor deficiencies.
- Although the Armed Helicopter testing did not include ship-based helicopter operations at sea, the IOT&E, supplemented by a VCD phase and a DOT&E-requested follow-up phase, was adequate to determine operational effectiveness and suitability in all missions except for operational effectiveness in the SUW mission.
- Due to the unavailability of an aircraft carrier at sea, the Navy was unable to demonstrate the Armed Helicopter variant's operational compatibility at sea with a full airwing complement.
- For SUW, Hellfire testing was inadequate. Only three missiles were fired, all against non-evasive targets and well short of the four nautical mile engagement range. Additionally, there were no nighttime or rapid rate-of-fire shots.
- Armed Helicopter cabin overcrowding hampered crew mobility in all missions. Troop seats were inadequate and the position of the M-240D gunner's seat, only seven inches from the cockpit wall, prevents the gunner from assuming a proper position in the event of a crash.
- DOT&E finds that the Armed Helicopter is survivable in most expected threat environments. The overall susceptibility to surface-to-air threats is lower when compared to the legacy HH-60H aircraft; however, the quantity of expendables (chaff and flares) available are considered insufficient and the radar warning receiver demonstrated problems with bearing ambiguities, false alarms, spatial coverage, and warning voice clarity.
- The vulnerability assessment from the live fire test established that, with few exceptions, the Armed Helicopter is robust and ballistically tolerant. The aircraft also meets its force protection requirements, which include crashworthiness features (qualified by similarity to the UH-60L) and armor for personnel protection qualified by test against modest small arms.
- The Block 2 Airborne Mine Countermeasures (AMCM) variant, designed primarily to support systems that are part of the new Littoral Combat Ship (LCS) Mine Countermeasures Mission Package, could not reliably deploy and retrieve its primary sensor using its carriage, stream, tow, and recovery system.
- P3I FOT&E will determine operational effectiveness and suitability of Link 16 integration (delineated as the Block 3B variant) and 12 additional components primarily addressing command and control, navigation, and situational awareness designed to enhance the ability of the aircraft to more efficiently complete its missions.

Recommendations

- Status of Previous Recommendations. The Navy has addressed one of the two FY07 recommendations.
- FY08 Recommendations. The Navy should:
  1. Determine CV(N) shipboard compatibility of the MH-60S Armed Helicopter under operationally-realistic conditions. Testing should include underway flight operations with a representative complement of all air wing aircraft embarked.
  2. Determine operational effectiveness of the Armed Helicopter variant in the SUW mission to include sufficient day and night overwater Hellfire missile firings to fully demonstrate the aircraft's ability to conduct attacks against threat-representative, evasively maneuvering, seaborne targets from all weapon stations at tactical ranges.
  3. Correct the safety, compatibility, human factor, and mission planning deficiencies recorded during the Armed Helicopter variant IOT&E.
  4. Improve the APR-39A(V)2 Radar Warning Receiver effectiveness and consider increasing the number of ALE-47 Chaff/Flare dispensers.
  5. Improve aircrew seats that are survivable and allow for sufficient space to provide a means for safe and effective aircraft egress.
  6. Develop a plan to execute the Airborne Mine Countermeasure (Block 2) variant IOT&E such that it will be ready to support Mine Countermeasure mission module testing on LCS.

Mk 48 Advanced Capability (ADCAP) Torpedo Mods



Executive Summary

- Operational testing of the Mk 48 Mod 7 Common Broadband Advanced Sonar System (CBASS) Phase I torpedo is complete and DOT&E issued a classified Beyond Low-Rate Production (BLRIP) Report in January 2008. Testing was adequate and found CBASS torpedo's performance was equivalent to the current Mk 48 Advanced Capability (ADCAP) Mod 6 torpedo.
- The Royal Australian Navy successfully conducted the first CBASS warshot Sinking Exercise in July 2008.
- The Navy is incorporating some Mk 48 Mod 7 CBASS software features into the Mk 48 Mod 6 torpedo. Initial operational testing started in September 2007 and will continue through early FY09.

System

- The Mk 48 ADCAP torpedo is the primary anti-submarine warfare and anti-surface ship warfare weapon used by U.S. submarines.
- Mk 48 ADCAP torpedo mods are a series of hardware and software upgrades to the Mk 48 torpedo.
- Mk 48 Mod 5, Mod 6, Mod 6 Advanced Common Torpedo - Guidance and Control Box (ACOT-GCB), and Mod 7 CBASS Phase I are fielded torpedoes.
- The Mk 48 Mod 6 ACOT-GCB replaces obsolete Mod 6 hardware and rewrites the software permitting an open architecture torpedo design to allow future software upgrades. The Navy designed the Mk 48 Mod 6 ACOT-GCB to have the same performance as the Mk 48 Mod 6.
- The Mk 48 Mod 6 Spiral 1 torpedo is the last planned software upgrade to the Mk 48 Mod 6. This upgrade uses software algorithms from the CBASS to improve shallow-water performance.
- Mk 48 Mod 7 CBASS upgrades the Mk 48 ACOT-GCB with a new sonar designed to improve torpedo effectiveness through future software upgrades, identified by phase and spiral numbers. Phase 1 torpedoes deliver the initial hardware and software; Phase 2 torpedoes are required to deliver full capability. The Navy fielded CBASS Phase 1; Phase 2 is in development.
- CBASS is a co-development program with the Royal Australian Navy.

Mission

The Submarine Force employs the Mk 48 ADCAP torpedo as a long-range, heavy-weight weapon:

- For destroying surface ships or submarines
- In both deep-water open-ocean and shallow-water littoral environments

Prime Contractor

- Raytheon

Activity

- DOT&E issued a classified BLRIP report on the effectiveness and suitability of the Mk 48 Mod 7 CBASS Phase I torpedo in January 2008.
- The Navy conducted shallow-water OT&E of the Mk 48 Mod 6 Spiral 1 torpedo in September 2007. The Navy conducted in-water regression testing in conjunction with fleet training events in November 2007, February 2008, May 2008, and October 2008. DOT&E approved a test plan change in June 2008, to allow some regression testing to occur in the Weapons Analysis Facility (WAF) hardware-in- the-loop simulator at the Naval Undersea Warfare Center in Newport, Rhode Island. The WAF regression testing occurred in June 2008.
- The Royal Australian Navy submarine, HMAS WALLER successfully conducted the first CBASS Sinking Exercise during the 2008 Rim of the Pacific (RIMPAC) exercise in July 2008. HMAS WALLER is the first Australian submarine converted to employ the AN/BYG-1 Combat Control System and the CBASS torpedo.

- The Navy completed development of an initial Test and Evaluation Master Plan (TEMP) to cover the Mk 48 CBASS Phase 2 torpedo. The TEMP is in the final review cycle.
- The Navy began software development and developmental testing of CBASS Phase 2 software without completing a TEMP update to cover the developmental and operational testing.

Assessment

- The Navy conducted adequate operational testing of the Mk 48 CBASS Phase 1 torpedo in 2006 and 2007 in accordance with the DOT&E-approved TEMP and test plan. In the Mk 48 CBASS Phase I BLRIP report, DOT&E concluded that the torpedo's performance is similar to the legacy Mk 48 ADCAP Mod 6 torpedo. Like the Mk 48 Mod 6, the CBASS torpedo did not meet all performance thresholds; however, the CBASS torpedo is effective in many Anti-Submarine Warfare and Anti-Surface Warfare environments. The CBASS torpedo is not effective in certain environments against modern submarine threats. The Mk 48 CBASS torpedo is operationally suitable. However, while the Navy successfully upgraded and replaced obsolete torpedo hardware, the desired performance improvements have been marginal. A detailed evaluation is contained in DOT&E's classified BLRIP report.
- The Navy incorporated some CBASS software algorithms into the Mk 48 Mod 6 Spiral 1 torpedo in an attempt to improve in-water torpedo performance in challenging shallow-water scenarios. Initial in-water testing in September 2007 demonstrated the performance was below thresholds. Regression testing of Spiral 1 will continue through early FY09 to confirm that the software changes do not degrade legacy Mk 48 Mod 6 performance.
- Due to the high demand for limited fleet assets, the low fleet priority assigned to developmental and operational testing and the Navy's need to reduce total cost, Navy testers attempt to combine testing events with fleet training events in order to accomplish operational testing. Although an appropriate combination of testing and training appears to be the efficient use of fleet assets, significant advance coordination and planning with the fleet trainers is necessary to ensure an adequate event is conducted that will meet the needs of both the trainers and the testers. Combining testing and training can also result in inadequate or excessively long test periods as has occurred with the Mk 48 ADCAP Spiral 1 torpedo test – over one year to complete regression testing.
- The successful sinking of an inactivated destroyer by an Australian submarine using a CBASS torpedo, in July 2008, was the first warshot test for the CBASS torpedo. This process is essential for verifying performance of the Fleet's warshot torpedoes.
- The current threats of record and threat environments require that the Navy develop systems as well as the ability to operate and fight in littoral and in shallow-water environments. Concerns about submarine safety and the lack of adequate shallow-water ranges impact the realism of operational test and training events and increase the complexity and time required to execute the events.

Recommendations

- Status of Previous Recommendations. The Navy has made progress in addressing four of the five previous recommendations. The FY07 recommendation to include a combat system test perspective in achieving mission success of target detection through target kill has not been implemented.
- FY08 Recommendation.
  1. The Navy should develop shallow-water test and training areas and modernize the exercise torpedo locating and recovery systems.

Mk 54 Lightweight Torpedo

Executive Summary
- Production of Mk 54 torpedoes resumed following a one-year delay due to quality assurance problems.
- The Navy needs to develop requirements documents, acquisition strategies, and associated Test and Evaluation Master Plans (TEMPs) to address the Mk 54 Pre-Planned Product Improvement (P3I) program and the Mk 54 High-Altitude Anti-submarine Warfare Weapons Capability (HAAWC).

System
- The Mk 54 Lightweight Torpedo is the primary anti-submarine warfare (ASW) weapon used by U.S. surface ships, fixed-wing aircraft, and helicopters.
- The Mk 54 combines the advanced sonar transceiver of the Mk 50 torpedo with the legacy warhead and propulsion system of the older Mk 46. An Mk 46 torpedo can be converted to an Mk 54 via an upgrade kit.
- The Mk 54 sonar processing is an expandable open-architecture system. It combines algorithms from the Mk 50 and Mk 48 torpedo programs with the latest commercial off-the-shelf technology.
- The Navy designed the Mk 54 sonar processing to operate in shallow-water environments and in the presence of sonar countermeasures.
- The Navy has designated the Mk 54 torpedo to replace the Mk 46 torpedo as the payload section for the Vertical Launch Anti-submarine Rocket (VLA) for rapid employment by surface ships.
- The HAAWC program will provide an adapter kit to permit long-range, high-altitude, GPS-guided deployment of the Mk 54 by a P-8A Maritime Patrol Aircraft.
- The Navy is planning a series of near-term improvements to the Mk 54, including an improved sonar array and block upgrades to the tactical software.

Mission
The Navy surface and air elements employ the Mk 54 torpedo as their primary anti-submarine weapon:
- For offensive purposes, when deployed by ASW aircraft and helicopters
- For defensive purposes, when deployed by surface ships
- In both deep-water open-ocean and shallow-water littoral environments
- Against fast, deep-diving nuclear submarines, and slow-moving, quiet, diesel-electric submarines

Prime Contractor
- Raytheon

Activity
- The Navy halted production of Mk 54 torpedoes in March 2007 due to quality assurance, workmanship, and assembly problems at the prime contractor's facility. After the Navy and prime contractor instituted a remediation program, production was resumed in March 2008.
- To support high-altitude deployment of the Mk 54 torpedo from the new P-8A maritime patrol aircraft, the Navy conducted a demonstration of the HAAWC proof of concept prototype from a P-3C aircraft in May 2007. Three manufacturers are currently competing for the contract.
- The Navy is developing requirements documents for HAAWC as well as the initial set of P3I hardware and software upgrades. Those requirements are necessary to support development of the associated acquisition strategies and TEMPs.
- The Navy conducted developmental testing of the VLA with an Mk 54 torpedo payload in November 2007. Of the six missiles fired, none were successful. In December 2007, the Navy cancelled operational testing pending remediation of the problems. The Navy corrected all known VLA problems and plans to restart operational testing in February 2009.
- In August 2006, the Navy began FOT&E to evaluate the terminal homing phase of the Mk 54 torpedo attack. During

the test, the Weapons Set-to-Hit Torpedo Threat Target (WSTTT) surrogate sank due to a system malfunction. Throughout 2007, the Navy test community engaged in Navy discussions to salvage the WSTTT and to allow for FOT&E completion and resolution of a Critical Operational Issue (COI) for Mk 54 effectiveness and lethality. The Navy's FOT&E remained incomplete throughout FY08 due to the lack of test target assets. On September 12, 2008, the Navy's Commander, Operational Test and Evaluation Force identified a threat-representative set-to-hit target as a test resource shortfall and a severe limitation for evaluating the Mk 54 Mod 0 torpedo.
- DOT&E placed the Mk 54 torpedo program on oversight in FY08.

Assessment

- The Navy completed the IOT&E of the Mk 54 Mod 0 torpedo in 2004. The Navy's IOT&E report identified a major limitation to test and inconclusive test data for evaluating the terminal homing phase of the Mk 54 torpedo's attack profile. DOT&E agrees with the Navy testers that the lack of a threat-representative set-to-hit target is severe limitation to test. DOT&E believes completing the Mk 54 FOT&E is critical for resolving the effectiveness and lethality of the Mk 54 Mod 0 torpedo and future planned upgrades of the torpedo.
- The six VLA developmental testing failures were due to multiple causes including the fire control software, Mk 54 reliability, and VLA canister hardware. The program believes that it has addressed all of these deficiencies and plans to resume testing in early FY09. Due to Fleet safety rules, Navy ships cannot fire the VLA against manned submarines; instead, the Navy plans to use an unmanned Mk 30 vehicle as the target. Navy testers and DOT&E agree that this VLA testing will only address VLA missile delivery performance but will not adequately assess torpedo effectiveness and end-to-end weapon performance.
- The Mk 54 program is being guided by requirements set in 1995. While the program is moving ahead with several initiatives, including HAAWC and P3I upgrades, it still lacks the formal requirements documents necessary to guide their development. Firm requirements and program definition are essential before the program can develop adequate acquisition and operational test strategies.
- Because of incomplete operational testing and the Mk 54 torpedo being the Navy's primary surface ship, helicopter, and Maritime Patrol Aircraft ASW weapon, DOT&E placed the Mk 54 torpedo program on DOT&E Oversight in FY08.

Recommendations

- Status of Previous Recommendations. This is the first annual report for this program.
- FY08 Recommendations. The Navy must:
  1. Define the program requirements for the Mk 54 torpedo planned improvements and develop an Acquisition Strategy and an overall test strategy.
  2. Provide the resources to resolve the limitations to test and deficiencies identified in the 2004 Mk 54 Mod 0 Operational Test Report.

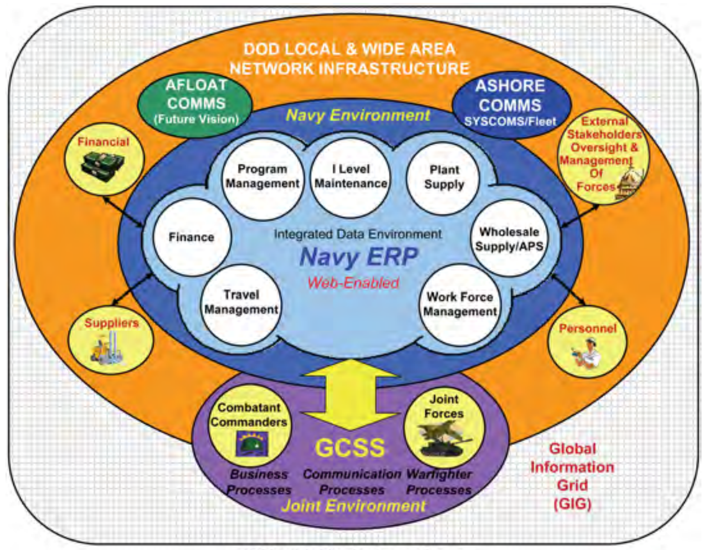
Navy Enterprise Resource Planning (ERP) Program

Executive Summary

- During FY08, Commander, Operational Test and Evaluation Force (COTF) conducted an extended IOT&E of Navy Enterprise Resource Planning (ERP) Release 1.0 at Naval Air Systems Command (NAVAIR) Headquarters. The system was operationally suitable, but not operationally effective. Change management and financial management were unsatisfactory, which led to a significant expenditure of resources and manpower that had not been anticipated.
- In July 2008, COTF reevaluated the release and found minimal progress in resolving financial management deficiencies since the IOT&E concluded. NAVAIR is still experiencing major difficulties matching disbursements to obligations and has a large backlog of payments to vendors, despite an increase in its workforce.
- Naval Supply Systems Command (NAVSUP), the next receiving command, and the Navy ERP program manager have taken vigorous and comprehensive change management steps to ensure that the new software can be successfully deployed to NAVSUP. The complexity, cost, and risk of deploying to NAVSUP appear to be significantly less than they were for NAVAIR.
- The program manager will deploy Release 1.0 to NAVSUP in 1QFY09, and COTF will conduct FOT&E at NAVSUP during 2QFY09 to determine whether the new change management processes are operationally effective. COTF will then conduct FOT&E at NAVAIR to establish whether long-term financial management solutions are effective. The FOT&E results will be used by the Deputy Under Secretary of Defense for Business Transformation to determine whether Release 1.0 should be fielded to additional Navy commands.

System

- A major component of the Navy's Global Combat Support System, Navy ERP uses commercial ERP software to manage financial and logistical activities. Some additional software development is necessary to perform unique military requirements.
- Navy ERP provides ERP web services to users worldwide through a Navy Enterprise Portal.
- The program manager is implementing the system in three stages, or releases: financial and acquisition management; wholesale and retail supply; and intermediate level maintenance.



GCSS - Global Combat Support System

- Navy ERP replaces four Navy ERP pilot systems (Supply Maintenance Aviator Reengineering Team (SMART), SIGMA (Financial System), Navy Enterprise Maintenance Automated Information System (NEMAIS) and CABRILLO (Warfare Center Management), converging them into a single, integrated system.

Mission

- The Navy utilizes the Navy ERP program to provide end-to-end management of the Navy's major resources (forces, support material, and funds) from forward-deployed forces back to supporting entities.
- The Navy intends to use the ERP program to transform key acquisition, logistics, and financial business activities into an integrated network of decision-making processes and business activities.

Prime Contractor

- BearingPoint

Activity

- Following a successful operational assessment at the conclusion of developmental testing, the system achieved Milestone C in late 4QFY07 and the program manager began a limited fielding to NAVAIR in 1QFY08.
- COTF began the first phase of IOT&E in November 2007, focusing on the technical aspects of system operation, supportability metrics, network and help desk performance, and other non-user related activities.

- COTF began the second phase of IOT&E at NAVAIR in January 2008, focusing on end-user capabilities and actual operational use. During this phase, the testers observed live business operations in the production environment and conducted interviews with end users. The IOT&E concluded on May 14, 2008.
- During July 2008, COTF assessed the adequacy of financial management corrective actions at NAVAIR and reviewed the change management preparation for fielding Release 1.0 to NAVSUP.

Assessment

- DOT&E assessed the IOT&E to be adequate to determine operational effectiveness and suitability. DOT&E concurred with COTF's assessment that Navy ERP Release 1.0 is operationally suitable, but is not operationally effective. The technical infrastructure is sound and the information assurance posture is exemplary. However, poor change management and other deficiencies resulted in unsatisfactory financial management operations and a significant unanticipated expenditure of resources and manpower.
- The primary financial management deficiency concerned the vendor pay process, which experienced a breakdown of automated invoice processing and a greatly increased manual accounting workload. Navy ERP rejected a significant number of records because they didn't contain the required financial matching information and validation data imposed by the new financial compliance requirements. The situation improved considerably during the IOT&E, but was still unsatisfactory when testing concluded.
- The COTF assessment of financial management corrective actions at NAVAIR found that the command was still experiencing major difficulties matching disbursements to obligations and still has a large backlog of payments to vendors. NAVAIR and the program manager have implemented short and long-term solutions; however, it appears that complete resolution will be a lengthy process that requires financial requirement actions and further automation in both Navy ERP and legacy systems.
- Following IOT&E, the program manager and the NAVSUP Commander made extensive preparations for the follow-on fielding of Release 1.0. Based on lessons learned, the program manager issued a Command Implementation Guide that provided detailed guidance on planning and execution of the deployment and cutover process. NAVSUP completed an impact assessment of changes to the command's business processes and developed mitigation strategies. A change readiness assessment was conducted to help smooth the upcoming organizational changes. DOT&E endorses this activity, as it will enable NAVSUP to effectively transition from their legacy system to Navy ERP.
- The complexity, cost, and risk of deploying Release 1.0 to NAVSUP appears to be significantly less than it was for NAVAIR. The release affects only a small percentage of NAVSUP's business, and there will be no migration of legacy data. NAVSUP and Navy ERP are concentrating intensely on effective change management and applying the lessons learned at NAVAIR, which will make NAVSUP better prepared to implement Navy ERP Release 1.0.

Recommendations

- Status of Previous Recommendations. The program manager made progress on the two FY07 recommendations; however, both require additional work.
- FY08 Recommendations.
  1. The Deputy Under Secretary of Defense for Business Transformation should limit additional fielding of Release 1.0 to NAVSUP.
  2. COTF should conduct FOT&E at both NAVSUP and NAVAIR in order to determine the system's current operational effectiveness and suitability before further deployment. The NAVSUP evaluation should determine whether the new change management processes are effective while the NAVAIR reevaluation should determine whether long-term financial management solutions are effective.

P-8A Poseidon

Executive Summary

- The first P-8A test aircraft rolled off the assembly line in July 2008. The first flight by the system contractor is scheduled for March 2009. The contractor will deliver the test aircraft to the Navy for their first test flight in August 2009.
- The detailed test planning for the System Development and Demonstration (SDD) phase began in FY08. There will be approximately 30 test flights per month during the SDD phase, which precedes the IOT&E beginning in 2012.
- Contractor developmental live fire ballistic vulnerability testing determined fire suppression system design requirements.

System

- The P-8A Poseidon is the Navy's next generation maritime patrol aircraft that will replace the P-3C.
- The P-8A is based on the Boeing 737-800 aircraft, but uses the 737-900 extended-range wing.
- It carries and employs anti-ship missiles, air-to-surface weapons, torpedoes, naval mines, sonobuoys, and other expendables.
- The P-8A onboard sensors include acoustics, radar, missile warning system (MWS), and electro optic sensors.
- Survivability enhancement and vulnerability reduction features are incorporated into the P-8A design.
  - Susceptibility is reduced with an integrated Aircraft Survivability Equipment (ASE) suite that consists of a radar warning receiver, chaff/flare dispenser, MWS, directed infrared countermeasures (DIRCM), and electronic Warfare Management Unit (EWMU) to control the system. Radio frequency countermeasures, based on a towed decoy, are planned for spiral development with installation provisions (including wiring and mounting pylons) incorporated into all production aircraft.
  - Vulnerability is reduced through the addition of fuel tank inerting systems and fire protection systems for the vulnerable dry bays that surround aircraft fuel tanks.

Mission

Units equipped with the P-8 will perform a wide-range of patrol missions including:

- Armed anti-submarine warfare
- Armed anti-surface warfare
- Intelligence collection, processing, evaluation, and dissemination to Naval and joint forces
- Maritime and littoral reconnaissance missions

Prime Contractor

- Boeing

Activity

- DOT&E approved the updated Test and Evaluation Master Plan (TEMP) in 2007 with the provision that the Navy retain P-3 flights in the test program to validate the modeling and simulation efforts used to characterize the P-3 baseline performance.
- The contractor is integrating and testing the actual system hardware in their Systems Integration Lab (SIL) prior to the beginning of flight testing. The contractor's SIL includes multiple simulators, benches, and workstations.
- The first P-8A test aircraft left the assembly line in July 2008. The first flight by the system contractor, Boeing, is scheduled for March 2009. The contractor will deliver the test aircraft to the Navy for their first test flight in August 2009.
- The Integrated Test Team (ITT) began detailed planning for the first five test aircraft being tested during the SDD phase. Once the contractor delivers the aircraft to the Navy, there will be approximately 30 test flights per month during the SDD phase. The IOT&E is scheduled to begin in January 2012.
- The program is updating the TEMP to support the Milestone C decision in 2010.
- The contractor completed developmental ballistic testing to determine the P-8A dry bay fire vulnerabilities and to define

the dry bay fire suppression requirements. The FY08 portion of the ballistic testing concentrated on vulnerabilities of and fire suppression requirements for:

- The aft electronic equipment bay
- The aft integral and mid auxiliary fuel tanks
- The forward auxiliary fuel tanks

Assessment

- The Navy's evaluation of the P-8A should include a comparison to the current mission capabilities of the Navy's P-3 aircraft. If data from modeling and simulation is used in lieu of side-by-side flight testing, the Navy needs to develop a methodology to collect P-3 data to validate further the models that characterize the P-3 baseline performance. The Navy has not yet developed a data collection plan.
- The SIL build-up of capabilities is progressing satisfactorily.
- The contractor-developed dry bay fire suppression system did not consistently suppress all dry bay fires. The program is reviewing the results and formulating a plan of action that may include additional testing.
- Developmental ballistic testing showed that fuel spillage from threat damaged lower fuselage fuel tanks results in fuel vapor build-up and potential for explosion in the lower fuselage. A lower fuselage liquid fuel drain and fuel vapor ventilation system is under consideration for incorporation to resolve this issue. Further testing is required to establish the adequacy of this approach.
- Developmental testing has shown the possibility of fuel and fire entering the crew cabin in some cases of fuel tank ballistic penetrations. The Navy will further assess this issue in full-scale testing to be conducted in FY12.

Recommendations

- Status of Previous Recommendations. The Navy addressed all previous recommendations.
- FY08 Recommendations.
  1. The Navy's future full-scale testing should include measurements to determine:
     - The effectiveness of lower lobe ventilation systems in reducing aircraft vulnerability to lower fuselage fuel vapor explosion
     - The vulnerability/crew casualty potential resulting from fire spread into the cabin from the lower fuselage
  2. The Navy must develop a methodology and data collection criteria to perform the P-3/P-8A comparison and document in the next TEMP update.

Ship Self-Defense System (SSDS)

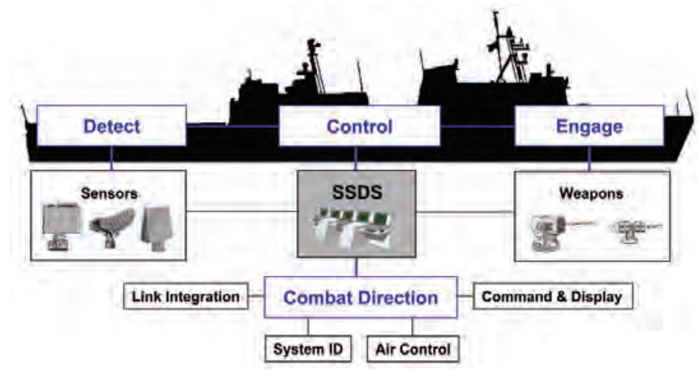
Executive Summary

The Ship Self-Defense System (SSDS) Mark 2 integration of sensor and weapons systems enhances ship self-defense and battle force command/control. However, the Navy must correct significant deficiencies with sensor coverage, multi-ship interoperability (command and control), weapon integration, weapon engagement scheduling, hardware reliability, and training before the system is operationally effective and suitable. Ships with SSDS Mark 2 variants deployed three times in FY08 prior to the Navy completing all planned operational tests or correcting identified deficiencies.

System

SSDS is a fiber-optic local area network that uses open computer architecture and standard Navy displays to integrate a surface ship's sensors and weapon systems and automate the detect-track-engage sequence for air defense.

- SSDS Mark 1 is the combat system for LSD 41/49 class ships.
- SSDS Mark 2 has four variants:
  - The Mod 1 is in development for CVN 68 class aircraft carriers.
  - The Mod 2 is in development for LPD-17 class amphibious ships.
  - The Mod 3 is in development for LHD-1 class amphibious ships.
  - The Mod 4 is in development for LHA replacement amphibious ships.



Mission

Navy surface forces use the SSDS to provide automated engagement capabilities for faster and more effective accomplishment of self-defense missions. Maritime Commanders intend to use:

- Mark 1 and Mark 2 to provide automated and integrated detect-to-engage capability against anti-ship cruise missiles (ASCM)
- Mark 2 to provide faster and more effective command and control for air and surface warfare areas

Prime Contractor

- Raytheon

Activity

- Commander, Operational Test and Evaluation Force (COTF) began FOT&E of the SSDS Mark 2 Mod 1 in February 2008 on USS *Ronald Reagan* (CVN 76) in accordance with a DOT&E-approved test plan. Reduced availability of Fleet and test assets, and problems with SSDS-based combat system elements is delaying completion of this test. USS *Ronald Reagan* deployed in May 2008.
- COTF conducted FOT&E of the SSDS Mark 2 Mod 1 on the Self-Defense Test Ship (SDTS) in December 2007 in accordance with a DOT&E-approved test plan. COTF has not issued a report on this testing.
- COTF continued FOT&E of the SSDS Mark 2 Mod 2 in conjunction with the IOT&E of the USS *San Antonio* (LPD-17) Amphibious Assault Ship. COTF conducted testing on USS *San Antonio*, USS *New Orleans* (LPD-18), and the SDTS. Reduced availability of Fleet assets, problems with SSDS-based combat system elements, and lack of adequate supersonic, sea-skimming targets, open-loop seeker subsonic targets, and supersonic, high-diving ASCM targets is delaying completion of SSDS Mark 2 Mod 2 operational tests. USS *Mesa Verde* (LPD-19) deployed in March 2008. USS *San Antonio* deployed in September 2008.

Assessment

- Initial indications from completed SSDS Mark 2 Mod 1 tests show that the system remains neither operationally effective nor suitable due to continued significant deficiencies with sensor coverage, multi-ship interoperability (command and control), weapon integration, hardware reliability, and training. Testing demonstrated that the SSDS Mark 2 Mod 1 software reliability is improved.
- Completed SSDS Mark 2 Mod 2 tests highlighted deficiencies regarding sensor performance in the LPD-17 Advanced Enclosed Mast Structure, vulnerabilities to certain ASCM threats, and weapon performance in scenarios that include potential fratricide.
- The major elements of both the SSDS Mark 2 Mod 1 and Mod 2 combat systems collectively have a large number of high severity software trouble reports (STR). Taken

separately, the probability of occurrence is low in most instances. However, the large number of high severity STRs increases the probability that one or more may occur in an operational situation.
- Testing identified end-to-end system engineering deficiencies and inadequate preparatory tests of SSDS-based combat system elements that are not part of the SSDS program leading to poor weapon system performance during operational testing.

Recommendations

- Status of Previous Recommendations. The Navy has not completed any of the FY06 or FY07 recommendations.
- FY08 Recommendations. The Navy should:
  1. Assign a high priority to correct and demonstrate with adequate operational testing identified SSDS Mark 2 Mod 1 sensor coverage, multi-ship interoperability (command and control), weapon integration, hardware reliability, training, and weapon engagement scheduling problems to preclude further CVN deployments with ineffective and unsuitable SSDS Mark 2 Mod 1 systems.
  2. Assign a high priority to correct and demonstrate with adequate operational testing identified SSDS Mark 2 Mod 2 sensor performance and weapon performance problems to preclude further LPD-17 class deployments with deficient SSDS Mark 2 Mod 2 systems.
  3. Develop a plan for more robust, end-to-end systems engineering and associated developmental/operational testing of SSDS-based combat system elements.
  4. Ensure availability of adequate supersonic sea-skimming, supersonic high-diving, open-loop seeker subsonic, and Threat D ASCM targets for planned SSDS operational tests.
  5. Ensure availability of Fleet assets for all planned SSDS Mark 2 operational tests.
  6. Assign a high priority to correct identified high severity STRs in major SSDS Mark 2 Mod 1 and Mod 2 combat system elements.

SSGN *Ohio* Class Conversion

Executive Summary

- DOT&E published the Combined Operational and Live Fire Test and Evaluation Report on the SSGN in May 2008.
- The SSGN is effective and suitable for strike and Special Operating Forces (SOF) operations and is survivable in the expected threat environment.
- The existing inventory of six Drydeck Shelters (DDS) may be inadequate to support all four SSGNs and DDS-capable nuclear attack submarines (SSNs) over the long term.

System

- The Navy converted four *Ohio* class ballistic missile submarines into strike and special operations platforms.
- In a full strike configuration, an SSGN can carry up to 154 Tomahawk cruise missiles for land attack strike, with 22 missile tubes carrying seven missiles per tube. In the standard configuration planned for normal operations, an SSGN carries one DDS or Advanced SEAL Delivery System (ASDS), embarked SEAL teams, and up to 105 Tomahawk cruise missiles in 15 tubes.
- The SSGN is designed to carry up to two ASDS and/or DDS, allowing submerged lockout and delivery of large numbers of SOF personnel. Additionally, the Navy converted two SSGN missile tubes into lockout chambers to allow submerged delivery of SOF without use of ASDS or DDS.
- The conversion includes extensive modernizations to electronics, radio, navigation, sonar, and fire control systems. It also includes an extensive payload capability for future off-board systems and weapons.

Mission

The Maritime Force Commander can employ the *Ohio* class SSGN for the following missions:

- Land attack strike mission, capable of launching Tomahawk cruise missiles
- Special operations missions, including all support and planning utilizing up to two SEAL submersible vehicles
- Traditional attack submarine missions

Prime Contractor

- General Dynamics

Activity

- DOT&E published the Combined Operational and Live Fire Test and Evaluation Report on the SSGN in May 2008.
- The Navy completed FOT&E in May 2008 to demonstrate SSGN Dual DDS capability.
- The Navy completed FOT&E in November 2008 to demonstrate special operations capability utilizing the SSGN lockout chambers.
- The first two SSGNs, USS *Ohio* and USS *Florida*, completed their initial overseas deployments in FY08.

Assessment

- In the Combined Operational and Live Fire Test and Evaluation report, DOT&E concluded that the SSGN is operationally effective for strike operations and for SOF operations when configured with either a single DDS or the ASDS. Additionally, DOT&E concluded that the SSGN is suitable for both strike and SOF operations and is survivable in the expected threat environment. Based on FOT&E results, the SSGN is also effective and suitable for SOF operations using two DDS or the SSGN lockout trunks.
- When configured with a single DDS or ASDS, the SSGN's capability to deliver SOF personnel to shore is commensurate with that of existing nuclear attack submarines (SSNs) in the same configuration. When configured with two DDS, the SSGN provides greater SOF delivery capability than an SSN. The SSGN lockout chambers also provide SOF delivery capability without use of a DDS or ASDS.
- In all configurations, the SSGN provides a significantly improved onboard environment for SOF operations, including better command, control, and communications as well as better equipment storage, berthing, and exercise facilities.
- The currently-deployed SSGNs are limited in their ability to utilize installed lockout chambers to deliver SOF because they lack oxygen recompression capability in case of a diver

accident. U.S. Special Operations Command (USSOCOM) will not certify the lockout chambers without this capability. The Navy intends to test this capability on USS *Michigan* in late 2008 or early 2009 and complete installation on remaining SSGNs during scheduled maintenance periods.

- The existing inventory of six DDS may be inadequate to support all four SSGNs and DDS-capable SSNs over the long term.
- Despite at least two attempts, the Navy has been unable to complete the testing required to certify the SSGN to launch Tomahawk missions that do not utilize GPS. This testing is intended to confirm that the SSGN systems can accurately transfer precise navigational data to the missile prior to launch.
- The Navy achieved their goal of maintaining the original ballistic missile submarine (SSBN) level of survivability by completing conversion to SSGN without introducing any new survivability deficiencies. However, SSGN missions require the submarine to operate closer to shore and assume a more detectable communications posture. As a result, the SSGN is more susceptible to detection than a typical SSBN.
- The Navy can enhance SSGN capability by modifying the SSGN High Data Rate (HDR) antenna in order to achieve the same antenna height as the HDR on *Ohio* class SSBNs. The shorter SSGN HDR antenna forces the SSGN to operate at a shallower depth while communicating. This makes control of the SSGN more difficult and results in greater periscope exposure, increasing the submarine's susceptibility to detection. The Navy expects to complete design of an appropriate modification by June 2009, but has not identified funding for procurement and installation.
- The Navy agreed to conduct Information Assurance (IA) network penetration testing of SSGN systems, but intends to evaluate the results from testing of similar systems installed on *Virginia* class attack SSNs prior to scheduling the testing on an SSGN. Previous IA test results indicate that the SSGN may be at high risk of network penetration.

Recommendations

- Status of Previous Recommendations. The Navy and USSOCOM have not yet taken effective action on two of the three FY07 recommendations. The recommendations concerning HDR antenna height and DDS inventory remain valid.
- FY08 Recommendations. The Navy should:
  1. Perform "Red Team" network penetration testing of SSGN systems as soon as practicable to fully evaluate the ship's vulnerability to network attack.
  2. Reassess SSGN tactical guidance for mine avoidance and use the Advanced Mine Simulation System to quantify the SSGN's specific susceptibility to bottom mines.
  3. Consider development of alternate strike tactics that will reduce the SSGN vulnerability during strikes conducted in adverse ASW environments.
  4. Complete certification of the SSGN for Tomahawk missions that do not utilize GPS.

SSN 774 *Virginia* Class Submarine

Executive Summary

- DOT&E submitted a classified Early Fielding Report in April 2008 when the Navy deployed the USS *Hawaii* before completing the IOT&E.
- The *Virginia* program started IOT&E in November 2007 per a DOT&E-approved test plan. IOT&E will continue through 1QFY09 to support a planned milestone and full-rate production decision in 3QFY09.
- IOT&E conduct, data distribution, and analysis has been hindered by the Navy's special security rules for *Virginia* acoustic and electro-magnetic signatures.
- Navy security rules restrict evaluation of *Virginia* operations near Anti-Submarine Warfare (ASW)-capable ships. As a result, the *Virginia* will complete IOT&E without resolving performance against a primary threat of record.
- *Virginia* class performance is dependent on the performance of separately managed sub-systems that are integrated into *Virginia's* Non-Propulsion Electronics Systems. Versions of many of these systems are used on *Los Angeles* class submarines.

System

The *Virginia* class submarine is the replacement for the aging fleet of *Los Angeles* class submarines. The *Virginia* class:

- Is capable of targeting, controlling, and launching Mk 48 Advanced Capability torpedoes, Tomahawk cruise missiles, and future mines
- Has sonar capability similar to the *Seawolf* submarine class with improvements to the electronic support suite and combat control systems
- Has a new design propulsion plant incorporating proven components from previous submarine classes
- Utilizes a modular design and significant commercial off-the-shelf computer technologies and hardware that allow for rapid and cost-effective technology refresh cycles

Mission

The Maritime Mission Commander will employ the *Virginia* class submarine to enable open-ocean and littoral covert operations in support of the following submarine mission areas:

- Strike warfare
- Anti-submarine warfare (ASW)
- Intelligence, surveillance, and reconnaissance (ISR); indications and warnings (I&W); and Electronic Warfare (EW)
- Anti-surface ship warfare (SUW)
- Special Operations Force (SOF) warfare
- Mine warfare
- Battle Group Operations

Prime Contractors

- General Dynamics
- Northrop Grumman

Activity

- DOT&E submitted a classified Early Fielding Report on the *Virginia* class submarine in April 2008, when the Navy used USS *Hawaii* for forward-deployed operations before completing the IOT&E. USS *Hawaii* is the third ship of the *Virginia* class and has not completed her Post Shipyard Modernization availability.
- DOT&E approved the *Virginia* Test and Evaluation Master Plan (TEMP), Revision E, Change 1 on April 10, 2008, based on Navy changes to the Operational Requirements Documents.
- DOT&E approved the IOT&E test plan in October 2007 and revisions in 2008 to support changes in Navy test planning and available test assets. The Navy started IOT&E in November 2007 to evaluate *Virginia's* performance in each of the seven mission areas. Test events include:
  - Demonstration of operations of the *Virginia* Lock-Out-Trunk by SOF in November 2007
  - ASW search and attack operational testing against a nuclear submarine target in April and June 2008
  - ASW attack and torpedo employment against a nuclear submarine at the Atlantic Undersea Test and Evaluation Center (AUTEC) range in June 2008

- SUW attack and torpedo employment against surface ships at the AUTEC range in June 2008
- Covert SOF warfare using the *Virginia's* Lock-Out-Trunk in July 2008
- Strike Warfare, including the launch of three Tomahawk cruise missiles, at the Eglin AFB, Florida, range in August 2008
- Mine avoidance and susceptibility operational testing in August 2008
- ASW search and attack testing and survivability testing in the Gulf of Maine operating areas in September 2008
- Information Assurance (IA) testing in May, July, and October 2008
- Battle Group Support Operations and ISR operational testing events in August and October 2008

- Additional operational testing is planned in October through January 2009 to make up for incomplete, cancelled (due to weather), and inadequate test events.
- The Navy conducted a ship and crew certification and a Technical Evaluation for each mission area before each phase of operational test.
- The Navy started TEMP Revision F development to support the:
  - Full-rate decision milestone
  - Future modernization of the *Virginia* submarine due to the incorporation of spiral development mission systems in the *Virginia*'s Non-Propulsion Electronics Systems (NPES)
  - Significant design changes planned for the third block of submarines
  - Operational testing not completed in IOT&E
- The Navy completed all live fire testing on the *Virginia* with the exception of component shock qualification testing. The Navy plans to complete component shock qualification testing in FY09.

Assessment

- Since the Navy does not operate diesel-electric submarines (SSK), Navy testers have relied on allied SSKs to act as surrogates for tests requiring an SSK threat of record. However, Navy security rules for the *Virginia* prevent realistic ASW testing using allied SSKs. As a result, the *Virginia* class submarine will complete IOT&E without resolving performance against a primary threat of record. The security rules also restrict *Virginia* submarine operations in the vicinity of allied ASW capable warships.
- The Navy rescheduled several IOT&E events due to test ship material problems, bad weather in the planned test area, or to obtain adequate test target surrogates and test assets. In addition, the Navy has invoked special security rules for all test data containing *Virginia* signature related information that significantly delays the transport, reconstruction, and analysis of test data. These factors have delayed IOT&E completion, will delay test analysis and reporting, and could postpone the milestone.
- *Virginia*'s mission performance is highly dependent on smaller acquisition programs that make up the *Virginia* NPES. The Acoustic Rapid Commercial Off-the-Shelf Insertion for Sonar (A-RCI) BQQ-10 sonar, the TB-29 series towed array, and the Mk 48 Advanced Capability (ADCAP) torpedo have been noted in previous assessments to likely result in below-threshold performance in some mission areas. For example, the TB-29 series arrays are unreliable and the Navy has instituted significant submarine operational limitations, when the array is deployed, to prevent array failure. These limitations during IOT&E could prevent evaluation of or the meeting of some performance thresholds. Other programs such as the Photonics Mast (replacement for the periscope), the Light Weight Wide Aperture Array sonar, the open loop degaussing circuit (Circuit D), and the Chin high-frequency sonar appear to have added new capabilities that could improve performance in some mission areas. These new systems and the design improvements incorporated into the *Virginia* class hull, mechanical, electrical, and electronic ship systems appear from initial test results to improve mission performance above that of the *Los Angeles* class.
- *Virginia* is the first submarine to undergo IA operational testing during the IOT&E. This testing is especially critical for the *Virginia* because the NPES integrates all mission systems on an integrated fiber optic network. IA testing has been difficult because of fleet operator concerns regarding potential damage to the systems during test and the need for recertification of the systems following test. These concerns have resulted in portions of the network being placed off-limits to testers. Navy testers are developing procedures and policies for test to ensure systems are returned to the pre-test baseline condition. Testers are evaluating the IA test practices and results.
- Due to the multi-mission capability of the *Virginia* submarine, the Navy conducted the IOT&E during several mission focused test events. Because of the high demand on fleet assets and in order to obtain the necessary test assets and targets for the IOT&E, testers followed the Navy's proposal to conduct testing in conjunction with fleet training. *Virginia*'s initial IOT&E test plan utilized the Navy's Composite Training Unit Exercise (COMPTUEX) with the USS *Theodore Roosevelt* Carrier Strike Group as the event to support most mission area evaluations. Unfortunately, *Virginia* experienced material problems that required the ship to return to port. By the time the repairs were completed, the COMPTUEX had completed. As a result, the *Virginia* test plan was substantially rewritten to expand current test events and to take advantage of other fleet training. Although an appropriate combination of testing and training appears to be the efficient use of fleet assets, significant advance coordination and planning with the fleet trainers is necessary to ensure an adequate event is conducted that will meet the needs of both the trainers and the testers.
- The Portable Underwater Tracking System (PUTS) developed for the *Virginia* minefield IOT&E provided an economical, reliable, and accurate method of tracking and analyzing the test ship's position in real time while submerged. PUTS was essential in convincing operators to conduct the in-stratum portions of the minefield testing and in the analysis of test data.

Also, since PUTS is portable, the Navy conducted operational testing in a representative environment.

Recommendations

- Status of Previous Recommendations. The Navy addressed three of the four previous recommendations. The FY06 recommendation for the Navy to invest in a capability to conduct realistic shallow-water and littoral testing and training remains valid.
- FY08 Recommendations. The Navy should:
  1. Propose and resource an appropriate surrogate and adequate test strategy to resolve performance against the SSK threat of record.
  2. Establish procedures where *Virginia* submarines can operate with and train for both their peacetime and wartime missions with our allies.
  3. Define clear rules for what *Virginia* data requires special classification and handling.

Surface Electronic Warfare Improvement Program (SEWIP)

Executive Summary
- The AN/SLQ-32 Electronic Warfare System (EWS), equipped with the Surface Electronic Warfare Improvement Program (SEWIP) Block 1B2 upgrade, shows improvement in the primary areas of situational awareness and human systems integration.
- Preparations for a full-rate production decision for the SEWIP Block 1B2 increment continue with DOT&E participation.

System
- The SEWIP is an incremental development program that is intended to improve the electronic warfare capability of the Navy's AN/SLQ-32 EWS, variants of which are installed on all Navy surface combatants.
- The first increment (Block 1A) consists of an improved operator console and replacement of obsolete digital processors and tracking modules.
- The second increment (Block 1B) consists of modifications to improve emitter identification, situational awareness, human systems integration, and crew training.

Mission
The Navy surface ships will use SEWIP to enhance their AN/SLQ-32 EWS anti-ship missile defense, counter-targeting, counter-surveillance, and electronic data collection capabilities.

Prime Contractor
- General Dynamics

Activity
- Commander, Operational Test and Evaluation Force (COTF) conducted operational testing of the AN/SLQ-32 EWS with the SEWIP Block 1B2 upgrade in March 2008 and August 2008. Testing was conducted in accordance with a DOT&E-approved test plan. COTF conducted the OT&E onboard USS *Nitze* (DDG 94) in the Virginia Capes operating area and included operationally-representative activities and scenarios using representative Navy enlisted operators.
- DOT&E issued an Operational Test and Evaluation (OT&E) report for the SEWIP Block 1B2 in October 2008.
- Preparations for a full-rate production decision for the Block 1B2 increment of SEWIP continue with DOT&E participation.

Assessment
- The AN/SLQ-32 EWS, equipped with the SEWIP Block 1B2 upgrade, shows improvement in the primary areas of situational awareness and human systems integration.
- A required SEWIP Block 1B2 interface between the Global Command and Control System-Maritime (GCCS-M) system and the AN/SLQ-32 Improved Control and Display (ICAD) operator's console was not developed in time for use with the OT&E test ship's GCCS-M configuration. This prevented the AN/SLQ-32 operator from automatic consideration of GCCS-M data in determining situational awareness. A full evaluation of SEWIP Block 1B2 situational awareness cannot be conducted until this interface is available.
- The test duration was not sufficient to demonstrate with a high degree of confidence that the hardware or software reliability thresholds were attained.
- The October 2008 DOT&E OT&E report states the SEWIP Block 1B2 upgrade does not make the AN/SLQ-32 EWS operationally effective or suitable. However, it does significantly enhance its ability to protect Navy ships by improving situational awareness and human systems integration in addition to laying a good foundation for future upgrades. COTF will conduct an operational evaluation of the full AN/SLQ-32 EWS in conjunction with the SEWIP

Block 2 upgrade that is planned to include improvements to the antenna/receiver system.

Recommendations

- Status of Previous Recommendations. The Navy has not resolved any of the five FY06 recommendations. These recommendations remain valid.
- FY08 Recommendations. The Navy should:
  1. Continue to collect in-service SEWIP Block 1B2 hardware and software reliability data to gain a higher degree of confidence regarding achievement of those requirements.
  2. Provide the required SEWIP Block 1B2 interface between the GCCS-M system and the AN/SLQ-32 ICAD operator's console. Verify this interface during FOT&E testing.

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

Executive Summary

- The *Lewis & Clark* class of dry cargo ships (T-AKE) is operationally effective in conducting its primary mission under peacetime, benign conditions.
- T-AKE is operationally suitable.
- The Navy conducted FOT&E Part 1 during FY08. Testing included the following events:
  - Successful at-sea testing of the acoustic deception device (NIXIE)
  - Successful collection of reliability, maintainability, and availability data
  - Initial testing of Information Assurance (IA); a second test is scheduled to complete 2QFY09 after a proven Intrusion Detection System is installed
- FOT&E Part 2 is scheduled for FY09. Part 2 will include testing of the Advanced Degaussing System using the Advanced Mine Simulation System, and an assessment of the Shipboard Warehouse Management System.
- Testing of the Advanced Degaussing System is delayed until completion of the magnetic silencing facility upgrades in Norfolk, Virginia, and San Diego, California.

System

T-AKE *Lewis & Clark* is a class of non-combatant ships designed to carry dry cargo, ammunition, and fuel (in limited amounts) for naval combat forces at sea. Eleven ships are planned for the Combat Logistics Force, and options for three additional ships for the Maritime Prepositioning Force (Future) have been negotiated. The T-AKE is:

- Constructed to commercial standards (American Bureau of Shipping) with some additional features to increase its survivability in hostile environments
- Operated by civilian mariners from the Military Sealift Command and a small Navy military detachment
- Propelled with a single shaft and propeller; driven by electric motors powered by diesel generators
- Designed to employ a computerized cargo inventory management system for both ordnance and non-ordnance cargo

Mission

The Maritime Component Commander is employing the T-AKE *Lewis & Clark* class of ships to:

- Re-supply other ships while connected underway using Standard Tensioned Replenishment Alongside Method rigs and embarked helicopters
- Move cargo and ammunition between a port and a larger consolidating replenishment ship, which stays with the Carrier/Expeditionary Strike Group
- Be part of the hybrid combination of ships of the Maritime Prepositioning Force (Future)

Prime Contractor

- General Dynamics

Activity

The Navy conducted FOT&E Part 1 in accordance with the DOT&E-approved Test and Evaluation Master Plan (TEMP) and test plan during FY08 and included the following test events:

- At-sea testing of the acoustic deception torpedo countermeasure system AN/SLQ-25A (NIXIE)
- IA that had been omitted during the IOT&E
- Collection of reliability, maintainability, and availability data during the deployments of T-AKE 1 and T-AKE 2

Assessment

- The Navy completed IOT&E on T-AKE in February 2007 and found it operationally effective in conducting its primary mission under peacetime, benign conditions. However, performance in a hostile environment and the ability to withstand attempted intrusion into platform information technology systems was undetermined.
- T-AKE is operationally suitable, and correction of deficiencies is being accomplished.

- Follow-on IA testing on T-AKE 3 revealed that the ship was unable to detect network penetration by surrogate intruders. The ability to detect is a prerequisite to reaction and restoration of information technology network systems. IA testing is therefore considered incomplete until conducted with an installed Intrusion Detection System.
- The Navy is in the process of upgrading their infrastructure to conduct full testing and calibration of the Advanced Degaussing System. This system is intended to reduce the ship's magnetic signature and susceptibility to mines, but will not be available until FY09.
- T-AKE is in receipt of all detailed design and vulnerability assessment documentation required for LFT&E. The ship has limited survivability attributes, and at-sea risks can be mitigated with a combatant escort in hostile environments.

Recommendations

- Status of Previous Recommendations. The Navy still needs to address one of the two FY06 recommendations and three of the six FY07 recommendations.
- FY08 Recommendation.
  1. The Navy should install a proven Intrusion Detection System prior to re-evaluating IA controls.

Tomahawk Missile and Weapon System

Executive Summary

- The Navy continues to conduct Operational Test Launches to verify reliability and performance of fielded Baseline II, III, and IV Tomahawk missiles; their associated weapon control systems; and the Tomahawk Command and Control System (TC2S). DOT&E considers the planned Operational Test Launch program to be adequate for continued verification of system reliability and accuracy.
- Based on FY08 test flights, the Tomahawk Weapon System continues to meet Navy standards for reliability and performance.
- The Navy conducted FOT&E from September to October 2008 to evaluate upgrades to the TC2S, corrective action for deficiencies identified during earlier operational testing, and the ability to conduct Tomahawk strikes at the SECRET classification level. Commander, Operational Test and Evaluation Force (COTF) expects to publish test results in early 2009.

System

- The Tomahawk Land Attack Missile is a long-range, land attack cruise missile designed for launch from submarines and surface ships.
- Tomahawk Baselines II and III completed production. There are currently three fielded variants, delivering a nuclear warhead (Baseline II only, not deployed), a conventional warhead, or a conventional warhead with submunitions.
- Tactical Tomahawk (Baseline IV) is currently in production as the follow-on to the Baseline III conventional warhead variant. These missiles are produced at lower cost and provide added capability, including the ability to communicate with and retarget the missile during flight.
- The Tomahawk Weapons System also includes the TC2S and the shipboard Tomahawk Weapon Control Systems (TWCS). The TC2S provides for targeting, mission planning, distribution of Tomahawk tactical data, and in-flight control of Baseline IV missiles.

Mission

The Maritime Force Commander can employ the Tomahawk missile for long-range, precision strikes against land targets.

Prime Contractor

- Raytheon

Activity

- The Navy continues to conduct Operational Test Launches to verify reliability and performance of fielded Baseline II, III, and IV Tomahawk missiles; their associated weapon control systems; and the TC2S. The Navy conducted a total of 11 Tomahawk missile test launches during FY08.
- The Navy utilized the Tomahawk flight test program to identify and correct a Baseline IV missile design problem that had the potential to reduce missile reliability.
- DOT&E approved a Test and Evaluation Master Plan revision and a test plan in August 2008 to support the next phase (OT-IIIE) of Tomahawk Weapon System FOT&E.
- COTF conducted OT-IIIE from September to October 2008. OT-IIIE evaluated upgrades to the TC2S, as well as corrective action for deficiencies identified during previous operational testing. Additionally, OT-IIIE evaluated the ability to conduct Tomahawk strike operations at the SECRET classification level, vice the TOP SECRET level used for all previous Tomahawk operations.

Assessment

- Based on FY08 test flights, the Tomahawk Weapon System continues to meet Navy standards for reliability and performance.
- DOT&E considers the current Operational Test Launch program for all Tomahawk missile variants to be adequate for continued verification of system reliability and accuracy. However, the Navy has not funded Baseline II and Baseline III test launches after FY12. The Baseline III missiles are expected to remain in operational use until 2020. DOT&E places high value on the continuing collection of flight data to evaluate end-to-end system performance and reliability for all deployed and deployable Tomahawk missile variants.
- COTF expects to publish the OT-IIIE report in early 2009.

Recommendations

- Status of Previous Recommendations. The one FY07 recommendation remains valid.
- FY08 Recommendations. None

VH-71 Presidential Helicopter Fleet Replacement Program

Executive Summary
- The VH-71 replaces existing presidential support helicopters.
- Increment 1 provides four test articles and five production aircraft with reduced capability in the near term.
- Increment 2 provides two new test articles and 23 production aircraft that vary significantly from Increment 1 aircraft.
- The program remains schedule-driven vice event-based.
- The Navy initiated Increment 1 live fire testing.

System
- The VH-71 aircraft replaces the current Marine Corps fleet of 11 VH-3D and eight VH-60N Helicopters flown by Marine Helicopter Squadron One to perform the presidential lift mission.
- The VH-71 is a dual-piloted, multi-engine helicopter based on the AugustaWestland EH-101 (pictured).
- The Navy intends the VH-71 to be capable of operating worldwide in day, night, or adverse weather conditions.
- The communications system will provide the ability to simultaneously conduct short- and long-range secure and non-secure voice, data, and video communications. It can also exchange situational awareness information with outside agencies, organizations, and supporting aircraft.
- Procurement of Increment 1 aircraft will include four test articles and five pilot production (low-rate initial production) aircraft.
- Procurement of Increment 2 aircraft will include 10 low-rate initial production aircraft and eight full-rate production aircraft. If it proves impractical to retrofit the five pilot production aircraft, five more production aircraft will be added at the end of Increment 2 production.

Mission
- Marine Helicopter Squadron One, using the VH-71 aircraft, will provide safe and timely transport of the President of the United States and other parties as directed by the White House Military Office.
- The VH-71 is required to operate from commercial airports, military airfields, Navy ships, and austere sites throughout the world.

Prime Contractors
- AgustaWestland
- Lockheed Martin

Activity
- The DoD is working to restructure the VH-71 program. DOT&E has not approved the Test and Evaluation Master Plan (TEMP) for the restructured program.
- All test vehicles are in the United States; two are undergoing modification, and two are in flight test.
- The integrated test and evaluation program has begun.
- The Navy continues Increment 1 live fire testing in accordance with the approved strategy.
- The Integrated Test Team, including operational test personnel from Marine Helicopter Squadron One, continues to refine and merge developmental and operational test plans.

Assessment
- The LFT&E is progressing as planned.
- The Increment 2, Milestone C decision is essentially a full-rate production decision as most Increment 2 aircraft will be on contract before completion of IOT&E. This is not a "fly-before-buy" strategy.
- Significant differences between Increment 1 and Increment 2 aircraft increase the amount of required testing for Increment 2.
- The current Increment 1 design is being adjusted to control weight. The helicopters at current estimated weight will just meet required range and airspeed.

Recommendations

- Status of Previous Recommendations. The program has made little progress addressing the previous recommendations. Three of the four previous recommendations remain valid and merit additional emphasis.
- FY08 Recommendation.
  1. Reinstitute T&E working group to plan revised T&E program.

Air Force Programs

Air Force Programs

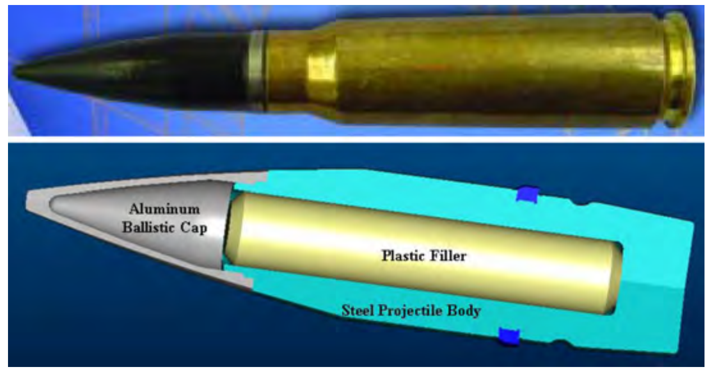
20 mm PGU-28/B Replacement Combat Round

Executive Summary

- The Air Force-conducted LFT&E Lethality program in FY07 demonstrated that the Penetrator with Enhanced Lateral Effect (PELE) 20 mm replacement combat round had significant lethality against a broad range of targets.
- Late in FY07, the Air Force's 53rd Wing completed a Force Development Evaluation (FDE) that demonstrated the PELE had acceptable weapons effects against ground and air targets.
- However, the final FDE report from the 53rd Wing stated that the PELE was not suitable due to ballistic differences between the PELE and the legacy PGU-27 that would require Aircraft Operational Flight Program adjustments and because of excessive barrel wear and an unacceptably high rate of nose cone damage.
- The Air Force is currently investigating the suitability issues and has allocated funding to modify the PELE rounds.
- The Air Force will conduct follow-on testing to assess the effectiveness and suitability of the modified PELE and the results of that testing will determine further actions.

System

- The PGU-28/B Replacement Combat Round program is intended to restore combat capability to tactical aircraft following PGU-28/B removal from service due to safety issues.
- Alliant-Techsystems (ATK) and Diehl Munitionssysteme of Germany, in a cooperative effort, developed the 20 mm PGU 28/B replacement cartridge by integrating the PELE projectile with an ATK 20 mm cartridge case.
- The PELE does not use explosives or a fuzing mechanism. Rather, it is a kinetic energy projectile that converts forward momentum into lateral fragmentation and penetration.



- The projectile case is steel, whereas the inner core is plastic. Target impact causes the plastic filler to expand in diameter with very high pressure. The rapid expansion of the plastic filler ruptures the steel case, achieving fragmentation with lateral velocities of about 300 meters per second.
- The Air Force intends the PELE cartridge to be compatible with F-15, F-16, and F-22 aircraft.

Mission

Fighter aircraft pilots will use the PELE cartridge to produce mission kills against enemy fighter and light civilian aircraft, produce mobility kills against light utility vehicles, and to inflict personnel casualties.

Prime Contractor

- Alliant-Techsystems

Activity

- The Air Combat Command (ACC) released their final report on the PELE in January 2008. That report contained both lethality and operational test and evaluation results and assessments.
- The ACC assessed the PELE as lethal and effective, but not currently suitable. As a result, the Air Force Logistics Command began an evaluation of whether to pursue procurement of an alternative combat round. Current PELE Foreign Comparative Test activities are in progress to address suitability and the results will determine further actions.

Assessment

While the PELE exhibited significant lethality, the ACC recommended and DOT&E agrees the suitability issues currently warrant a no-fielding decision.

Recommendations

- Status of Previous Recommendations. There were no previous recommendations.
- FY08 Recommendations.
  1. The Air Force, while pursuing PELE modifications to address suitability, must remain cognizant of any effect those changes may have on the underlying lethality of the projectile.
  2. The Air Force must conduct additional ballistic testing to confirm that there is no change in lethality as a result of the modifications to the round.

Advanced Extremely High Frequency (AEHF) Satellite Communications System

Executive Summary

- Test planning activities continue for the upcoming Operational Utility Evaluation (OUE) in the fall of 2009. The OUE will focus on the Mission Control Segment, which will be fielded to assume control of the Military Strategic, Tactical, and Relay (Milstar) constellation prior to launch of the first Advanced Extremely High Frequency (AEHF) satellite.
- Recent schedule slips of the space vehicles have allowed the Navy and Air Force terminal programs to substantially reduce the degree to which their programs lag the satellite program.
- The operational test agencies have been actively planning for operationally relevant testing of anti-jam capabilities.

System

- AEHF represents the third generation of Extremely High Frequency Satellite Communications capability protected from nuclear effects and jamming activities.
- The AEHF system will follow the Milstar program as the protected backbone of the DoD's integrated military satellite communications architecture. The AEHF is expected to increase system throughput capacity by a factor of 10.
- The overall AEHF system has three segments:
  - Space segment: The space segment comprises an integrated constellation of Milstar and AEHF satellites.
  - Mission Control segment: The control segment includes fixed and mobile telemetry, tracking, and commanding sites; fixed and transportable communication planning elements; and the common user interface with the Space Ground-Link Subsystem and the Unified S-Band capability.
  - Terminal (or User) segment: The terminal segment includes ground-fixed, ground-mobile, man-portable, transportable, airborne, submarine, and shipboard configurations.

- The first AEHF satellite will have the capabilities of a Milstar II satellite at launch, but the software will be upgraded to full AEHF capability after the launch of the second satellite, which will be launched as a fully capable AEHF satellite.
- The Defense Acquisition Board authorized fabrication and assembly of the first three satellites and development of the Control and User segments. The exact number of satellites in the AEHF constellation is yet to be determined.

Mission

Combatant commanders and operational forces worldwide intend to use the AEHF system to provide secure, responsive, and survivable space-based, strategic, and tactical military communications.

Prime Contractor

- Lockheed Martin

Activity

- Government integrated testing successfully demonstrated extended data rate (XDR) communications between the payload simulator and XDR-capable Army terminals. Testing demonstrated compatibility between terminals and payload in both XDR mode and in backward compatible modes.
- Test planning activities continue for the upcoming OUE in the fall of 2009. The OUE will focus on the Mission Control Segment, which will be fielded to assume control of the Milstar constellation prior to launch of the first AEHF satellite.
- An extensive rewrite of the Test and Evaluation Master Plan (TEMP) is nearing completion. This update accommodates substantial program changes since the original TEMP in 2001 and incorporates additional pre-launch operational test opportunities.
- In response to interference between the XDR and low data rate (LDR) waveforms, future Army and Navy terminals will be modified to correct the interference. However, current Army and Navy terminals will accept the degradation and will not be compatible with the XDR waveform.
- The Air Force did not have adequate test resources to evaluate AEHF capabilities in a threat environment; therefore, OSD funded a jamming simulator for the Air Force through the Resource Enhancement Program. The Air Force Operational

Test and Evaluation Center has identified the need for additional test tools to assess AEHF performance in a scintillated high demand/low capacity environment.
- The AEHF program is currently undergoing Nunn-McCurdy certification following a breach based on Average Per Unit Cost.

Assessment

- The test community is making solid progress in planning the upcoming operational test of the Mission Control Segment and long-range planning for the Multi-Service Operational Test and Evaluation. The Air Force has made significant progress in pursing early test involvement. Good cooperation exists between the developmental and operational test communities.
- Developmental testing has been extremely thorough. Although many of the problems identified have led to significant schedule slips, the developmental testing has effectively identified the issues prior to launch.
- Recent schedule slips of the space vehicles have allowed the Navy and Air Force terminal programs to substantially reduce the degree to which their programs lag the satellite program.
- The operational test agencies have been actively planning for operationally relevant testing of anti-jam capabilities.

Recommendations

- Status of Previous Recommendations. The Air Force has made satisfactory progress on all but one of the previous recommendations.
- FY08 Recommendation.
  1. The operational test organizations should continue their early involvement in upcoming test events while maintaining a well-defined, dedicated phase of OT&E.

ALR-69A Radar Warning Receiver (RWR)

Executive Summary

- DOT&E concurred with the Air Force Operational Test and Evaluation Center (AFOTEC) FY07 Operational Assessment (OA-1) that the ALR-69A did not demonstrate potential for operational effectiveness and suitability. However, an Acquisition Decision Memorandum (ADM) dated June 20, 2007, established the second OA-2 entry gates and allowed the ALR-69A program to enter the first phase of low-rate initial production (LRIP) (10 units).
- The Air Force, in coordination with DOT&E, added a series of additional tests in FY08 to augment the original operational assessment and provide more credible information on ALR-69A maturity prior to the second LRIP decision currently scheduled for 1QFY09.
- Since OA-1, the Air Force incorporated several key re-designs to ALR-69A software, hardware, and aircraft integration efforts.
- FY08 OA-2 testing is in progress and is demonstrating improved performance over OA-1.

System

- The ALR-69 is a Radar Warning Receiver (RWR) that detects, identifies, and locates threat electronic signals.
- The Core ALR-69A RWR design improves performance over the Air Force's primary RWR system, the ALR-69, by enhancing:
  - Detection range and time
  - Accuracy of threat identification
  - Location of threat emitter systems
  - Performance in a dense signal environment
  - Reliability and maintainability
- The system integrates with transport and fighter aircraft. The lead platform is the C-130H, with other platforms to be added at a later date.
- Core ALR-69A RWR components include:
  - Radar Receivers (previously the digital quadrant receivers)
  - Countermeasures Signal Processor (previously the countermeasures computer)
  - Control indicator
  - Azimuth indicator
- The Air Force incorporated spiral developments, which are incremental improvements to the core system, to provide the most significant new ALR-69A capabilities. These ALR-69A spiral designs improve the Core ALR-69A's threat locating capabilities, which enable the following:
  - Spiral 1: Accurate threat-locating capability by single aircraft
  - Spiral 2: Location of threat emitters through a multi-aircraft network, accurate enough for destruction with GPS-guided munitions
  - Spiral 3: Specific Emitter Identification — currently RWRs classify threats as general threat systems, but the Specific Emitter Identification is designed to "fingerprint" a specific threat
- Spiral 1 is temporarily unfunded and development is on hold. Spiral 2 is part of the program of record, is being assessed as an advanced concept technology demonstration effort, and should complete in September 2008. Spiral 3 is unfunded.

Mission

- Combatant commanders will use ALR-69A to enhance the survivability of transport, fighter, and special operations aircraft on missions that penetrate hostile areas.
- Commanders use the ALR-69A to provide aircraft self protection by warning pilots of radar threats, supporting threat avoidance, or permitting timely use of defensive countermeasures.

Prime Contractor

- Raytheon

Activity

- The Air Force entered the first phase (10 units) of ALR-69A LRIP in FY07.
- System improvements continued through FY08 during both laboratory and flight testing.
- AFOTEC, the Air Force's Operational Test Agency, completed the first Operational Assessment-1 of the ALR-69A in FY07 in support of the first LRIP decision.

- The Air Force continued to incorporate several key re-designs to ALR-69A software, hardware, and aircraft integration design throughout FY07 and FY08.
- The Air Force, in coordination with DOT&E, added a series of additional tests in FY07/08 to augment OA-1 results and provide sufficient data for assessing ALR-69A maturity prior to a FY09 LRIP decision. These additional ALR-69A tests included C-130 flight tests at Eglin AFB and Duke Field, Florida.
- The Air Force designated Air Mobility Command's C-130H as the lead aircraft for ALR-69A integration.
- FY08 testing included both government and contractor testing which utilized the Electronic Warfare Avionics Integrated Support Facility, Warner Robins AFB, Georgia; the Benefield Anechoic Chamber, Edwards AFB, California; and the Multi-Spectral Test and Training Environment, Eglin AFB, Florida.
- FY08 ALR-69A testing was conducted in accordance with the DOT&E-approved Test and Evaluation Master Plan (TEMP).

Assessment

- The ALR-69A continues to show improved operation in dense and dynamic (flight test) environments; however, system maturity is less than expected at this point in the program.
- In FY08, government flights have shown the radar warning display is partially usable for crew members. The display clutter is still a problem including threat symbol split tracks, miss identifications, non-correlated threat emitters, unusable threat identification emitter audio, and incorrect age-out times.

Recommendations

- Status of Previous Recommendations. The Air Force has taken effective actions on the previous recommendation.
- FY08 Recommendation.
  1. The Air Force should ensure that ALR-69A maturity and ground testing meet the Milestone Decision Authority's entry gates for follow-on LRIPs as detailed and documented in the Acquisition Decision Memorandum and TEMP.

B-2 Radar Modernization Program (B-2 RMP)

Executive Summary

- The B-2 Radar Modernization Program (RMP) program completed developmental testing for Mode Set 1, and entered IOT&E for Mode Set 1 in November 2008. Mode Set 1 consists of conventional capabilities. Mode Set 2 incorporates nuclear capabilities. Mode Set 2 IOT&E is planned for 2009.
- The B-2 RMP program has experienced hardware and software technical challenges throughout developmental testing resulting in multiple test delays and increased schedule pressure. The Air Force assessed overall RMP performance in developmental testing as marginal with the system appearing not to perform as well as the legacy radar. The Air Force assessed that limitations and deficiencies noted in developmental testing would not prevent the B-2 from accomplishing its mission.
- The Air Force should ensure that planned test events unaccomplished in developmental testing are executed in IOT&E to fully characterize the operational performance of the RMP system, and that RMP suitability be accurately assessed in IOT&E.

System

- The B-2 is a multi-role, low-observable bomber capable of delivering conventional and nuclear munitions. It has four turbofan engines and twin side-by-side weapons bays.
- The B-2 RMP features an Active Electronically Scanned Array radar operating on a new frequency. The RMP replaces the B-2 legacy Mechanically Scanned Array radar and changes radar operating frequency to avoid conflicts with other radar frequency spectrum users. The RMP does not add additional capabilities to the B-2 radar beyond those in the legacy system.
- System avionics include a multi-mode radar, GPS-aided navigation, and a Defensive Management System for radar warning functions.
- The bomber's principal conventional weapons are the 2,000 pound and 500-pound Joint Direct Attack Munition.

Mission

- Combatant commanders use the B-2 aircraft to attack global targets during the day or at night, in all weather, in highly defended threat areas at the strategic, operational, and tactical levels of warfare.
- Commanders use the B-2 to engage high-value, heavily defended target sets including: command and control facilities, airfields, industrial complexes, logistical and air defense systems, lines of communication, and battlefield forces and equipment.

Prime Contractors

- Northrop Grumman
- Raytheon

Activity

- B-2 RMP testing was conducted in accordance with the January 2004 DOT&E-approved B-2 Capstone Test and Evaluation Master Plan (TEMP). DOT&E approved the B-2 RMP Milestone C TEMP Annex in September 2008.
- Developmental testing was ongoing throughout FY08. The Air Force temporarily suspended testing at several points throughout FY08 due to component manufacturing design changes, radar software changes, and fleet wide grounding due to an operational mishap. These factors delayed completion of planned developmental testing events.
- The Air Force Operational Test and Evaluation Center (AFOTEC) completed an operational assessment (OA) of Mode Set 1 capabilities in June 2008. The AFOTEC OA assessed that RMP performance in the weather avoidance mode tended to over-classify weather resulting in inaccurate radar return displays in the cockpit. The OA further assessed that the system was unlikely to meet reliability and maintainability requirements, although there had been improvement in these areas throughout FY08 developmental testing.

- The program completed developmental testing in August 2008, and the Air Force assessed overall RMP performance as marginal with the system appearing not to perform as well as the legacy radar. The Air Force further assessed that limitations and deficiencies noted in developmental testing would not prevent the B-2 from accomplishing its mission.
- The Air Force certified the RMP program ready for IOT&E, which began in November 2008.

Assessment

- The RMP program is largely schedule-driven due to a compulsory system fielding date. Testing delays due to design and manufacturing changes, radar software performance, and fleet-wide grounding precluded the program from completing all planned developmental testing events and missions within the available schedule.
- DOT&E concurs with the AFOTEC OA and Air Force developmental testing assessments of RMP performance. Marginal performance in developmental testing increases program risk in achieving the user's operational effectiveness, suitability, and mission capability metrics in IOT&E.
- Due to the limited number of dedicated IOT&E flight hours and the numerous changes in configuration throughout developmental testing, it may be difficult to fully characterize system suitability using IOT&E data alone. Supplemental system suitability data from developmental testing may have to be included in the evaluation to accurately characterize RMP system suitability.

Recommendations

- Status of Previous Recommendations. There are no outstanding recommendations.
- FY08 Recommendations.
  1. The Air Force should ensure that planned test events unaccomplished in developmental testing be executed in IOT&E to fully characterize the operational performance of the RMP system.
  2. The Air Force should ensure that RMP system suitability be accurately assessed in IOT&E and throughout subsequent Mode Set 2 FOT&E.

Battle Control System – Fixed (BCS-F)

Executive Summary

- The Battle Control System - Fixed (BCS-F) Spirals 1 and 2 have satisfied many BCS-F requirements. Spiral 3 will transition to a Linux system and increase capability.
- The Air Force tested and fielded interim software builds to correct deficiencies within Spiral 2 in an Increment 2.2 software release.

System

- BCS-F is a tactical air battle management command and control system.
- The North American Aerospace Defense Command (NORAD) intends for BCS-F to replace the legacy AN/FYQ-93 and NORAD Contingency Suite. The DoD put the NORAD Contingency Suite system in place after 9-11 to help with the increased operator workload. However, BCS-F (the system of record) provides the mainland U.S. air defense sectors and Hawaii and Alaska regional air operation centers with common commercial off-the-shelf hardware and an open architecture software configuration.
  - Spirals 1 and 2, developed through September 2008, have satisfied many of the BCS-F requirements. These spirals relied upon a 9-11 contingency system to do much of the over land analysis.
  - Spiral 3 will transition to a Linux operating system and use the Raytheon-Solipsys Tactical Display Framework. This spiral will eliminate the need for the contingency system. Additionally, this spiral will share much of the software used on a similar ground-based system, BCS-Mobile.
- Each BCS-F system requires some customization due to the different interfaces required at each of the sites.
- BCS-F is a binational program with Canada.
- The DoD established the National Capital Region Integrated Air Defense System (NCR IADS) after 9-11 to coordinate air defense of the NCR. In addition to the civilian aviation system, it added Sentinel radars and optical/infrared sensors for detection and identification of air traffic. The NCR IADS includes both pedestal-mounted Stingers and ground-based Advanced Medium-Range Air-to-Air Missiles for defense.

Mission

- NORAD forces and Homeland Defense forces use BCS-F to monitor and control U.S. and Canadian airspace.
- Forces use the BCS-F to monitor air traffic in and approaching U.S. airspace, and to pass information regarding air traffic onto air defense and national command authorities.
- The Air Force uses the BCS-F to control air defense assets, including fighters, to intercept and identify potential air threats to U.S. airspace.
- The DoD charged the NCR IADS with defending the NCR from air threats.

Prime Contractor

- Thales-Raytheon

Activity

- The Air Force tested and fielded two interim software builds to correct deficiencies in the Increment 2.2 software release.
- The Air Force began developmental testing of Spiral 3, Increment 3.1.
- The Air Force is finalizing the Increment 3.1 Test and Evaluation Master Plan (TEMP).

Assessment

- The Increment 2.3 and 2.4 releases corrected the deficiencies they targeted.
- Increment 2.3 corrected 45 deficiencies in the BCS-F tracking functions identified by operators at the air defense sectors and regional air operations sectors.
- Increment 2.4 improved BCS-F's automatic tracking capabilities in circumstances with very large numbers of tracks and sensors during complex tracking circumstances (greater than 15,000 track families).
- The first phase of developmental testing on Increment 3.1 uncovered a large number of problems that the program is working to correct prior to the start of the second phase of

developmental testing. This resulted in the Program Office delaying interoperability certification testing.

- The program tested with models and simulations that the Operational Test Agency had not verified and validated. Until the Program Office validates and verifies the models, test agencies cannot accredit the models used in testing or provide informed assessments.
- The program is suffering from the accumulation of additional warfighter requirements. Although the system meets many of the requirements in the approved Operational Requirements Document (ORD), users have used the deficiency reporting and review process to create new requirements, effectively increasing thresholds for some requirements. This is happening in part because the ORD no longer reflects the user's actual requirements.
- The program must conduct some developmental testing at the operational sites due to limitations of its test-bed, the BCS-F System Support Facility, and lack of test personnel.

Recommendations

- Status of Previous Recommendations. The Air Force is making progress on all but one of the two previous recommendations from FY07.
- FY08 Recommendations. The Air Force should:
  1. Verify and validate all models and simulations used prior to IOT&E, so that the Operational Test Agency can accredit and use modeling data for operational assessments.
  2. Update the ORD to reflect the system's current requirements.
  3. Upgrade the BCS-F System Support Facility to minimize the impact of developmental testing on operational sites.

C-5 Avionics Modernization Program (AMP) and Reliability Enhancement and Re-engining Program (RERP)

Executive Summary

- The C-5 Reliability Enhancement and Re-engining Program (RERP) will likely improve overall effectiveness of the modernized aircraft, but mission capability improvements require further assessment.
- C-5 Avionics Modernization Program (AMP) software upgrades address some of the deficiencies identified in previous operational testing, and may improve situational awareness and integrated diagnostic functionality.
- An adequately funded C-5 enterprise-wide Acquisition Strategy, fleet integration roadmap, and modernization Test and Evaluation Master Plan (TEMP) are needed to clearly define the planned and programmed modernization effort.
- Ballistic testing on a production-representative C-5 RERP pylon demonstrated that threat impacts to fuel and hydraulic lines can produce sustained fires.

System

- The C-5 is the largest four-engine, military transport aircraft in the United States. The C-5 has 36 pallet positions and can carry a maximum payload of 270,000 pounds. The typical crew size is seven.
- The AMP incorporates a mission computer, a glass cockpit with digital avionics (including autopilot and auto-throttles), and state-of-the-art communications, navigation, and surveillance components for air traffic management functionality.
- The RERP provides reliability enhancements, plus new commercial engines, nacelles, thrust reversers, and pylons.

Mission

- Units equipped with the C-5 perform strategic airlift, emergency aero-medical evacuation, transport of brigade-size forces in conjunction with other aircraft, and delivery of outsize or oversize cargo (cargo that does not fit on a standard pallet) to the warfighter.
- Units equipped with the C-5 execute missions at night, in adverse weather conditions, and in civil-controlled air traffic environments around the world. As the C-5 receives in-flight aerial refueling, the units are capable of completing extended-range missions.

Prime Contractor

- Lockheed Martin

Activity

- USD(AT&L) restructured, recertified to Congress, and designated RERP as an Acquisition Category 1D program in February 2008, following a Nunn-McCurdy breach in late FY07. The scaled-down program now includes 49 RERP production aircraft: 47 B models and two C models. Including the three test aircraft, there will be a total of 52 RERP aircraft.
- The RERP Milestone C Acquisition Decision Memorandum (ADM) allowed the restructured program to enter low-rate initial production (LRIP). The first LRIP lot will be for one aircraft, delivered in late FY10 after operational testing finishes.
- The Integrated Test Team is in the process of updating the TEMP. The Milestone C ADM required an update to the C-5 TEMP for all planned RERP activity by June 2008 and an additional update that would address all C-5 fleet-wide updates by the December 2008 Integrated Program Review (IPR).
- The Air Force Operational Test and Evaluation Center (AFOTEC) completed its report on a second operational assessment on RERP in December 2007, in time to support the Milestone C decision in March 2008. AFOTEC determined that the RERP was progressing to enhance overall C-5 effectiveness; however, results from data assessing mission capability rates were inconclusive.
- AFOTEC began a third operational assessment in June 2008, in accordance with the DOT&E-approved plan. Results from the OA-3 will support the December 2008 IPR.

- RERP developmental testing on the three designated test aircraft (two B model and one A model) continued through FY08, nearing completion of the four-year developmental test effort. The test team flew over 400 flights and 1,100 hours during the developmental period through August 2008, which included a four-day outside the continental United States (OCONUS) Integrated System Evaluation (ISE). A second ISE mission is planned for December 2008, over the Pacific, encompassing 11 missions in 8 days, outside of OCONUS.
- The C-5 Program Offices are pursuing parallel efforts to upgrade software and hardware for both the RERP and the AMP aircraft.
- The C-5 AMP BCC07 upgrade completed developmental testing on one operational AMP-modified C-5B aircraft at Travis AFB, California. Developmental testing included both ground and flight test activity, involving over 80 flight hours and an OCONUS ISE. AFOTEC will conduct follow-on operational testing starting in early FY09, to support AMC's fielding decision for BCC07 in early 2009. The next upgrade to the AMP aircraft, BCC03, has just begun.
- C-5 RERP production version 3.3, completed developmental flight test in September 2008. Upgrade version 3.4 is in the works and the Air Force is planning to incorporate prior to the start of operational testing.
- Ballistic testing conducted on a production-representative pylon for the C-5 RERP pylon showed that threat impacts onto hydraulic and fuel lines could cause sustained fires for all threats tested.

Assessment

- Although restructured, the C-5 RERP will not have a production aircraft for IOT&E until 4QFY09. AFOTEC will use the three SDD aircraft, from the developmental testing period and reconfigured as production-representative for the IOT&E, to support the full-rate production decision.
- C-5 RERP will likely improve overall mission effectiveness of the modified fleet; however, the extent to which it will meet the mission capability rate requires further assessment.
- C-5 AMP BCC07 addresses deficiencies found during IOT&E in 2006 and will likely improve aircrew situational awareness and integrated diagnostic functionality.
- The C-5 modernization strategy, C-5 Fleet Integrated Roadmap, and TEMP are in progress. The Air Force needs to adequately fund deficiency correction and sustainment.
- The new pylon design separates the flammable fluids from potential ignition sources to reduce the possibility of a safety-related fire. However, this design does not offer protection from ballistic threats and the pylon has no effective fire suppression system.

Recommendations

- Status of Previous Recommendations: The Air Force has made satisfactory progress on all but one of the previous recommendations.
- FY08 Recommendations.
  1. The program should consider modifying the current engine nacelle fire suppression system to provide expanded fire suppression into the pylon.
  2. The C-5 enterprise should address remaining deficiencies identified during AMP IOT&E in upcoming AMP BCC software builds and RERP follow-on development.
  3. The Air Force should apply lessons learned from the AMP IOT&E, e.g., ensuring technical orders are fully validated and verified prior to the start of RERP IOT&E.
  4. The Air Force should develop and deliver an adequate fleet integration roadmap that addresses all modernization efforts and configuration management of the entire C-5 fleet. The roadmap should be updated annually.

C-17A – Globemaster III Aircraft

Executive Summary

- The Terrain Collision and Avoidance System (TCAS) Overlay procedure does not provide adequate formation flight monitoring/guidance for Instrument Meteorological Conditions (IMC) and does not increase operational capability to the C-17 fleet.
- The Formation Flight System (FFS) is not ready to proceed to operational testing.

System

- The C-17 is a four-engine turbofan cargo aircraft with a crew of three (two pilots and one loadmaster).
- The C-17 has 18 pallet positions to carry cargo and can carry payloads up to 170,900 pounds.
- On-going/planned improvements include:
  - Core Integrated Processor (CIP) replacement
  - Improved formation flight capability
  - Improved weather radar

Mission

Units equipped with the C-17:

- Provide worldwide theater and strategic airlift and airdrop
- Augment aero-medical evacuations and special operations

- Deliver loads to austere airfields, including:
  - Passengers
  - Bulk, oversize, and outsize cargo
  - Special equipment

Prime Contractor

- Boeing

Activity

- The Air Mobility Command's Test and Evaluation Squadron (AMC/TES) completed a second Force Development Evaluation (FDE) on the TCAS Overlay procedure, designed to enhance formation flight capability and remove current IMC restrictions on the C-17 fleet.
- The command directed the test after the FY07 FDE identified training shortfalls, inadequate crew alerting mechanisms when formation displays are not reliable, and a lack of an automatic fault detection system. The AMC/TES conducted the second FDE using actual formation flights. C-17 Weapon System Trainers were used to evaluate crew responses to scripted anomalies.
- AMC/TES determined that the TCAS Overlay procedure was not effective for formation flight of two or more aircraft in IMC.
- The Air Force Flight Test Center (AFFTC) completed initial developmental testing on the Block 17-integrated FFS after four flights and approximately 50 hours of testing. AFFTC wrote eight Deficiency Reports and observed a number of anomalies during the test. In one instance, the TCAS and Station Keeping Equipment formation symbology disappeared for 5 to 10 seconds from the electronic cockpit displays.
- The AFFTC assessed the FFS overall performance as satisfactory and recommended the system proceed to an Integrated Systems Evaluation (ISE).
- During the subsequent ISE, numerous anomalies occurred, including blanking of aircraft displays and loss of formation flight guidance. Due to these anomalies, AMC/TES delayed operational testing.

Assessment

- The TCAS Overlay procedure does not provide adequate formation flight monitoring and guidance for IMC. It also does not increase operational capability to the C-17 fleet.
- The FFS is not ready to proceed to operational testing due to numerous deficiencies and lack of operational test certification.

Recommendations

- Status of Previous Recommendations. The Air Force addressed one of the two FY07 recommendations. The other recommendation remains valid.
- FY08 Recommendation.
  1. The Air Force should complete rigorous developmental testing on the FFS and redo the ISE, prior to initiating operational testing.

C-130 Avionics Modernization Program (C-130 AMP)

Executive Summary

- The integrated diagnostics system is not fully developed. The lack of a robust integrated diagnostics system increases aircraft downtime and adversely impacts sortie generation rate. The Air Force is planning to evaluate system capability in 4QFY09.
- The Air Force is lacking a reliability growth program.

System

- Legacy C-130s (excluding the C-130J) are four-engine turboprop aircraft used by the Air Force, Navy, Marines, and Special Operations units. Crew size varies from four to 13 depending on aircraft mission.
- The AMP adds glass cockpits, integrated digital avionics, and an integrated defensive systems suite. It eliminates the need for a navigator on all Combat Delivery missions. The AMP provides new communications, navigation, and surveillance capabilities for Air Traffic Management functions.
- Combat Delivery C-130 AMP aircraft have six pallet positions for cargo.

Mission

- Units equipped with the C-130 primarily perform the tactical portion of the airlift mission, flying shorter distances, and using austere airfields within combat zones.

- Combat delivery includes:
  - Airdrop of paratroopers and cargo (palletized, containerized, bulk, and heavy equipment)
  - Airland delivery of passengers, troops, and cargo

Prime Contractor

- Boeing

Activity

- DOT&E approved the latest Test and Evaluation Master Plan on February 28, 2008, following the Joint Requirements Oversight Committee (JROC) approval of the Capabilities Production Document.
- Due to delays in software development and installation, testing, and incomplete required program-level documentation, the Milestone C, originally scheduled for June 2008, is now planned for November 2008.
- The contractor installed production software build (Core Complete 2.2) on one aircraft, which includes much of the remaining functionality for AMP. The Air Force conducted the first flight test of this build on August 11, 2008. A second AMP aircraft completed its periodic inspection and the contractor will install Core Complete 2.2 on it in early FY09. The third AMP aircraft is undergoing the initial modification.
- Air Force Flight Test Center, reporting on the AMP modification prior to installation of Core Complete 2.2, found the C-130 AMP to have more capability than legacy aircraft, but system immaturity limited the assessment of some areas.
- The Air Force Operational Test and Evaluation Center (AFOTEC) completed an Operational Assessment in support of the Milestone C decision.

Assessment

- The operational test will include a minimum of four production-representative aircraft with at least two of those being low-rate initial production (LRIP) aircraft. This supports the formation flight requirement.
- The AMP modification includes a Heads-Up Display (HUD) that enhances situational awareness. However, some shorter or taller pilots (approximately 10 percent of the current C-130 pilot population) cannot use the full capability of the HUD due to design limitations.
- The design of the AMP modification reduces the C-130 cargo-carrying capacity by 2,000 pounds, and requires the loadmaster to reconfigure some cargo to maintain emergency egress routes.
- The transfer of data from the mission planning system to the aircraft does not function per the Air Force requirement. If not resolved, this problem will severely limit the effectiveness of the C-130 AMP aircraft and crews to perform the combat delivery mission.
- The integrated diagnostics system and its interaction with Air Mobility Command's Maintenance Tracking System has not yet been fully developed. The lack of a robust integrated

diagnostics system increases aircraft downtime and adversely impacts sortie generation rate. Installation and testing of the system and interfaces are slated to occur in August 2009.

- Based on current failure rates and failure corrections planned for Core Complete 2.2, the C-130 AMP will not meet reliability predictions.

Recommendations

- Status of Previous Recommendations. The Air Force addressed all previous recommendations.
- FY08 Recommendations. The Air Force should:
  1. Determine the number of C-130 pilots (active duty, guard, and reserve) unable to use the HUD as a primary flying device and determine if the impact of the current HUD design is acceptable.
  2. Develop and implement a reliability growth program.
  3. Develop a plan to resolve the integrated diagnostics/maintenance interface tracking system disconnect.

C-130J Aircraft

Executive Summary

- The C-130J is in production with periodic Block Upgrades to correct deficiencies and to provide capability enhancements.
- The C-130J is effective in performing single ship airland and airdrop missions in a permissive threat environment.
- The C-130J is not effective in performing formation airdrop missions in Instrument Meteorological Conditions where the use of Station Keeping Equipment (SKE) is required.
- The C-130J is not effective for worldwide operations in a non-permissive threat environment.
- The C-130J has shortfalls in meeting user suitability requirements due to maintainability issues.
- The Air Force is correcting some initial OT&E deficiencies and adding new capabilities in the Block Upgrade 7.0. The Air Force scheduled the OT&E for 2011.

System

- The C-130J is a medium-sized four-engine turboprop tactical transport aircraft.
- Compared to previous models, the cockpit crew requirement is reduced from four to two on the J model; loadmaster requirements vary (one or two), depending on mission need.
- Compared to legacy models, the C-130J has approximately 70 percent new development. Enhancements unique to the C-130J include a glass cockpit and digital avionics, advanced integrated diagnostics, a new propulsion system, improved defensive systems, and an enhanced cargo handling system.
- The C-130J has two different lengths denoted as a long and a short body. The long body carries eight standard pallets; the short carries six.

Mission

- Combatant commanders use the C-130J within a theater of operations for combat delivery missions which include:
  - Airdrop of paratroopers and cargo (palletized, containerized, bulk, and heavy equipment)
  - Airland delivery of passengers, troops, and cargo
  - Emergency aeromedical evacuations
- Combat Delivery units operate in all weather conditions, use night-vision lighting systems, and may be required to operate globally in civil-controlled airspace.

Prime Contractor

- Lockheed Martin

Activity

- Air Mobility Command conducted Phases I and II of their Force Development Evaluation of Block Upgrade 6.0 in October 2007. Air Mobility Command completed the testing in accordance with a DOT&E-approved test plan.
- The Air Force completed combined developmental and operational testing of the AN/ALR-56M system on the C-130J in the second and third quarters of FY08.
- AFOTEC completed operational testing of the AN/ALR-56M radar warning system on the C-130J in 4QFY08. AFOTEC will complete a full evaluation of the effectiveness and suitability of the AN/ALR-56M in FY09.
- The Modular Airborne Fire Fighting System (MAFFS) completed system-level OT&E on a C-130H model aircraft. The Air Force Flight Test Center began testing the MAFFS on the C-130J in August 2008. The 146th Airlift Wing at Channel Islands is participating in this test with both crews and aircraft.
- The Air Force is correcting some initial OT&E deficiencies and adding new capabilities in the Block Upgrade 7.0. The Air Force scheduled the OT&E for 2011.
- The Air Force is updating the Test and Evaluation Master Plan (TEMP) to encompass the Block Upgrade 7.0 and Formation Flight System testing.

Assessment

- The C-130J with Block Upgrade 6.0 continues to be effective in performing single ship airland and airdrop missions in a permissive threat environment. Subsequent to the Force Development Evaluation, the Air Force increased the maximum gross weight for assault landings from 115,000 pounds to 162,285 pounds.

- The Block Upgrade 6.0 did not correct the SKE anomalies previously observed during Phase II OT&E. Employing the Traffic Alert and Collision Avoidance System as an overlay to the SKE display provides the aircrew with additional situational awareness during formation flight operations. However, it does not permit aircraft formation flight operations in Instrument Meteorological Conditions.
- The C-130J with Block Upgrade 6.0 still has shortfalls in meeting user suitability requirements due to maintainability issues. The integrated diagnostics false alarm rate is high and the poor performance of the portable maintenance aid adversely impacted the ability to generate sorties. The Air Force reported more than 90 open deficiencies at the end of Phase II OT&E, only two of which are addressed by Block Upgrade 6.0.
- The C-130J is not effective for worldwide operations in a non-permissive threat environment.
  - The AAR-47 infrared missile/laser warning system is operationally effective as installed on the C-130J but has one significant classified limitation.
  - The ALR-56M completed developmental and operational testing and recently completed FOT&E. The effectiveness and suitability are currently under evaluation to determine if the system is ready for release to the fleet.

Recommendations

- Status of Previous Recommendations. The Air Force has taken adequate action on the previous recommendations.
- FY08 Recommendations. None.

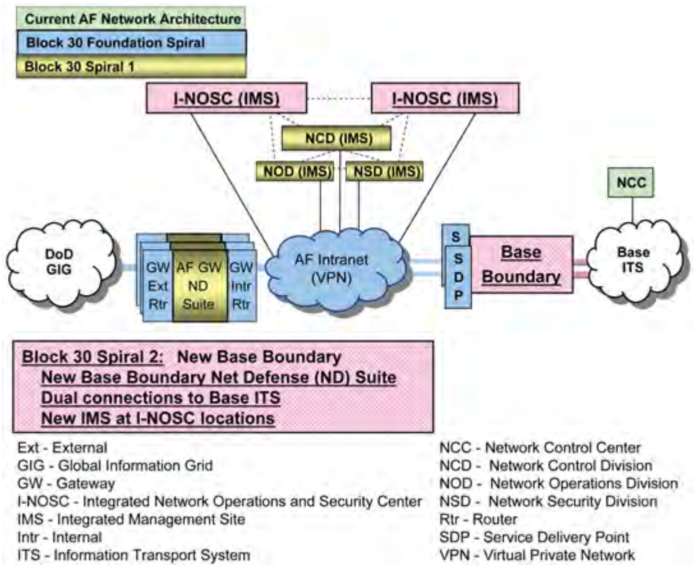
Combat Information Transport System (CITS)

Executive Summary

- The Combat Information Transport System (CITS) program is a family of projects that incorporate a variety of commercial off-the-shelf (COTS) items that must be integrated to perform the required military missions. Significant organizational change is necessary to implement the projects to perform centralized network management and defense.
- The 346th Test Squadron (346 TS) conducted an Operational Utility Evaluation (OUE) of the Second Generation Wireless Local Area Network (2GWLAN) at Randolph AFB, Texas, in January 2008.
- The 346th Test Squadron and DOT&E assessed the 2GWLAN COTS-based system as operationally effective and suitable for its intended mission. The Aruba-based wireless components provide a system that is operationally effective and suitable.
- The Mobility Management System (MMS) used to centrally command, control, and manage the various wireless networks deployed on a base, and its associated operator-defined documentation, are neither operationally effective nor suitable.
- The Capabilities Development Document (CDD), Test and Evaluation Master Plan (TEMP), and other system-level acquisition and test documents are still in development.

System

- CITS provides an end-to-end capability to create, store, transport, manipulate, archive, protect, and defend information within the Air Force components of the Global Information Grid (GIG).
- The CITS program is a family of projects that provide COTS-based communications infrastructure enhancements, wireless communications and data capabilities, and robust network management and network defense for the Air Force.
- The current program consists of three projects:
  1. Second Generation Wireless Local Area Network (2GWLAN). The 2GWLAN provides COTS-based wireless capabilities to users at over 100 Air Force sites worldwide. The 2GWLAN provides encrypted wireless access via computers and other handheld devices to support flight-line maintenance, supply, and medical operations. Limited-range secure wireless access is available via the Secret Internet Protocol Network (SIPRNet). The MMS supports centralized network management of access points and other infrastructure components associated with the 2GWLAN.



  2. Vulnerability Life-cycle Management System (VLMS). VLMS implements DoD-mandated network security tools using a centralized enterprise-level management structure. VLMS supports centralized remediation and patching of software security vulnerabilities.
  3. CITS Block 30 Spiral 1. This is the largest network redesign in Air Force history and provides a centrally controlled interface between Air Force network assets and the rest of the GIG. CITS Block 30 Spiral 1 consists of 16 gateways worldwide, through which all traffic enters and leaves the Air Force network, centralized network management, monitoring, and defense in depth of all network assets.

Mission

Commanders, operators, and planners will utilize CITS to support joint warfighting operations by leveraging an integrated and interoperable set of capabilities to effectively manage the Air Force enterprise network and maintain asset visibility; to move digital information seamlessly across geographical or logical boundaries; and to support multi-level operations.

Prime Contractor

- Government Integrator (Program Management Office)

Activity

- The 346th Test Squadron conducted an OUE of the 2GWLAN at Randolph AFB, Texas, in January 2008.
- Operational testing of both VMLS Spiral 1.5 and CITS Block 30 Spiral 1 is scheduled for FY09. The 346th

Test Squadron determined the level of testing for CITS projects using the risk-based approach outlined in the DOT&E "Guidelines for Operational Test and Evaluation of Software-intensive System Increments."
- Recent Program Management Directive from the Office of the Air Force Chief Information Officer establishes the Air Force Operational Test and Evaluation Center (AFOTEC) as the operational test agency for CITS.
- AFOTEC is working with the user and acquisition communities to gather data on the 16 CITS projects identified to date and is assessing their scope, functionality, and test relevance.
- Quarterly meetings of the CITS Integrated Test Team (ITT) have been well-attended by all stakeholders, including user representatives.

Assessment

- The OUE was adequate to assess the operational effectiveness and suitability of the 2GWLAN.
- The 346th Test Squadron and DOT&E consider the 2GWLAN COTS-based system operationally effective and suitable for its intended mission.
- The 346th Test Squadron and DOT&E determined the 2GWLAN MMS, intended to allow centralized wireless system management and network defense, was neither operationally effective nor suitable for continued use.
  - Users were not able to effectively use the COTS software to manage the large number of system alerts, even with only one base reporting to the MMS.
  - MMS users could not perform their tasks due to inadequate operational procedures and technical orders.
  - The CITS Program Office has done work to correct these shortcomings. Results from regression testing are not yet available.
- Significant changes in Air Force Network Operations organizational structure and personnel roles are required to implement both VLMS and CITS Block 30 Spiral 1.
  - Operational users must be involved in all design reviews so that adequate operational procedures, technical orders, and organizational roles and responsibilities can be developed prior to deployment for testing and operational use.
  - Significant integration issues remain for both VLMS and Block 30 COTS products, even though there is only minimal custom software being developed for the system.
- The CDD, TEMP, and other system-level acquisition and test documents are still in development. The lack of documentation may impact AFOTEC's ability to plan and execute adequate testing to meet program schedules.

Recommendations

- Status of Previous Recommendations. This is the first annual report for this program.
- FY08 Recommendations.
  1. The CITS Program Management Office should correct deficiencies identified in the MMS.
  2. The Air Force must complete the CDD and the Program Office must complete the TEMP prior to operational testing of Block 30 Spiral 1.
  3. The Air Force Network Operations Command and Air Force Warfighting Integration Center should ensure users are involved in the development of procedures and technical documentation for CITS operational implementation.

Combatant Commanders Integrated Command and Control System (CCIC2S)

Executive Summary

- The 17th Test Squadron conducted the Combatant Commanders Integrated Command and Control System (CCIC2S) Communications Processing System Release 3 (CPS3) Force Development Evaluation (FDE) in March 2008 in accordance with the DOT&E-approved test plan.
- CPS3 is operationally effective and operationally suitable.
- With the implementation of CPS3, CCIC2S transitioned to the sustainment phase.

System

- The Air Force initiated CCIC2S to integrate existing and legacy systems and update functionality supporting Integrated Tactical Warning and Attack Assessment, Information Operations, Shared Early Warning, and Theater Battle Management Core System functions. It provides terrestrial and space-based sensor data, processing and control nodes, Battle Management Command and Control nodes, and communications and dissemination links, including U.S. and Canadian defense information networks.
- The CCIC2S effort includes two blocks: Block 1 to address CCIC2S Operational Requirement Document requirements from January 2004 and Block 2 to address the Space Command and Control (Space C2); Space Situational Awareness; Air/Missile Warning; and Core Command and Control Capability Development Documents (CDDs).
- CCIC2S Block 1 consisted of:
  - Air Warning: Completed in January 2004
  - Space Battle Management Core System (SBMCS): Completed in June 2004
  - Missile Warning: Completed in December 2006
  - CPS3: Operationally deployed in March 2008
  - Space Data Server - Replacement (SDS-R): To be addressed by future Space Defense Operations Center capabilities
- The Air Force restructured CCIC2S Block 2 to address sustainment of delivered capabilities. The delivery of the additional capabilities has been re-aligned into three separate acquisition programs: Space C2, Integrated Space Situational Awareness, and the Rapid Attack Identification and Reporting System.

Mission

The North American Aerospace Defense Command (NORAD) and U.S. Strategic Command (USSTRATCOM) use CCIC2S as a comprehensive command and control tool to execute existing and future space operations and missile defense missions including support to other combatant commanders. Commanders use CCIC2S capabilities to:

- Monitor worldwide sensor networks for potential threats
- Identify, assess, and characterize threats
- Warn the U.S. and Canadian National Command Authorities
- Recommend appropriate engagements based on the threats

Prime Contractor

- Lockheed Martin

Activity

- The 17th Test Squadron conducted a FDE of CPS3 in accordance with the DOT&E-approved test plan.
- The operational approval panel accepted CPS3 for operational use in April 2008.
- With the completion of CPS3, CCIC2S transitioned to the sustainment phase. Future functionality updates will be accomplished through the Space C2, Integrated Space Situational Awareness, and the Rapid Attack Identification and Reporting System programs.

Assessment

- CPS3 is operationally effective and suitable. Information Assurance (IA) testing by the 92nd Information Operations Squadron identified vulnerabilities; however, based upon the physical and administrative controls employed by the user, IA risks are manageable.

- In addition to the IA deficiencies, the FDE identified several minor deficiencies with message formatting and increased time to process messages in the queue. While these deficiencies did not preclude the system from satisfying the user requirements, correction would improve system performance.

Recommendations

- Status of Previous Recommendations. The Air Force has taken adequate action on the previous recommendations.
- FY08 Recommendation.
  1. The program manager should implement corrective actions to the deficiencies identified by the FDE in future maintenance updates.

E-3 Airborne Warning and Control System (AWACS)

Executive Summary

The Air Force conducted an operational assessment (OA) of the Block 40/45 upgrade to the E-3 Airborne Warning and Control System (AWACS). The OA included data from modeling and simulation at Boeing's Virtual Warfare Center (VWC), St. Louis, Missouri, and developmental flight testing using Test System 3 (TS-3). With the retirement of the test support aircraft, Big Crow, there are insufficient resources to test AWACS system's resistance to Electronic Warfare (EW).

System

- The E-3 AWACS is an air battle command and control system and an airborne surveillance system. It includes surveillance radar, identification friend or foe system, and an electronic surveillance measures system installed on a Boeing 707. It also has an extensive voice and data communications suite. The mission computing system displays the surveillance and data link information to the crew and enables their conduct of the mission. The current fielded system is the Block 30/35 Radar System Improvement Program E-3.
- The Block 40/45 program replaces the mission computing subsystem with a local area network using commercial off-the-shelf servers and workstations. The upgraded computing hardware enables the implementation of multi-sensor correlation and fusion algorithms, new tracking algorithms, improved data link management, and a user-friendly interface. The upgrade also includes improvements to the electronic surveillance measures subsystem.
- Test System 3 (the AWACS test aircraft), used in the developmental testing of Block 40/45, is not production representative because it includes an upgraded surveillance radar (single cabinet) and a computer-controlled communications suite, which are not included in Block 40/45.

Mission

- The AWACS aircrew provides command and control for the aerial refueling mission and air combat missions, which include air defense and strike missions.
- The AWACS aircrew provides air surveillance, monitors data link information, and provides airborne early warning to other command and control aircraft and command and control ground units.

Prime Contractor

- Boeing

Activity

- The Air Force Operational Test and Evaluation Center (AFOTEC) conducted an OA during 2QFY08 and 4QFY08. This OA included flight test data and modeling and simulation data. The OA included participation in the Joint Integrated Air and Missile Defense Organization's Nimble Fire simulation exercise at the VWC, St. Louis, Missouri.
- The Joint Interoperability Test Command tested the Block 40/45 software to assess its potential joint interoperability. The AWACS test community conducted interoperability testing.
- The program plans to have a Milestone C decision for low-rate initial production in 1QFY09.

Assessment

- The Block 40/45 software has been very stable.
- The Block 40/45 system has a Combat Identification (CID) Key Performance Parameter (KPP) to provide accurate CID information to the warfighter. The primary cause of incorrect or unknown CID is uncertainties from sensor inputs. When those uncertainties are removed, Block 40/45 software performs well.
- The Block 40/45 system has a KPP to provide the operator with a single track for each target. However, the system has been unable to demonstrate an ability to provide the operator with a single track for all targets. Thus far, the program has

been able to demonstrate 94 percent correlation between a single track to a single track.
- The developmental flight test program included interoperability testing. That testing demonstrated the system's ability to enter data links and to exchange data. However, because of the limited amount of interoperability flight testing done to date, future flight testing is required to fully evaluate systems interoperability.
- There are insufficient resources to adequately test the AWACS system's resistance to EW. Block 40/45 does not change the E-3's previous ability to resist EW, as there are no changes to the S-band radar or any of its radios. However, EW does affect how the mission computer processes the information and displays it to the operators.

Recommendations

- Status of Previous Recommendations. This is the first annual report for this program.
- FY08 Recommendations.
  1. The Air Force should conduct additional flight testing focused on interoperability. This testing should include verification of fixes as well as interoperability issues not yet tested.
  2. The Air Force needs to develop adequate EW test resources to fully characterize AWACS system performance in a realistic EW environment.

F-22A – Advanced Tactical Fighter

Executive Summary

- F-22A test efforts included developmental testing and support systems modification necessary to support Increment 3.1 enhanced global strike FOT&E scheduled to begin in June 2010.
- F-22A Low Observables Stability Over Time testing completed the third of a five-year series of testing to assess the validity of the F-22A low observable Signature Assessment System tool and the metrics used to determine durability and priorities for low observables maintenance actions in operational environments and employment. Accurate assessment of trends will not be realized until the entire body of test data has been collected and analyzed over the five-year test period.

System

- The F-22A is an air superiority fighter that combines low observability to threat radars, sustained high speed, and integrated avionics sensors.
- F-22A low observability reduces threat capability to engage with current weapons.
- It maintains supersonic speeds without the use of an afterburner.
- Avionics that fuse information from the Active Electronically Scanned Array radar, other sensors, and data linked information for the pilot enable employment of medium- and short-range air-to-air missiles and guns.
- The F-22A is designed to be more reliable and easier to maintain than current fighter aircraft.
- F-22A air-to-air weapons are the AIM-120C radar-directed missile and the AIM-9M infrared-guided missile.
- F-22A air-to-ground precision strike capability consists of two 1,000-pound Joint Direct Attack Munitions (JDAMs).
- The F-22A program is designed to deliver capability in increments.

Mission

A unit equipped with the F-22A:

- Provides air superiority over friendly or enemy territory
- Defends friendly forces against fighter, bomber, or cruise missile attack
- Escorts friendly air forces into enemy territory
- Provides air-to-ground capability for counter-air, strategic attack, counter-land, and enemy air defense suppression missions

Prime Contractor

- Lockheed Martin

Activity

- F-22A testing was conducted in accordance with the DOT&E-approved Test and Evaluation Master Plan.
- The Air Force began modifications to the Air Combat Simulator necessary to support F-22A Increment 3.1 FOT&E. Increment 3.1 incorporates enhanced air-to-ground weapons capabilities and avionics enhancements to expand F-22 global strike capabilities. Simulator systems modifications include threat system upgrades, weapons models, mission scenarios, and the establishment of a verification, validation, and accreditation plan. Increment 3.1 FOT&E is scheduled to begin in June 2010.
- Developmental flight testing of the aircraft instrumentation system needed to support Increment 3.1 FOT&E completed in FY08. Six instrumentation units will be delivered to the operational test unit at Nellis AFB, Nevada, in December 2008 for operational testing in preparation for Increment 3.1 FOT&E.
- Initial planning for the scheduled June 2010 Increment 3.1 FOT&E began in FY08.
- The Air Force Air Combat Command concluded the third year of the five-year Low Observable Stability Over Time Test. This evaluation is an on-going Force Development Evaluation assessing the validity of the F-22A low observable Signature Assessment System tool and the metrics used to determine durability and priorities for low observables maintenance actions in operational environments and employment. The Air Force Air Combat Command conducted testing under the provisions of the DOT&E-approved test plan.

- Air Combat Command continued electronic warfare software development and testing throughout FY08 under the DOT&E-approved Mission Data Optimization Test Plan.

Assessment

- F-22A FY08 test efforts largely supported future Increment 3.1 FOT&E scheduled for June 2010. Developmental testing and operational test planning efforts suggest the program is progressing to meet the Increment 3.1 FOT&E target date.
- F-22A Low Observables Stability Over Time test data collection and analysis to date has not revealed significant trends in the stability of the F-22A low observables signature or effectiveness of the Signature Assessment System. Continued collection and analysis of data, in accordance with the DOT&E-approved test plan is ongoing and accurate assessment of trends will not be realized until the entire body of test data has been collected and analyzed over the five-year test period.

Recommendations

- Status of Previous Recommendations. The Air Force continues to address all previous recommendations.
- FY08 Recommendations. None.

Global Broadcast Service (GBS) System

Executive Summary

- The Air Force Operational Test and Evaluation Center (AFOTEC) released the Global Broadcast Service (GBS) Multi-Service OT&E 2 (MOT&E-2) Report in November 2007, and found the system to be both operationally effective and operationally suitable. The report did identify significant limitations to the system's operational effectiveness and operational suitability. DOT&E concurred with AFOTEC's assessment and recommended the deficiencies be corrected as part of the Spiral 4B software and hardware upgrades to the transmit and receive segments.
- Developmental testing of the Spiral 4B system upgrades identified additional deficiencies. The program is addressing these deficiencies.
- The GBS has demonstrated the ability to deliver increased volumes of high-speed data over a Wideband Global Satellite Communication (WGS) satellite using both Transportable Injection Point (TIP)/Theater Satellite Broadcast Manager (TSBM) and Teleport/Satellite Broadcast Manager (SBM) transmit segment equipment. The lack of a compatible X-band interface between the SBM and Teleport limits the ability of GBS to fully utilize WGS capabilities.
- The Air Force needs to test the cross-banding capabilities of GBS with WGS when a compatible X-band interface with the DoD Teleport has been incorporated.

1 - Space segment: UFO (UHF Follow-On) satellite (l) and WGS (Wideband Global SATCOM) satellite (r) hosting the GBS payload
2 - Transmit Segment in Theater: Theater Satellite Broadcast Manager (truck) and Theater Injection Point (antenna)
3 - Receive Broadcast Manager
4 - Receive Terminal
5 - Transmit Segment: Primary Injection Point (white dish antenna) and Satellite Broadcast Manager (buildings), also Teleport (inset)

System

- The GBS is a satellite-based broadcast system providing near worldwide, high capacity, one-way transmission of operational military data.
- The GBS system consists of three segments:
  - The space segment includes GBS transponders on WGS, Ultra High Frequency Follow-On (UFO) satellites, and an additional government-leased satellite capability to meet operational demand.
  - The transmit segment broadcasts data streams and manages the flow of selected information through the orbiting satellites for broadcast to the appropriate theaters of operation. The system interfaces through DoD Teleport sites for the WGS satellites and fixed Primary Injection Points for the UFO satellites and commercial satellites. Mobile Theater Injection Point antennas provide support for all satellites.
  - The receive segment consists of ground- and sea-based mobile terminals that extract the appropriate information for distribution to the end users within selected areas of operation.
- GBS Phase 1 (previously known as the Joint Broadcast Service) was fielded in 1996 in support of operations in the Balkans.
- GBS Phase 2 contains block upgrades to augment and interface with other military communications systems:
  - Phase 2 Block 1 hosted payload packages on UFO satellites 8, 9, and 10. Air Force Space Command declared the Initial Operational Capability (IOC) 1 for GBS Phase 2 in 2003.
  - Phase 2 Block 2 employs broadcast capability for WGS communications with transponder-like downlinks across the Ka-band and X-band frequencies. Block 2 functions are based upon an Internet Protocol transport.
- The Military Satellite Communications Joint Program Director is responsible for integrating the GBS and the WGS space and control capabilities.

Mission

- Combatant commanders and operational forces worldwide use GBS to provide a continuous high-speed and high-volume flow of data, audio, imagery, and video at multiple classification levels for sustained operations.
- Commanders use the GBS capability to provide intelligence and battlespace weather information, increasing the joint operations mission data available to deployed and garrisoned military forces across the globe.

Prime Contractor

- Raytheon

Activity

- AFOTEC released the GBS MOT&E-2 Report in November 2007, and found the system to be both operationally effective and operationally suitable. The report did identify significant limitations to the system's operational effectiveness and operational suitability. DOT&E concurred with AFOTEC's assessment and recommended the deficiencies be corrected as part of the Spiral 4B software and hardware upgrades to the transmit and receive segments.
- AFOTEC completed the final remaining GBS test objectives during the GBS portion of the WGS MOT&E in May 2008. Testing was conducted in accordance with DOT&E approved Test and Evaluation Master Plan (TEMP) and test plans. AFOTEC could not test these objectives until WGS was ready for MOT&E.
- The test community is finalizing the AFOTEC WGS MOT&E Report. Results will be combined with those from the 2007 GBS MOT&E-2 to provide the basis for Air Force Space Command (AFSPC) to declare IOC for Phase 2, Block 2.
- The program conducted developmental testing of the Spiral 4B changes to the system. This testing revealed additional deficiencies that are being corrected.
- The Joint Staff deferred an IOC declaration by AFSPC due to information assurance concerns. The GBS program is taking the necessary remedial actions to address the Joint Staff's concerns before declaring IOC.

Assessment

- Upon the completion of the MOT&E-2, DOT&E assessed the system as effective with limitations and suitable with limitations. The GBS receive suite terminals were operationally effective, but did not deliver the level of service and dependability required since the receive suites did not demonstrate the capability required while operated in the "unattended" mode. The GBS receive suite terminals were operationally suitable, but had reliability difficulties and information assurance deficiencies. These deficiencies are being corrected.
- The GBS has demonstrated the ability to deliver increased volumes of high-speed data over a WGS satellite using both TIP/TSBM and Teleport/SBM transmit segment equipment. The lack of a compatible X-band interface between the SBM and Teleport limits the ability of GBS to fully utilize WGS capabilities.
- The existing satellite constellation limits the coverage of GBS; however, this is being corrected as more WGS satellites become operational.

Recommendations

- Status of Previous Recommendations. The Air Force has made progress on the FY06 and FY07 DOT&E recommendations. Three of the seven FY06 recommendations and all of the FY07 recommendations remain valid.
- FY08 Recommendation.
  1. The Air Force should plan and conduct follow-on testing of the cross-banding capabilities of GBS with WGS when a compatible X-band interface with the DoD Teleport has been incorporated.

Global Hawk High Altitude Endurance Unmanned Aerial System, RQ-4

Executive Summary

- Integrated developmental and operational test events informed production decisions, which were dependent on test completion and performance. The Air Force Operational Test and Evaluation Center (AFOTEC) reported operational assessments to the Global Hawk Defense Acquisition Board (DAB).
- Measurements of the effectiveness of the imagery intelligence and signals intelligence sensors for Block 20 and Block 30 indicate the system is likely to provide the expected intelligence value indicated in the joint-validated requirement. AFOTEC noted deficiencies in infrared imagery quality, geo-location accuracy, training systems, and specific preparations for IOT&E. Limited data constrained accurate measurements of suitability, which is a risk area for IOT&E. Due to the volume of developmental testing remaining, entering IOT&E before the end of FY09 is high risk. However, the test team's focus on test efficiencies and tempo, combined with the potential to make economical improvements to system performance during the next year are important positive efforts.
- The Block 40 system significantly lags the development and test profile planned by the Air Force in the 2005 program restructure. The sensor under development in the Multi-Platform - Radar Technology Insertion Program (MP-RTIP) experienced numerous setbacks in testing, accumulating a 12-month delay as of the end of FY08. A requirements review by the Joint Capabilities Board resulted in a recommendation to prioritize modes and incrementally field all required capabilities. However, the potential exists that sensors with operational capability may not be available until a year after the delivery of Block 40 aircraft.

System

- Global Hawk is a long-range surveillance and reconnaissance system.
- The Global Hawk system includes:
  - An Unmanned Aerial Vehicle (UAV) capable of high altitude (above 60,000 feet) and long endurance (greater than 24 hours) operations
  - Launch/recovery ground station and mission control ground station
- The current Block 10 payload includes infrared, optical sensors, and synthetic aperture radar, all of which image ground targets and areas of interest.
- Ground crews use satellite and radio communications to control the system and transmit collected data.
- Appropriately equipped distributed ground stations receive data either directly from the air vehicle via a data link or from the mission control ground stations for exploitation to meet the theater commander's intelligence needs. Signals intelligence will be processed in a similar manner.

- The program plans to produce additional systems of air vehicles and ground stations (Blocks 20, 30, and 40) capable of greater payloads that include the following:
  - Imagery intelligence only (Block 20)
  - Multi-intelligence: Imagery and Signals intelligence (Block 30)
  - Radar surveillance only (Block 40)

Mission

- A unit equipped with this system would provide surveillance and reconnaissance imagery and data to the theater commander's exploitation assets, such as the Distributed Common Ground Station. Ground personnel assigned to exploit the collected material then develop the intelligence products to support theater operations.
- Units with Global Hawk provide persistent intelligence gathering through long-range and long-loiter capability when other assets are not available.
- The theater Air Operations Center tasks Air Force Global Hawk reconnaissance squadrons to either collect imagery and signals data in order to answer essential elements of information identified by the theater commander or directly support a ground unit.

Prime Contractor

- Northrop Grumman

Activity

Block 20

- The Combined Test Force (CTF) continued Block 20 ground and flight testing at Edwards AFB, California.
  - The CTF tested the Block 20 aircraft integrated with the Enhanced Integrated Sensor Suite (EISS) and production ground segments.
  - Primary accomplishments were sensor calibration, initial sensor performance measurements, envelope expansion, and endurance assessment of the aircraft.
  - In an effort to achieve the pace required to begin IOT&E in 4QFY09, the CTF added second and third test aircraft and worked to make test plans more efficient.
- During an integrated test period, AFOTEC accomplished an operational assessment of the Block 20 using the developmental test data and reported results to the October 2008 DAB. The AFOTEC results indicated the following:
  - The electro-optical sensor demonstrated the required image quality. It exceeded Block 10 performance.
  - The infrared sensor performed better than the Block 10 system, but did not meet requirements at the required range.
  - Only a small sample size was available from the Synthetic Aperture Radar (SAR) sensor due to performance deficiencies that delayed its evaluation. The first images after calibration were of poor quality. Subsequent to the operational assessment period, additional image assessments indicate that the system meets requirements.
  - Due to the lack of useful reliability, availability, and maintainability data, AFOTEC answered suitability measures primarily using engineering estimates of performance. The assessment did not note significant suitability deficiencies other than incomplete technical order data for maintenance.
- The Joint Staff's Joint Capabilities Board considered and approved the Functional Capabilities Board recommendation to refine the imagery quality requirement through a joint Air Force-National Geospacial-Intelligence Agency study, but decided not to change the EISS key performance parameters.

Block 30

- The baseline Airborne Signals Intelligence Payload (ASIP) completed developmental testing on the U-2 in July 2008 and began flight testing on Global Hawk in September 2008.
  - Flight testing on the U-2 aircraft demonstrated capability across the required spectrum.
  - The Air Force conducted an additional flight test period on the U-2 to complete all test objectives and avoid deferral to Global Hawk flight test.
  - While the test team eventually accomplished the test objectives, test rigor was limited.
- AFOTEC accomplished an operational assessment of the ASIP sensor on the U-2 using developmental test data and reported results to the October 2008 DAB. The AFOTEC results indicated the following:
  - The system detects signals across the required frequency spectrum; however, AFOTEC was able to assess only two of 12 required signal types. Geo-location in a portion of the frequency spectrum does not meet requirements.
  - The operator training system, concept of operation, technical data, test planning, and documentation were significantly deficient.
- The Defense Acquisition Executive (DAE) authorized production of three of five ASIP sensors planned for Lot 8 in FY08. Production of the final two sensors is contingent on continued progress in Global Hawk flight test.
- The first Global Hawk Block 30 multi-intelligence system (with EISS and ASIP) accomplished its first test flight in September 2008. This is the only Block 30 multi-intelligence flight test asset.
  - The CTF plans approximately eight months of developmental testing on one test aircraft leading up to IOT&E in 4QFY09.
  - The test team continues to mature test plans for the four-phased Global Hawk test program.
- The Joint Staff's Joint Capabilities Board considered the Global Hawk signals intelligence key performance parameter in light of performance reported by AFOTEC and determined that geo-location accuracy is not part of the system key performance parameter, but remains a key system attribute.

Block 40

- The MP-RTIP payload program was unable to complete the Radar System Level Performance Verification test phase.
  - Flights tests revealed the contractor's design for sensor calibration was a failure. System stability is deficient and significantly affects performance.
  - By the end of FY08, a small sample size of SAR imagery from the sensor was available for performance measurements.
- AFOTEC accomplished an operational assessment of the MP-RTIP sensor during the developmental test period and reported the results to the October 2008 DAB. The AFOTEC results indicated the following:
  - While the SAR image quality assessments relied on a sample size of only five images, AFOTEC assessed the SAR sensor is likely to meet requirements by IOT&E.
  - Capability to detect moving targets, stationary target position error, information assurance, effective-time-on-station, concept of operation, test planning, and documentation, training plans, and technical publications were significantly deficient.
  - The DAE delayed long lead funding of four sensors planned for Lot 8 in FY08 until integrated testing demonstrates better performance. An assessment update is planned for December 2008.
- The Joint Staff's Joint Capabilities Board recommended prioritization of basic modes (Spot and Swath SAR and Ground Moving Target Indicator (GMTI)) during the remainder of the development program. The board did not change or relieve the requirement for all modes (concurrent SAR/GMTI, high range resolution, and electronic protection).

- The program is orchestrating mode prioritization to avoid production of Block 40 systems without any capability. The DAE previously procured the first three sensors and aircraft in low-rate initial production lots.

Assessment

Block 20

- Test progress lags the planned schedule by six months. The developmental test program has grown to twice the original time span (80 weeks vice 40 weeks) due to discoveries in the aircraft and sensor. However, the pace has increased towards the end of FY08 and, along with CTF actions to find test efficiencies, may result in readiness for IOT&E by 4QFY09. Additional discoveries in the aircraft, sensor, or ground station will jeopardize the ability of the Service to conduct IOT&E in the programmed window and field the system as planned. No additional schedule margin is available for the Block 20 Imagery Intelligence IOT&E in 4QFY09.
- Electro-optical and SAR sensors currently meet the requirements; infrared sensor performance is less than the requirement, but still provides intelligence value. System optics, bounded by the size of the aperture, limits the improvement possible in the infrared capability. An increase to aperture size requires a major aircraft re-design. Operational suitability is unknown. Endurance with mission payloads will meet the 28-hour key performance parameter. The readiness-to-test deficiencies identified by AFOTEC are significant and need resolution prior to IOT&E.

Block 30

- Developmental flight test of Block 30 aircraft equipped with the ASIP sensor is behind the planned schedule by approximately three months. Limited schedule margin is available for the Block 30 multi-intelligence IOT&E, which will be concurrent with the Block 20 IOT&E. Completing and reporting these concurrent evaluations before the Block 30 production decision in 2QFY10 will be a challenge.
- While the integrated testing conducted so far indicates the sensor meets most requirements, limitations of signal type, sample size, and testing on a different platform (U-2) limit the understanding of the signals intelligence operational capability of Global Hawk Block 30. While ASIP integration on Global Hawk is very similar to U-2, differences exist in thermal management, antenna arrangement, and electro-magnetic interface characteristics.
- Multi-intelligence capability on Global Hawk Block 30 is unknown. The first multi-intelligence test flight is 2QFY09. The geo-location deficiency requires careful analysis and additional testing to determine how operators can mitigate its operational impact, or design a fix. However, the potential exists for Block 30 to provide significant signals intelligence capability if it can demonstrate it meets requirements in a representative operational environment. As with the Block 20 system, the Block 30 readiness-to-test issues identified by AFOTEC are serious and need resolution prior to IOT&E.

Block 40

- Failure to design a useful calibration of the MP-RTIP sensor seriously jeopardizes the Air Force's plan to complete Block 40 development in 2010. Poor system software stability significantly limits useful operating time. The potential exists that the contractor will deliver up to six of the 15 planned Block 40 systems before there is any operational capability available in the MP-RTIP sensor. The program estimate that only 25 weeks are necessary to complete Block 40 developmental testing is, in light of prior Global Hawk sensor integrations and flight test experiences, not credible. The potential for significant extension of the development schedule is high.
- Prioritization of MP-RTIP "basic modes" (i.e. SAR and GMTI) may enable incremental development and test strategies to emerge. Careful analyses of the documented requirement and the approved concept of operations are necessary. The current requirement is for Block 40 to support both forensic intelligence, surveillance, and reconnaissance (ISR) and battle management missions. Based on the results of the Joint Capabilities Board, neither the Joint Staff nor the Service plan to change the requirement. Battle management may still be possible without the remaining sensor modes (concurrent modes and high range resolution). However, it is not clear that the current Block 40 concept of operations, which highly leverages battle management capability, is achievable if only basic modes are available.

Recommendations

- Status of Previous Recommendations. The Air Force made progress on four of the eight recommendations from previous annual reports. The remaining previous recommendations are valid and deserve resolution.
- FY08 Recommendations: The program should address the following:
  1. Despite the schedule risk, continue to plan and make concerted efforts towards the Block 20 and Block 30 concurrent IOT&E in late FY09. Program managers and acquisition executive leadership need to ensure the necessary resources are readily available to developmental and operational test directors.
  2. As developmental testing continues in FY09, program management should place special emphasis on measuring reliability, availability, and maintainability of all Global Hawk systems, and feed these measurements into a viable reliability growth program.
  3. Block 20 and Block 30 operational test plans should consider and include comparison evaluations using Block 10 and U-2 legacy systems to provide a critical context for evaluating mission capability.
  4. Do not increase the Block 20 or Block 30 imagery quality requirements thresholds for delivery prior to IOT&E. Any such increase should be for future development.

5. Establish stability goals for the Block 40 sensor and report progress towards meeting the goals as evidenced by flight test results.
6. Current approved concepts do not account for the system capabilities expected at IOT&E and initial fielding. Update Block 30 and Block 40 concepts of operation during early FY09 so that AFOTEC can finalize operational test plans. The Block 40 concept of operations needs to take into account the ISR exploitation and battle management ground components that are realistically available at the time of test and fielding. Plans to implement Block 40 mode deferral need to inform the user's concept of operations and operational test design. Complete an analysis of the implications of incremental mode development/fielding in the Block 40 system on both ISR and battle management mission capability.

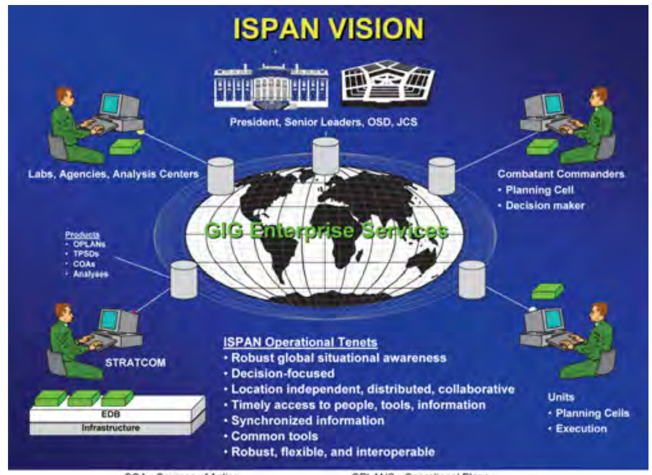
Integrated Strategic Planning and Analysis Network (ISPAN)

Executive Summary

- U.S. Strategic Command (USSTRATCOM) and the Air Force Operational Test and Evaluation Center (AFOTEC) conducted an Integrated Strategic Planning and Analysis Network (ISPAN) Collaborative Integration Environment (CIE) Spiral 6.2 Operational Utility Assessment (OUE) in February 2008. The OUE supported a deployment decision to satisfy an urgent USSTRATCOM need. DOT&E determined that the ISPAN CIE Spiral 6.2 was operationally effective and suitable, and recommended deployment.
- USSTRATCOM and AFOTEC conducted an ISPAN Block 1 Operational Test (OT), in accordance with the DOT&E-approved test plan, in September 2008. The OT confirmed that the problems found during ISPAN Spiral 3 Operational Assessment were resolved. The ISPAN Block 1 program is ready to proceed into the IOT&E; pending a signed Joint Requirements Oversight Committee Memorandum for ISPAN's Block 1 Capability Production Document and an Acquisition Decision Memorandum.

System

- ISPAN is an operational planning and analysis network modernization program for USSTRATCOM being developed in three blocks. ISPAN modernization expands planning and analysis to new mission areas integrating the full spectrum of kinetic and non-kinetic weapons into strategic and theater plans. ISPAN comprises both the Mission Planning and Analysis System (MPAS) and the CIE. The program is currently developing and fielding Block 1.
- MPAS provides dedicated planning and analysis for all U.S. strategic nuclear forces. MPAS also provides planning and analysis to create plans for specified theater and strategic conventional forces. Maintenance and capability enhancements are tested and delivered every six months.
- CIE provides collaboration capabilities for time sensitive planning and is being developed in six spirals for Block 1. This capability will allow users from multiple Combatant Commander (COCOM) staffs, subordinate commands, as well as other agencies, to collaborate online while providing planning and analyses to senior decision-makers.



COA - Courses of Action
EDB - Enterprise Database
GIG - Global Information Grid
JCS - Joint Chiefs of Staff
OPLANS - Operational Plans
OSD - Office of the Secretary of Defense
STRATCOM - Strategic Command
TSPD - Time Sensitive Planning Documents

Mission

- USSTRATCOM uses ISPAN to perform deliberate and adaptive, strategic, nuclear, and non-nuclear planning and analysis. This includes developing the national deterrence war plans offering both nuclear and non-nuclear weapon options using the MPAS.
- The COCOMs, subordinate staffs, and other national agencies use the CIE for collaborative mission planning and analysis, course of action development, and commander's decision briefing preparation in support of time sensitive planning scenarios and time critical decisions regarding force employment.

Prime Contractors

- Lockheed Martin
- Government Integrator (USSTRATCOM)

Activity

- The ISPAN Program Office declared a Nunn-McCurdy breach on July 31, 2007. USSTRATCOM and the ISPAN Program Office developed a recovery plan that specified the development of the Block 1 Capability Production Document (CPD), definition of the new Block 1 end-state, and creation of a new Test and Evaluation Master Plan (TEMP). Secretary of the Air Force-Acquisition approved the ISPAN recovery plan in June 2008. The Joint Capabilities Board approved the Block 1 CPD and end-state definition in August 2008. DOT&E approved the TEMP version 6.18 in February 2008.
- USSTRATCOM and AFOTEC conducted ISPAN (MPAS) Block 1 Spiral 6 maintenance and modernization testing

from December 12-14, 2007. Users exercised a number of enhanced tools to include Theater Integrated Planning System (TIPS), Commander's Decision Aid (CDA), Nuclear Aimpoint Constructor, Dynamic Application and Rapid Targeting System (DARTS), as well as, conversion of the MPAS infrastructure to Solaris 10 Operating System and a Weblogic 9.2 backbone. USSTRATCOM fielded MPAS Spiral 6 in January 2008.
- USSTRATCOM and AFOTEC conducted an ISPAN CIE Spiral 6.2 OUE on February 13-14, 2008, at USSTRATCOM, Offutt AFB, Nebraska, and the Combined Air Operations Center, Barksdale AFB, Louisiana.
- USSTRATCOM and AFOTEC conducted ISPAN (MPAS) Block 1 Spiral 7 maintenance and modernization testing from June 23-26, 2008. Seventeen MPAS tools, 11 of those having some level of enhanced capability, were exercised by users to generate nuclear strike options including targeting, weapon assignment, quality review, and simulation and analysis of the proposed solutions. USSTRATCOM fielded MPAS Spiral 7 in July 2008.
- USSTRATCOM and AFOTEC conducted an ISPAN Block 1 OT, which included the CIE and MPAS, September 3-25, 2008, at USSTRATCOM, Offutt AFB, Nebraska, and the Combined Air Operations Center, Barksdale AFB, Louisiana.

Assessment

- USSTRATCOM and the ISPAN Program Office executed a development and test schedule that delivers MPAS maintenance and modernization builds on a six-month schedule per the DOT&E-approved TEMP. A combined test team comprised of USSTRATCOM functional experts and AFOTEC testers found no significant operational issues with Spiral 6 and Spiral 7 releases. Testing and performance for ISPAN (MPAS) Spiral 6 and Spiral 7 was adequate to support the fielding decisions.
- DOT&E confirmed that earlier problems found during the ISPAN Spiral 3 Operational Assessment were adequately addressed in ISPAN Block 1 OT. The system has matured significantly in the past year and users were able to fully accomplish their mission objectives. ISPAN is ready to proceed into IOT&E.

Recommendations

- Status of Previous Recommendations. USSTRATCOM and the Program Office have effectively addressed previous recommendations.
- FY08 Recommendations. None.

Joint Air-to-Surface Standoff Missile (JASSM)

Executive Summary

- The Air Force initiated a series of steps to implement program management changes, identify reliability drivers, and characterize the reliability of corrected Lot 4 production missiles. Fourteen of 16 missile firings were successful.
- The Air Force executed one Joint Air-to-Surface Standoff Missile (JASSM)-Extended Range (ER) live fire shot on September 24, 2008. The weapon was employed at a nominal JASSM-ER range and functioned correctly in all respects.
- The Air Force should implement the acquisition and test strategies for JASSM-ER and follow-on variants, ensuring an event-driven approach based on operational concepts, requirements, and system capabilities.

System

- Baseline JASSM is a stealthy cruise missile that flies a preplanned route from launch to a target, using GPS satellite information and an internal navigation system. JASSM:
  - Has a 1,000-pound penetrating warhead
  - Has an imaging infrared seeker that can be used for greater accuracy and precision; the seeker uses image templates planned by a rear echelon intelligence unit
  - Can be launched by B-1, B-2, B-52, and F-16 aircraft
  - Includes a container that protects the weapon in storage and aids ground crews in moving, loading, and checking the missile
  - Uses the same Air Force mission planning systems used for aircraft and other weapons
- JASSM Electronic Safe and Arm Fuze (ESAF) adds a more reliable fuze with the same capabilities as the baseline fuze. Development is ongoing.
- JASSM-ER is intended to fly longer ranges using a more efficient engine, larger capacity fuel tanks, and other modified components (all within the same outer shape).
- JASSM Weapon Data Link (WDL) is intended to add capabilities for two-way communication that support battle damage assessment and in-flight re-targeting. Development has been on hold since June 2007.
- JASSM Anti-Surface Warfare (ASuW) will build on WDL capabilities and add the capability to attack maritime targets under certain circumstances. Development has been on hold since June 2007.

Mission

- Operational units equipped with JASSM intend to employ the weapon from multiple aircraft platforms against high value or highly defended targets from outside the lethal range of many threats. Units equipped with JASSM intend to use it to:
  - Destroy targets with minimal risk to flight crews and support air dominance in the theater
  - Strike a variety of targets greater than 200 miles away
  - Execute missions using automated preplanned or manual in-flight mission planning
  - Attack a wide-range of targets including soft, medium, or very hard (not deeply buried) targets
- Units with JASSM-ER intend to support the same missions with a range more than twice the baseline JASSM.
- Units with JASSM WDL and ASuW should have added flexibility and greater retargeting capabilities in executing JASSM missions.

Prime Contractor

- Lockheed Martin

Activity

- The program completed a Nunn-McCurdy certification on May 1, 2008. The USD(AT&L) certified and re-baselined the program.

JASSM Baseline

- The Air Force initiated a series of steps to implement program management changes, identify reliability drivers, and characterize the reliability of corrected Lot 4 production missiles.
- The Air Force conducted reliability baseline testing in February 2008, with 14 successful missile firings out of 16 attempts, for a point estimate reliability of 0.87.

- Under OSD direction, the Air Force incorporated the changes into program documentation with the developer, completed an OSD-approved System Evaluation Plan (SEP) and a DOT&E-approved Test and Evaluation Master Plan (TEMP), and conducted additional testing of the Lot 5 production missiles.

JASSM ESAF

- Fuze qualification testing is ongoing. Sled testing resumed at Eglin AFB, Florida, during July 2008. The second sled test failed to meet the test objectives and further ESAF testing is on hold while failure analysis is ongoing.

JASSM-ER

- The Air Force resumed integrated testing of the JASSM-ER variant in 2008 after program recertification.
- The Air Force executed one JASSM-ER live fire shot on September 24, 2008, in accordance with the DOT&E-approved JASSM Baseline TEMP.

Assessment

- As a by product of the Nunn-McCurdy certification, the Air Force continued screening previous system and test information to identify deficiencies impacting reliability. The program adopted the OSD Systems Engineering Plan and DOT&E TEMP strategies to stress production missiles in captive carry environments and ground tests to identify failure modes. The Air Force then implemented corrections in missiles that flight testing subsequently confirmed.
- DOT&E considers the Air Force schedule as moderate risk. DOT&E is concerned that pressure to maintain the production schedule could reduce reliability improvements, not incorporate corrections as needed, and/or reduce planned adequate testing.
- The continued failures in ESAF sled tests indicated that further evaluation of the electronic fuze is required. The current plan ensures adequate testing on the fuze in progressively challenging environments in live fire sled testing and flight test. Upon successful completion, the Program Office will initiate production.
- The September 24, 2008, JASSM-ER shot functioned correctly in all respects after executing a weapon's profile at a nominal JASSM-ER range.

Recommendations

- Status of Previous Recommendations. The Air Force is addressing the two FY07 recommendations.
- FY08 Recommendations. The Air Force should:
  1. Continue to characterize the reliability of baseline missile production lots, incorporating reliability and program management improvements.
  2. Implement the acquisition and test strategies for JASSM-ER and ASuW/WDL variants, ensuring an event-driven approach.

Joint Direct Attack Munition (JDAM)

Executive Summary

The Navy and Air Force performed testing on Laser Joint Direct Attack Munition (LJDAM) in response to an Urgent Operational Need (UON) request from the warfighter. The Air Force performed a LJDAM Operational User Evaluation (OUE) in support of limited fielding in theater. The Navy is conducting a Quick Reaction Assessment (QRA) to support a limited fielding in early FY09.

System

- The Joint Direct Attack Munition (JDAM) is a low-cost, autonomously controlled, adverse weather, accurate guidance kit tailored for Air Force/Navy general purpose bombs to include:
  - 2,000-pound Mk 84 and BLU-109 bombs
  - 1,000-pound Mk 83 and BLU-110 bombs
  - 500-pound Mk 82 bomb
- A GPS aided inertial navigation system provides primary guidance to the weapon. Augmenting the JDAM inertial navigation system with GPS signals enhances accuracy.
- Guidance and control designs enable accuracy of less than 5 meters when GPS is available and less than 30 meters when GPS is absent or jammed after release.
- The LJDAM provides an increased capability to attack moving targets. In addition to retaining the precision of JDAM, the LJDAM provides enhancements for moving target attacks, Target Location Error elimination due to precise laser target designation, capability to operate beneath a cloud layer, and ability to select weapon impact angle in combination with laser guided precision.

Mission

- Combatant commanders use JDAMs employed by fighter, attack, and bomber aircraft to engage targets day or night, in all weather at the strategic, operational, and tactical levels of warfare.
- Combatant commanders employ JDAM against fixed and relocatable, soft and hard targets to include command and control facilities, airfields, industrial complexes, logistical and air defense systems, lines of communication, and all manner of battlefield forces and equipment.

Prime Contractor

- Boeing

Activity

- The Air Force performed an OUE in February 2008, dropping five LJDAM weapons against high-speed, non-maneuvering ground targets at the China Lake test range in California. A limited fielding recommendation approved production of 400 units following the OUE.
- The Navy performed a QRA in May 2008, dropping three operational test (OT), three developmental test (DT)/OT, and 11 DT weapons against static as well as high-speed non-maneuvering targets at the China Lake test range. The FA-18C/D and AV-8B aircraft delivered ordnance using an expanded employment envelope.
- Analysis is still ongoing.

Assessment

- The Air Force UON dictated employment parameters and limited integration onto two delivery aircraft (F-15E and F-16) thereby restricting employment options. LJDAM provides enhanced capability against moving targets in a limited employment envelope and tactical scenarios for which it is designed and cleared. The weapon performed as expected with accuracy better than requirements when sufficient laser energy was present on the target during endgame.
- Navy QRA results indicate accuracy similar to that achieved in Air Force tests while retaining existing JDAM capabilities. The aircrew observed high work loads due, at least in part, to limited integration with delivery platform systems, incurred by the need for rapid response to the UON and subsequent limited development program.
- The currently fielded LJDAM capability does not represent the end-state of LJDAM capability development. Significant expansion of LJDAM target acquisition and tracking, capability, or integration onto delivery platforms will require an update to the JDAM Test and Evaluation Master Plan to

allow the test program to support a new Acquisition Strategy and test program.

Recommendations

- Status of Previous Recommendations. The Navy and Air Force satisfied their respective FY07 recommendations.
- FY08 Recommendations.
  1. The Air Force and Navy should monitor operational employment to correlate results with OUE and QRA results in order to assist decision-makers with future acquisition and test decisions.
  2. The Air Force should prepare to update the JDAM Test and Evaluation Master Plan in the event of procurement beyond current levels. This update should include both Air Force and Navy L JDAM testing.

Large Aircraft Infrared Countermeasures (LAIRCM)

Executive Summary

- The Large Aircraft Infrared Countermeasures (LAIRCM) Phase I system is fielded, is in full-rate production, and, as stated in DOT&E's FY05 report to Congress, is operationally effective and suitable.
- DOT&E assessed LAIRCM Phase II Guardian Laser Turret Assembly (GLTA) testing and demonstrated capabilities as adequate to support a low-rate initial production (LRIP) decision, based on the Air Force's FY07 Guardian Operational Assessment (OA).
- The Air Force changed the Guardian Acquisition Strategy from development of a new capability to an engineering change proposal in FY07.
- This new Air Force Acquisition Strategy for Guardian eliminated the Air Force's milestone decisions for the Guardian upgrade, allowing entry into full production without milestone decision points. The Air Force has not published a revised Acquisition Strategy.
- The Air Force's Milestone Decision Authority (MDA) is accepting risk if the GLTA production continues above previously planned LRIP quantities before the Air Force conducts the 2QFY10 LAIRCM Phase II IOT&E. In order to mitigate this risk, the upcoming Test and Evaluation Master Plan (TEMP) update addresses the provision of additional FY08 GLTA reliability data to DOT&E.
- DOT&E concurs with the Air Force Operational Test and Evaluation Center's (AFOTEC) OA report and assessment that the Next Generation Missile Warning System (NexGen MWS) testing and development is adequate to support making an LRIP decision. AFOTEC provided a white paper to DOT&E on GLTA reliability.

System

LAIRCM is a defensive system for large transport and rotary wing aircraft that combines the Air Force's newest Missile Warning System (MWS) and infrared laser jammer countermeasure systems.

- LAIRCM Phase I is fielded.
  - It delivers a system of proven and available subsystems.
  - Key components include ultraviolet MWS, countermeasures processor, and infrared laser jammer.
  - The infrared laser jammer is the Small Laser Transmitter Assembly (SLTA).
  - Platforms with LAIRCM Phase I include C-5, C-17, C-37, C-130H, MH-53, and CV-22.
  - Integration on C-40, AC-130H/U, and C-130J is planned or currently underway.
- LAIRCM Phase II is a spiral upgrade in development and incorporates:
  - A new infrared MWS called the NexGen MWS
  - A smaller jammer called GLTA
- The Phase II NexGen MWS is designed to provide higher performance warning compared to Phase I MWS through:
  - Earlier threat warning
  - Improved detection in challenging urban and natural environments
  - Enhanced capability against emerging threats
- Phase II GLTA reduces life-cycle costs through:
  - Smaller and lighter packaging
  - Reliability improvements

Mission

Combatant commanders use LAIRCM to provide automatic protection to crews and large transport or rotary wing aircraft against shoulder-fired, vehicle-launched, and other infrared guided missiles. Operators need such protection during normal take-off and landing, assault landings, tactical descents, air drops, low-level flight, and aerial refueling.

Prime Contractor

- Northrop Grumman

Activity

LAIRCM Phase I

- The Air Force fielded LAIRCM Phase I in FY05; no significant testing of the Phase I system with the SLTA took place in FY08.

LAIRCM Phase II

- LAIRCM Phase II is in the System Development and Demonstration phase.
- The Air Force made the NexGen MWS source selection and LRIP decision in 1QFY09. The selection decision was between the two-color infrared MWS from Northrop Grumman and one-color infrared MWS from Lockheed Martin. Northrop Grumman's two-color infrared MWS was selected.
- The Air Force tested the integration of the LAIRCM on the C-5 transport aircraft in 1QFY08, on the C-40 in 2QFY08, and on the AC-130H in 4QFY08. The LAIRCM system configuration on these aircraft was a combination of the Phase I ultra-violet MWS and the Phase II GLTA jammer.
- The Service will continue LAIRCM suitability testing into FY09 as a component of C-5 systems integration testing. Air Mobility Command (AMC) is collecting detailed suitability data on LAIRCM reliability on the C-5, C-17, and C-130 aircraft.
- The LAIRCM Program Office is working on an update to the January 2007 DOT&E-approved TEMP, which will reflect the revised Acquisition Strategy. Despite the LAIRCM Program Office's best efforts, this update has not made sufficient progress.
- The Service conducted LAIRCM testing in FY08 in accordance with the current DOT&E-approved TEMP.

Assessment

LAIRCM Phase I

- The LAIRCM Phase I system is operationally effective and suitable, and enhances aircraft survivability.

LAIRCM Phase II

- Limited GLTA testing has not confirmed design maturity; however, the MDA is planning to exceed 20 percent LRIP quantities before the Air Force conducts the LAIRCM Phase II IOT&E in 2QFY10. System performance, reliability, availability, and maintainability have not been proven with the current design.
- The AFOTEC OA is a basis for NexGen MWS source selection that ended in 3QFY07. DOT&E concurred with AFOTEC OA conclusions that NexGen testing and performance were adequate to support an LRIP decision.
- The LAIRCM Program Office is implementing several hardware and software changes to the laser designed to improve the reliability of both the SLTA and GLTA. These changes are intended to support the current operational tempo of the transport aircraft with LAIRCM, and also reduce depot maintenance.

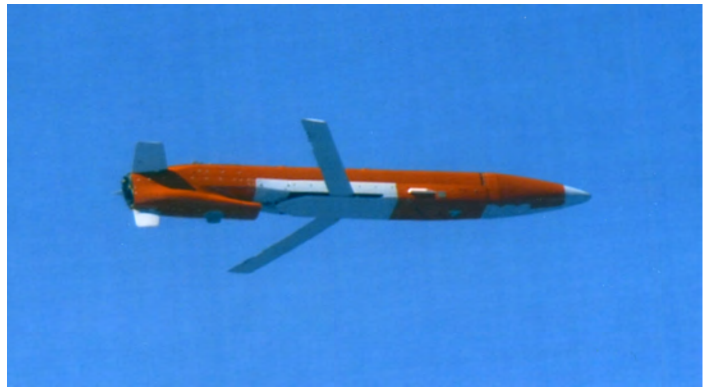
Recommendations

- Status of Previous Recommendations. The Air Force addressed three of the four previous recommendations; however, they have not provided the revised TEMP for Phase II as recommended in FY07.
- FY08 Recommendations.
  1. LAIRCM Phase II: The Air Force should provide a revised TEMP that incorporates changes to the LAIRCM Acquisition Strategy, details a Reliability Improvement Program, and clearly defines the effectiveness and suitability testing to support the FY10 LAIRCM Phase II IOT&E.
  2. After the NexGen source selection, the Air Force should conduct the planned developmental testing on the C-17 in order to demonstrate system maturity for the Phase II IOT&E.

Miniature Air Launched Decoy (MALD), including MALD-Jammer (MALD-J)

Executive Summary

- The Air Force separated the Miniature Air Launched Decoy (MALD) and MALD-J (including jammer) programs in February 2008 in order to provide easier visibility and clearer tracking of each program's progress and documentation.
- The Air Force conducted an Operational Assessment (OA) assessing MALD progress towards operational mission capabilities in support of a June 2008 low-rate initial production (LRIP) Milestone C decision.
- The Air Force assessed MALD is making satisfactory progress toward meeting effectiveness and suitability requirements.
- DOT&E approved a Test and Evaluation Master Plan (TEMP) for MALD to support the Milestone C decision. A separate MALD-J TEMP will be required to support a Milestone B decision in FY09.
- The Air Force approved a Capability Production Document for MALD in May 2008.



System

- MALD is a small, low-cost, expendable, air-launched vehicle that replicates what fighter, attack, and bomber aircraft look like to enemy radar operators.
- MALD-J is an expendable close-in jammer designed to degrade and deny threat early warning or acquisition radar ability to establish a track on strike aircraft while maintaining the ability to fulfill the decoy mission.
- The Air Force plans to procure the first 150 of 1,500 production MALD in FY08 to support testing and an Initial Operational Capability in 2010.
- The F-16 C/D and B-52 are the lead aircraft to employ MALD and MALD-J. In the future, the Air Force plans to employ both versions of these decoys on F-15C/E, B-1B, A/OA-10, B-2, F-22, and F-35 aircraft.

Mission

Combatant commanders use the MALD to allow a strike force to accomplish its mission by forcing enemy radars and air defense systems to treat MALD as a viable target. MALD-equipped forces should have improved battle space access for airborne strike forces by deceiving, distracting, or saturating enemy radar operators and Integrated Air Defense Systems. Airborne strike leaders will use MALD-J to degrade or deny early warning and acquisition radar detection of friendly aircraft or munitions.

Prime Contractor

- Raytheon

Activity

- The Air Force Operational Test and Evaluation Center (AFOTEC) conducted an OA to assess MALD progress toward meeting operational mission capabilities in support of the June 18, 2008, LRIP Milestone C decision. The Air Force assessed MALD to be progressing to meet effectiveness and suitability requirements.
- MALD ground tests included: aircraft integration tests of hardware and electromagnetic compatibility with host aircraft; payload integration to ensure the mission plan could be uploaded into the MALD; and sortie generation data collection such as time to load and Built-in-Test (BIT) to check the MALD.
- MALD open-air range tests included captive carry, jettison tests, and full-up flight test vehicle missions. Captive carry tests quantified aerodynamic, electrical, temperature, and vibration environments. Jettison tests included fit checks, aircraft compatibility, and safe separation tests. Flight test vehicle missions assessed in-flight payload performance, navigation accuracy, and maneuverability.
- MALD-J completed risk reduction Phase I with captive carry flights supporting the sub-system critical design review in February 2008.
- MALD-J entered a risk reduction Phase II that will support entry into System Development and Demonstration Phase with a Milestone B decision in FY10.

Assessment

- MALD testing and performance are progressing. Although reliability did not meet requirements, the trend was positive with no critical failures during the last six developmental test flights.
- The Air Force's primary open air electronic warfare range, the Nevada Test and Training Range, is extremely limited in overland flight profiles available for MALD, and does not authorize simultaneous flights of multiple MALD. Additionally, the Air Force has not developed a mature modeling and simulation plan or other mitigating ground testing for full MALD assessment. These limitations challenge the Air Force's ability to adequately assess MALD in a realistic mission environment.
- Evaluation of MALD reliability and performance in a dense threat environment will rely heavily on modeling and simulation, which will require a proactive and disciplined validation, verification, and accreditation process.
- The Air Force needs to update the MALD/MALD-J Concept of Operations based on lessons learned during testing.
- Both MALD and MALD-J are designed to work in concert with coalition forces as part of the Airborne Electronic Attack system-of-systems architecture. To ensure successful operations, the Air Force must develop a clear mission planning concept of employment to ensure MALD/MALD-J mission planning products capture the Master Air Attack Plan objectives produced at the Air Operations Center.

Recommendations

- Status of Previous Recommendations. The Air Force has taken effective action on previous recommendations with the exception of the improved test methodology and range resources recommendation.
- FY08 Recommendations. The Air Force should:
  1. Submit and gain DOT&E approval of the MALD-J TEMP.
  2. Complete a mission-planning concept of employment and a modeling and simulation plan to support the operational test and evaluation plan.
  3. Submit and gain DOT&E approval of the MALD operational test concept and operational test plan.

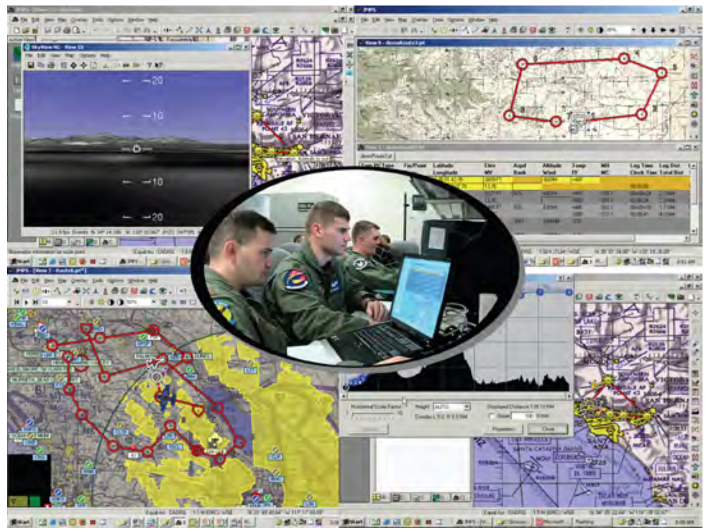
Mission Planning System (MPS) (including Joint Mission Planning Systems (JMPS))

Executive Summary

- The Joint Mission Planning System (JMPS) demonstrated improved results during developmental and operational testing.
- The Air Force is leading Service efforts to develop the new common core Joint Mission Planning System Framework version 1.4. This new framework, once matured, is intended to be adopted by all Services as a common core to build Service and host platform-specific Mission Planning Environments (MPE).

System

- JMPS is currently a Windows XP, PC-based common solution for aircraft mission planning. It is a system of common and host platform-unique mission planning applications for Air Force host platforms.
- A Mission Planning Environment (MPE) is a total set of developed applications built from modules. The basis of an MPE is the Framework, to which a Unique Planning Component (UPC) is added for the specific aircraft type (e.g., F-15E). Other Common Components (CCs) that can support multiple users are added as well (e.g., GPS-guided weapons, electronic warfare planner, etc.) to complete the MPE.
- JMPS operates as an unclassified or classified system in either a stand-alone, workgroup, or domain environment.
- Although the JMPS software is being co-developed among DoD components, JMPS is not a joint program.



Mission

Aircrews use JMPS to plan all phases of their missions and then save required aircraft, navigation, threat, and weapons data on a data transfer device so they can load it into their aircraft before flight.

Prime Contractor

- Framework: BAE Systems

Activity

- DOT&E published a Beyond Low-Rate Initial Production (BLRIP) Report to Congress for the operational test of the Air Force Mission Planning System (MPS) Program, Increment II (F-15) (Version 1.2) during FY08.
- The 46th Test Squadron conducted a user test of the B-1B bomber MPE during FY08 at Eglin AFB, Florida.
- Air Combat Command’s 28th Test and Evaluation Squadron conducted an operational test of the F-15 version 1.3.4 MPE during FY08.
- The Air Force Operational Test and Evaluation Center (AFOTEC) conducted an operational test of the B-1B SB12 MPE during FY08.
- The 46th Test Squadron conducted a user test of the F-16 4.2+ MPE during FY08 at Eglin AFB, Florida.
- The 46th Test Squadron conducted a user test of the RC-135 Spiral 2 MPE during FY08 at Offutt AFB, Nebraska.
- The Air Force conducted operational testing in accordance with the DOT&E-approved TEMP and applicable test plans.

Assessment

- In the BLRIP report to support the fielding decision for the Air Force F-15 Version 1.2 MPE, DOT&E evaluated that testing was adequate to demonstrate that the F-15 version 1.2 was operationally effective, but not operationally suitable. The system was operationally effective based on the findings that the aircrew could use the MPS to plan missions, although there were human factors and data fidelity deficiencies with some of the F-15 Mission Planning software modules. The evaluation of not operationally suitable was based in large part on system instability with a number of failures in reliability, maintenance, and logistics supportability. A comprehensive evaluation of information assurance vulnerabilities indicated additional effort is needed to support direct interface with classified communications networks.

- The 28th Test and Evaluation Squadron evaluated the F-15 MPE version 1.3.4 as operationally effective and suitable. The test verified the effectiveness of new planning capabilities, including satellite communications and improved air-to-surface ordnance delivery planning. The test squadron demonstrated accurate transfer of mission planning data to F-15 aircraft. While the number of system failures encountered during the tests was high, overall operational suitability was improved as compared to F-15 version 1.2 test results. DOT&E concurs with the evaluation.
- The Air Force Operational Test and Evaluation Center (AFOTEC) evaluated the B-1B SB-12 MPE as operationally effective and suitable. The single JMPS replaces three separate legacy mission planning systems used by B-1 aircrew and provides new mission planning capabilities. AFOTEC demonstrated accurate transfer of mission planning data to B-1B aircraft. Base power outages due to severe weather during the test resulted in some lost planning data and computing system reboot anomalies. This highlighted three system deficiencies, including the need for uninterrupted power supply systems for JMPS, lengthy initial system setup time, and numerous computer failures during mission planning. DOT&E concurs with the AFOTEC evaluation.

Recommendations

- Status of Previous Recommendations. The Air Force satisfactorily addressed all of the FY07 recommendations.
- FY08 Recommendations.
  1. While somewhat improved over predecessor versions, computing system stability under relatively light loading still hinders JMPS reliability. The Air Force should review the adequacy of computing processing and memory requirements for JMPS. The Air Force should also design a test to define and document the maximum stress loading of the JMPS in terms of simultaneous mission planning conducted in a network.
  2. The Air Force should review the results of the B-1B MPE test and acquire adequate uninterrupted power supplies to minimize materiel damage, software corruption, and adverse impact to aircrew mission planning.
  3. The Air Force should continue to place emphasis on information assurance improvements to ease the process to import air tasking orders and threat data into the mission planning computer.

MQ-9 Reaper Hunter Killer Armed Unmanned Aircraft System (UAS)

Executive Summary

- The Air Force Operational Test and Evaluation Center (AFOTEC) completed and reported on the MQ-9 IOT&E assessing the MQ-9 as effective and suitable. DOT&E analysis is still ongoing.
- The Air Force is employing the MQ-9 in Operation Enduring Freedom.
- The MQ-9 effectively delivered Hellfire missiles and 500-pound laser-guided munitions in combat.
- The MQ-9 was not assessed for its intelligence, surveillance, and reconnaissance capability in the IOT&E.
- Based on the observed limitations during IOT&E and combat operations, FOT&E of the MQ-9 system will be required to fully assess and characterize its effectiveness, suitability, and unassessed Key Performance Parameters.

System

- The MQ-9 is a remotely piloted, armed, unmanned air vehicle (UAV) that uses optical, infrared, and radar sensors to attack ground targets.
- This system includes ground stations for launch/recovery and mission control of sensors and weapons.
- This MQ-9 is a medium-sized UAV that has an operating ceiling up to 50,000 feet, an internal sensor payload of 800 pounds, an external payload of 3,000 pounds, an endurance of approximately 14 hours, and stronger landing gear than its predecessor, the MQ-1 Predator.
- The MQ-9 shares command and control characteristics with the MQ-1 Predator.
- The MQ-9 is commanded by ground elements via Ku-band satellite and C-band line-of-sight data links.
- It carries Hellfire II anti-armor missiles (AGM-114) and 500-pound laser-guided bombs (GBU-12).

Mission

- The combatant commander uses the MQ-9 onboard sensors and weapons to conduct armed reconnaissance and pre-planned strikes. Units equipped with MQ-9s can find, fix, track, target, engage, and assess critical emerging targets (both moving and stationary).
- MQ-9 units can also conduct aerial intelligence gathering, reconnaissance, surveillance, and target acquisition for other airborne platforms.

Prime Contractor

- General Atomics

Activity

- AFOTEC completed and reported on the MQ-9 IOT&E in August 2008.
- Government-led developmental testing continued through FY08. Significant efforts included developmental testing of incremental operational flight program (OFP) improvements, takeoff and landing procedures, weapons integration testing, and sensor improvement testing.
- The Program Office completed an Integrated System Evaluation (ISE) in 2QFY08 in order to support the decision to proceed with the IOT&E.
- The MQ-9 employed Hellfire missiles and 500-pound laser-guided bombs effectively in combat.

Assessment

- The MQ-9 demonstrated an initial combat capability during the observed ISE in the delivery of Hellfire missiles and GBU-12 bombs. The Air Force executed the combat capability demonstrated in the ISE in a scripted scenario.
- The MQ-9 demonstrated a lack of an ability to attack targets in obscured environmental conditions.

- Based on the observed limitations during IOT&E and combat operations, FOT&E of the MQ-9 system will be required to fully assess and characterize its effectiveness, suitability, and unassessed Key Performance Parameters.
- The MQ-9 was not assessed for its intelligence, surveillance, and reconnaissance capability in the IOT&E.

Recommendations

- Status of Previous Recommendations. The Air Force has addressed all previous recommendations.
- FY08 Recommendations. The Air Force should:
  1. Submit an updated TEMP reflecting the current Acquisition Strategy and detail the FOT&E activities required to fully assess the effectiveness and suitability of IOT&E deficiencies, incremental improvements, and intelligence, surveillance, and reconnaissance capabilities.
  2. Implement a robust reliability improvement program in order to address identified reliability shortfalls.

NAVSTAR Global Positioning System (GPS)

Executive Summary

- The Air Force Operational Test and Evaluation Center (AFOTEC) completed the GPS Architecture Evolution Plan (AEP) Operational Utility Evaluation (OUE) in 4QFY07. DOT&E assessed the new Operational Control Segment (OCS) as operationally effective and operationally suitable with some limitations.
- The NAVSTAR GPS test community is addressing previously identified deficiencies by including user equipment in operational testing and has developed a comprehensive GPS Enterprise Test and Evaluation Master Plan (TEMP).
- The NAVSTAR GPS Modernized System needs to integrate operational end-to-end testing of the space, control, and GPS modernized (Military-code) receivers on representative combat platforms in realistic operational and threat environments.

System

- The NAVSTAR GPS is an Air Force-managed joint Service precision navigation and timing space program used for DoD and non-DoD operations.
- The NAVSTAR GPS consists of three operational segments:
  - Space Segment: The NAVSTAR GPS spacecraft constellation consists of a minimum of 24 operational satellites in semi-synchronous orbit.
  - Control Segment: The control segment consists of primary and backup GPS master control stations, operational system control antennas, a pre-launch compatibility station, and geographically dispersed operational monitoring stations.
  - User Segment: There are many versions of NAVSTAR GPS mission receivers hosted on a multitude of operational systems and combat platforms.
- The system is being modernized with a Military-code (M-code) enhanced capability to better meet the needs of operational users. Future GPS updates will improve service in signal interference/jamming environments; enhance military and civil signal integrity; and provide time-critical constellation status.
- The Air Force Space Command has launched three blocks of NAVSTAR GPS satellites and has two blocks of spacecraft in development:
  - Block I (1982-1992)
  - Block II/IIA (1990-1997)
  - Block IIR/IIR-M (Modernized) (1997-present)
  - Block IIF development (initial launch scheduled for FY09)
  - Block III development (replacement spacecraft)

Mission

- Combatant commanders, U.S. military forces, allied nations, and various civilian agencies use the NAVSTAR GPS system to provide highly accurate, real-time, all-weather, passive, common reference grid positional data, and time information to operational users worldwide.
- Commanders use NAVSTAR GPS to provide force enhancement for combat operations and military forces in the field on a daily basis throughout a wide variety of global strategic, operational, and tactical missions.

Prime Contractors

- Block IIR/IIR-M: Lockheed Martin
- Block IIF: Boeing

Activity

- AFOTEC completed the GPS Architecture Evolution Plan (AEP) 5.2.1 OUE in 4QFY07. Testing was conducted in accordance with the DOT&E-approved TEMP and test plans. DOT&E assessed the new OCS as operationally effective with the limitation that it could not support reliable, autonomous operations. DOT&E assessed the new OCS as operationally suitable with the limitation that frequent warm starts and hardware reboots, while sustainable during normal operations, may be unacceptable during times of higher operations tempo.
- The Program Office completed developmental testing of the OCS AEP version 5.2.2 in 3QFY08.
- The Air Force launched the sixth NAVSTAR GPS Block IIR-M (Modernized) satellite in March 2008 and completed early on-orbit testing.
- As directed, the Integrated Test Team developed a draft TEMP for the GPS Enterprise. The GPS Enterprise includes Blocks IIF and III of the satellites; the AEP upgrade to the current OCS; the next generation Operational Control

Segment (OCX); Selective Availability / Anti-Spoof Module (SAASM)-capable GPS User Equipment; and M-code capable Military GPS User Equipment (MGUE).

Assessment

- To ensure effectiveness for combat, the NAVSTAR GPS Modernized User Equipment (MUE) receivers must be integrated into production-representative MGUE hosted on representative platforms (i.e., ships, aircraft, land, and space vehicles) and tested in realistic operational environments that include appropriate electronic warfare and information assurance conditions.
- The test planning by the NAVSTAR GPS test community for all segments of GPS (Space, Control, and User) improved significantly in 2008. The Integrated Test Team now includes members from the Army, Navy, Air Force, Marines, OSD, Federal Aviation Administration, and industry. The test planning must continue to integrate end-to-end testing of the Space, Control, and GPS receivers (including MGUE) in realistic operational environments.
- The sixth Block IIR-M satellite launched in March 2008; however, prototype NAVSTAR GPS MUE will not be available to conduct basic developmental testing of Block IIR-M unique capabilities until at least 2010. While this problem affects developmental testing, the Air Force should have production-representative MUE in place for adequate operational testing scheduled for 2012.
- The synchronization of the development of the space, control, and user segments continues to be a concern; however, progress towards creating MGUE production-representative articles has improved the situation. Delays in fielding MGUE preclude operational testing of IIR-M unique capabilities, but the risk to GPS III has been mitigated by the Air Force commitment of resources and planning to test GPS III capabilities with MGUE on operational platforms.
- The new capabilities and features of the Block IIR-M/IIF, and subsequent NAVSTAR GPS spacecraft must also complete realistic end-to-end testing to demonstrate adequate levels of effectiveness and suitability.

Recommendations

- Status of Previous Recommendations. There were no recommendations in FY06 or FY07. The Air Force continues to make progress on previous FY05 DOT&E recommendations, yet four out of the five recommendations still remain valid.
- FY08 Recommendations. None.

Small Diameter Bomb (SDB) Increment I

Executive Summary

- The Air Force conducted DOT&E-approved follow-on testing in early FY08.
- The release of Joint Munitions Effectiveness Manual Weaponeering Software (JWS) 1.2.1 corrected deficiencies in Small Diameter Bomb (SDB) lethality estimates. Additional improvements are expected in mid-FY09.
- The SDB Program Office conducted additional testing to determine optimal fuze settings when using aircraft target-designation. These different fuze settings resulted in greater lethality.
- Central Command (CENTCOM) led a Joint Capability Technology Demonstration (JCTD) on SDB Focused Lethality Munition (FLM) at White Sands Missile Range, New Mexico, in March 2008, in order to field 50 weapons in theater.

System

- The SDB is a 250-pound air launched weapon using deployable wings to achieve standoff range.
- SDB combines GPS and internal inertial navigation system guidance to achieve precise guidance accuracy.
- F-15E aircraft employ SDBs from the BRU-61/A four-weapon carriage assembly.
- The SDB warhead is a penetrator design with additional blast and fragmentation capability. Weapon impact initiates integral fuzing, with or without a specified function delay, or by reaching a preset height above the intended target.
- SDB provides reduced collateral damage while achieving kills across a broad range of target sets by precise accuracy, small warhead design, and focused warhead effects.
- SDB may receive support by the Talon NAMATH system. The system provides GPS differential corrections to the SDB through the F-15E data link prior to weapon release to increase SDB accuracy.

Mission

- Combatant commanders use SDB to attack fixed or relocatable targets that remain stationary from weapon release to impact. Units can engage both soft and hardened targets to include communications facilities, aircraft bunkers, industrial complexes, and lightly armored ground combat systems and vehicles.
- SDB-equipped units can achieve an increased weapons load out per aircraft compared to conventional air-to-ground munitions for employment against offensive counter-air, strategic attack, interdiction, and close air support targets in adverse weather.

Prime Contractor

- Boeing

Activity

- The Air Force completed a FOT&E, consisting of six live attacks, in early October 2007. The attack consisted of two live weapons against a ZSU-23-4 air defense system and four live attacks against a BM-21 multiple rocket launcher replica. The aircrew used aircraft target-designation with all six weapons set for impact fuzing.
- After reviewing the test results, the Program Office conducted additional flight tests in March 2008 against armored personnel carriers to compare SDB I lethality as a function of three different fuzing options. In August 2008, the Program Office repeated the FOT&E tests against the ZSU-23-4 and BM-21s with a different fuze setting.
- The Air Force conducted 17 live missions against a variety of targets to evaluate different targeting tactics.
- A major effort to improve JWS small warhead weaponeering accuracy is ongoing with large numbers of SDB I and II warheads and bare charge equivalents employed in static tests against realistic targets.
- The Air Force implemented hardware improvements in 4QFY07 and software improvements in January 2008 to improve BRU-61/A carriage reliability.
- The CENTCOM-led JCTD conducted SDB FLM testing throughout 2008. The Air Force supplemented the original six-weapon test program with 2 additional weapons and a

single weapon in 4QFY08. SDB FLM had a limited fielding of 50 weapons in theater.

Assessment

- As a result of the FOT&E and additional Program Office flight tests, the SDB program will release recommended fuze settings based on the targeting method employed. These additional tests demonstrated greater lethality than earlier tests. Apart from a fuze failure resulting in a dud, testing was largely successful, with target damage and collateral damage results in line with expectations.
- Release of JWS 1.2.1 reflected notable changes in SDB lethality numbers based on the new data and warhead test efforts. JWS 2.0 will emerge in mid-FY09 incorporating new data and major changes in methodology.
- The BRU-61A carriage reliability requirement is stated in terms of Mean Time Between Failure (MTBF). Before the improvement implementation, the MTBF stood at 327 hours, with the requirement being 500 hours by the end of Lot 2 deliveries. With these improvements addressing 70 percent of the flight failures, the re-calculated Lot 2 MTBF is 1,078 hours. The system now exceeds its operational requirement.
- The Program Office completed follow-on live fire testing using impact-fuzed SDBs to validate JWS improvements and to provide a more robust set of empirical data to better characterize the range of SDB capabilities against ground combat systems such as field artillery and lightly armored air defense systems in early FY08.

Recommendations

- Status of Previous Recommendations. The Air Force completed the FY07 recommendation and continues to make progress on the three FY06 recommendations.
- FY08 Recommendation.
  1. The Joint Munitions Effectiveness Manual office should continue efforts to collect small warhead test data to improve JWS 2.0 software and provide an update in FY09.

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

Executive Summary

- A September 2008 Acquisition Decision Memorandum (ADM) approved the Air Force's acquisition of a third and fourth Space-based Infrared System (SBIRS) Geostationary Earth Orbit (GEO) satellite, as well as sensor payloads for the third and fourth Highly Elliptical Orbit (HEO) systems.
- HEO-1 is undergoing operational testing, and is on schedule for message certification in 1QFY09. Early data indicate better than expected sensor performance; yet, overall system performance may be restricted initially by ground software limitations.
- The Air Force launched the HEO-2 payload in 2008, and it is undergoing early on-orbit testing. The test team intends to include HEO-2 in the current operational test plan with HEO-1.
- The ground architecture and operational requirements for subsequent HEO and GEO deliveries, including mobile survivable and endurable elements, need further definition.

System

The SBIRS program is being developed to replace the Defense Support Program (DSP) satellites and is being developed in two system increments:

- Increment 1 uses the SBIRS Control Segment and User Segment, operating with DSP satellites, to provide current military capability. Initial Operational Capability for Increment 1 was attained in December 2001, consolidating the operations of the DSP and Attack and Launch Early Reporting to Theater missions.
- Increment 2 will include a space segment consisting of two hosted payloads in HEO and four satellites in GEO. Currently, only the two HEO payloads have been launched. Increment 2 also provides new software and hardware to process data from both the DSP and the SBIRS space segment.

Mission

- Combatant commanders, deployed U.S. military forces, and allies intend to use SBIRS to conduct missions that require improved space sensors and operational launch detection capabilities.
- Commanders will use SBIRS to enhance support to joint combat forces in four key areas:
  - Timely and responsive space-based missile warning and detection
  - Launch detection for missile defense operations
  - Technical intelligence
  - Battlespace awareness

Prime Contractor

- Lockheed Martin

Activity

- A September 2008 ADM approved the Air Force's acquisition of a third and fourth SBIRS GEO satellite and sensor payloads for the third and fourth HEO systems. HEO-1 and the ground segment are currently undergoing an Operational Utility Evaluation (OUE) and U.S. Strategic Command expects certification of messages from fused DSP and HEO-1 data in late 2008. The OUE Report is due in 3QFY09.
- The Air Force launched the HEO-2 payload in 2008. It is currently undergoing early on-orbit testing and will be transferred to operations in 2QFY09. The Air Force Operational Test and Evaluation Center (AFOTEC) is planning to include HEO-2 in the current operational test plan with HEO-1. AFOTEC's aggressive integrated test and reporting efforts combined to accelerate operational acceptance and fielding of HEO-1 by approximately six weeks.
- Deficiencies in the GEO Flight Software Subsystem (FSS) were identified during GEO-1 developmental testing and required redesign to meet spacecraft control and telemetry functionality. The redesigned FSS is currently undergoing test. GEO-1 has a projected launch date of December 2009.

- Progress continues toward development of modeling and simulation software required to support SBIRS operational testing.

Assessment

- The SBIRS Increment 1 system, operating with the current DSP satellites, continues to demonstrate improved performance over the legacy DSP system.
- Early data from HEO-1 operational testing indicates good sensor sensitivity and acceptable end-to-end performance, but overall system performance appears to be limited by the capabilities of the current ground software. Individual measures are yet to be analyzed and reported.
- The ground architecture and operational requirements for subsequent Increment 2 deliveries need better definition to support development of an integrated test strategy that can meet the program schedule and mission needs. Specifically, the ground architecture for full HEO and GEO message processing, and the survivable and endurable mobile elements, lack sufficient definition.
- The Program Office is pursuing an initiative to accelerate the schedule from launch to testing and operations for the GEO-1 satellite. DOT&E supports testing at the earliest opportunity; however, a GEO operational test strategy and Test and Evaluation Master Plan (TEMP) need to be developed. Testing must include a combination of live targets and validated scenarios that include operationally-representative earth backgrounds.
- Compressed schedules for accredited SBIRS operational test scenarios and simulations increase program risk.

Recommendations

- Status of Previous Recommendations. The Air Force continues to make progress on the FY05 DOT&E recommendations, yet two of the original four recommendations remain valid as the Air Force continues to refine Concepts of Operation and operational requirements for each SBIRS increment. Both FY07 recommendations also remain valid.
- FY08 Recommendations.
  1. The Air Force should specify the ground architecture and operational requirements for each key SBIRS Increment 2 delivery.
  2. The Air Force should begin GEO TEMP development, and identify operational scenario needs early in order to provide sufficient development time with minimal risk.

Wideband Global SATCOM (WGS)

Executive Summary

- The Air Force successfully launched the first Wideband Global SATCOM (WGS) satellite in October 2007.
- In April 2008, U.S. Strategic Command accepted WGS-1 for operational use and deployed users were transitioned from a Defense Satellite Communications System (DSCS) satellite to WGS.
- The Air Force Operational Test and Evaluation Center (AFOTEC) completed Multi-Service OT&E (MOT&E) in May 2008, but AFOTEC has not yet published the report.

System

- WGS is the next generation wideband component in the DoD's future military satellite communication architecture providing communications in both the X-band and Ka-band frequencies. It is being procured in conjunction with the Government of Australia.
- WGS combines several capabilities onto a single satellite, providing tactical X-band communications, augmenting the Global Broadcast Service (GBS) Phase 2 system, and providing new two-way Ka-band service.
- The WGS system will be composed of three segments:
  - The Space Segment is being procured in a block of three or more satellites under the Federal Acquisition Regulation Part 12 rules for commercial item acquisition. The initial launch occurred in FY08.
  - The Control Segment equipment and components will be integrated with existing satellite communications control assets to provide an integrated WGS satellite constellation control capability.
  - The Terminal Segment consists of both existing and programmed terminal types acquired under Service and agency terminal programs.

Mission

- Combatant commanders, U.S. joint warfighters, and allied partners will use the capabilities of the WGS space-based communications system for all military operations short of nuclear war.
- Commanders will employ the WGS to alleviate the spectrum saturation of X-band, to provide increased single user data rate availability, and to increase total satellite communications capacity over that available with the current DSCS III satellites.

Prime Contractor

- Boeing

Activity

- The Air Force successfully launched the first WGS satellite in October 2007.
- Developmental testers and operational testers, along with Air Force and Army operators, worked effectively together to address all the system requirements during the limited windows to conduct integrated and dedicated operational test.
- On April 11, 2008, U.S. Strategic Command accepted WGS-1 for real-world operations and deployed users were transitioned from a DSCS satellite to WGS.
- AFOTEC conducted a MOT&E from April 21 to May 9, 2008, in accordance with the DOT&E-approved Test and Evaluation Master Plan (TEMP) and test plan.
- The MOT&E included multiple ground receive locations and three Navy ships in the Pacific region. AFOTEC has not yet published the report.

Assessment

- MOT&E was adequate to determine that the WGS satellite is effective and suitable. However, testing identified areas of concern in Management and Control.
- Based on operations with deployed users that transitioned from DSCS to WGS, users were able to effectively use the traditional DSCS X-band mission on WGS.
- Based on observations and preliminary results from the OT&E, the WGS satellite appears to be working well. New capabilities, including Ka-band service and more efficient use of the frequency spectrum, offer a substantial increase in wideband satellite communication capacity.
- Users could not effectively plan WGS communications using the Common Network Planning Software in its intended mode of operation during MOT&E.
- Legacy baseband equipment, not part of the system under test, has inherent limitations that may preclude users from realizing the data rate potential offered by the WGS satellite.

Recommendations

- Status of Previous Recommendations. The Air Force addressed all previous recommendations.
- FY08 Recommendation.
  1. The Air Force should conduct a follow-up assessment to assure that shortcomings in Management and Control have been corrected.

Ballistic Missile Defense Systems

Ballistic Missile Defense Systems

Ballistic Missile Defense System (BMDS)

Executive Summary

- The Missile Defense Agency (MDA) testing emphasis continues to move from testing the elements to testing the Ballistic Missile Defense System (BMDS).
- Due to test hardware problems associated with the Exoatmospheric Kill Vehicle (EKV), the MDA was unable to attempt any Ground-based Midcourse Defense (GMD) intercept tests during FY08. Instead, the MDA performed the Flight Test Other-03 (FTX-03) sensors-only flight test event.
- Terminal High-Altitude Area Defense (THAAD) and Aegis Ballistic Missile Defense (BMD) – theater elements of the BMDS – completed a combined total of five successful intercept flight tests in the past year.
- Command, Control, Battle Management, and Communications (C2BMC) continues to add and update functionality; battle management capability is still in early development.
- Sensor correlation and fusion that results in the generation of a weapon task plan remains untested during end-to-end live intercept flight tests. Multiple sensors were tested and a weapon task plan was generated during the sensors-only FTX-03 flight test; however, the MDA did not plan an intercept during the test.
- Target availability, reliability, performance, and cost remain major issues in BMDS flight testing.

System

- The current BMDS architecture integrates ballistic missile defense capabilities against all ranges of threats.
- BMDS is a distributed system currently composed of four elements and six sensor systems.

Elements

- Aegis Ballistic Missile Defense (BMD)
- Command, Control, Battle Management, and Communications (C2BMC)
- Ground-based Midcourse Defense (GMD)
- Patriot Advanced Capability 3 (PAC-3)

Sensors

- Aegis BMD AN/SPY-1 Radar
- Cobra Dane Radar
- Upgraded Early Warning Radars (UEWRs) – Beale and Fylingdales
- AN/TPY-2 (FBM) (Forward-Based Mission) radar (formerly Forward-Based X-band Transportable radar, or FBX-T)
- Space-Based Infrared System (SBIRS) / Defense Support Program (DSP)

- BMDS is employed as part of the nation's integrated strategic response plans.
- Projected near-term additions to the BMDS include the Sea-based X-Band (SBX) Radar, UEWR-Thule, and THAAD.
- Far-term additions to the BMDS may include:
  - Airborne Laser (ABL)
  - Kinetic Energy Interceptor (KEI)
  - Multiple Kill Vehicle (MKV)
  - Space Tracking and Surveillance System (STSS)

Mission

- The U.S. Strategic Command is responsible for synchronizing and integrating ballistic missile defenses employing U.S. Northern Command, U.S. Pacific Command, U.S. Central Command, U.S. European Command, and the BMDS to defend U.S. territory, deployed forces, friends, and allies against ballistic missile threats of all ranges, in all phases of flight. Initial capability will permit defending U.S. territory against simple ballistic missile threats and defending deployed forces, friends, and allies from theater-level ballistic missile threats.
- U.S. Strategic Command and U.S. Pacific Command will maintain situational awareness across the full mission engagement space using the C2BMC system.
- The Army employs Patriot to provide theater defense for the deployed forces against short- and medium-range threats. The MDA transferred Patriot to the Army; it is reported as an Army program.

Prime Contractor

- Boeing

Activity

- The MDA continued its emphasis on planning and conducting combined developmental and operational testing to the maximum extent possible during both flight and ground tests. Although not classic operational testing, the MDA incorporated as much operational realism as possible into its tests without compromising developmental test objectives.
- Due to test instrumentation problems, the MDA restructured the GMD flight test program. They conducted a non-intercept test, FTX-03, in July 2008 in place of FTG-04, and committed to adjusting their FY09 and beyond test program to ensure they collect the intercept data lost when FTG-04 was not accomplished. AN/TPY-2 (FBM), Aegis AN/SPY-1, SBX, and UEWR-Beale, C2BMC, and GMD Fire Control (GFC) elements participated in FTX-03.
- The MDA conducted two system-level ground tests, Ground Test Distributed-02 (GTD-02) in November 2007 and Ground Test Integrated-03 (GTI-03) in June 2008. One developmental ground test, Ground Test Other-3a (GTX-03a), occurred in February 2008. GTX-03b (scheduled for April 2008) was cancelled due to the test content being either deferred to a future test or re-allocated to GTX-03a.
- The MDA conducted a fully-digital simulation event of the BMDS in Performance Assessment 07 (PA07), which occurred in September/October 2007. This digital simulation included representations of GMD, Aegis BMD, AN/TPY-2 (FBM), C2BMC, and SBIRS/DSP. During FY08, the MDA cancelled the PA08 digital simulation event due to unavailability of Aegis BMD and AN/TPY-2 simulations of sufficient fidelity and validity, and to concentrate resources on preparations for PA09.
- THAAD conducted two intercept flight tests, Flight Test THAAD-08 (FTT-08) and FTT-09 between October 2007 and June 2008. Both events resulted in successful intercepts. THAAD also participated in GTX-03a, in preparation for GTI-03.
- Aegis BMD conducted three intercept flight tests, Flight Test Standard Missile-13 (FTM-13), Japanese FTM-1 (JFTM-1), and FTM-14, between November 2007 and June 2008. All three flight tests resulted in successful intercepts, and one of them demonstrated Aegis BMD ability to engage multiple, simultaneous threats. Aegis BMD conducted one sensor tracking exercise, Glory Trip-197, and participated in the GTX-03a ground test. In addition, Aegis BMD, using modified software in the current radar, fire control, and SM-3 Block 1A missile, participated in the successful shoot-down of a failed U.S. satellite.
- Patriot conducted the first successful flight test of the Missile Segment Enhancement (MSE) PAC-3 missile (Flight Test 7-1A) in May 2008 by firing an MSE control test missile at a simulated target.
- The U.S. Strategic Command Joint Functional Component Command for Integrated Missile Defense (JFCC-IMD) sponsored the Terminal Fury 08 wargame in November 2007, and the Assured Response 08a BMDS Exercise in June 2008.
- C2BMC participated in a variety of ground-tests, flight-tests, and wargames, including FTT-09, FTT-10, JFTM-01, FTM-14, FTX-03, GTD-02, GTX-03a, GTX-03d, GTI-03, Fast Shield, Terminal Fury, Assured Response 08a, Vigilant Shield 08, and JDIE-08.
- The MDA supported the Anti-Tactical Missile (ATM)-50 Patriot test in March 2008. This test was a Tactical Ballistic Missile (TBM) test using Patriot-as-a-Target (PAAT) with engagements by Patriot interceptors. ATM-50 also involved intercepting an Air Breathing Threat (ABT) in the debris cloud created by the PAAT engagements. Patriot also participated in FTT-10, and had four other successful flight test missions.
- The MDA used several single and multi-sensor satellite calibration exercises to gather data for modeling and simulation validation purposes.
  - Used Post Flight Reconstruction of the FTX-02 principal objects to anchor AN/TPY-2 model
  - Used a field data-driven approach to partner acceptability criteria with the BMDS Operational Test Agency Team

- Provided verification of model and simulation software, environments, threat performances and signature, radar atmospheric propagation, radar antenna and front-end processing data to accredit ground test digital simulations for use in performance assessments
- Continued investments in ground test infrastructure including digital signal injection systems that will exercise tactical signal and data processors, a capability that also enables future Concurrent Training Testing and Operations

• The MDA accomplished a number of important BMDS information assurance activities.
  - Throughout 2008, conducted Controls Validation Tests on BMDS sensors including the Beale and Thule UEWRs, Cobra Dane, and the SBX
  - Conducted a penetration test on SBX in June 2008
  - In September 2008, using the Air Force's 92nd Information Operations Squadron, conducted a comprehensive network penetration test on the C2BMC
  - Fielded Network Intrusion Detection Systems and monitoring capability on secure GMD communication networks
  - Continued to harden its fire control loop and deployed external interface boundary protection devices between GMD and the BMDS elements, sensors, and test enclaves

Assessment

• The elements that comprise the present and future BMDS are at differing levels of demonstrated capability.
  - Patriot provides the most mature and best understood capabilities against its assigned theater-level missile threats. This assessment is based on the number and complexity of test and evaluation events in which Patriot has participated (both flight and ground testing) as well as combat operations during Operation Iraqi Freedom.
  - Aegis BMD made progress towards demonstrating a robust theater-level missile defense capability against its assigned threats. This assessment is based on considerably less flight and ground testing than PAC-3, and includes few real-world operations, with one notable exception. In February 2008, a modified Aegis BMD shot down a failed U.S. government satellite.
  - THAAD testing indicates that it will provide a significant increase in capability against short- to intermediate-range threats when the MDA incorporates it into the BMDS in FY10.
  - GMD was unable to perform any intercept flight testing in FY08 due to problems with the test equipment onboard the EKV. As the most technologically complex element of the fielded BMDS, GMD provides the least mature missile defense capability. While GMD has demonstrated a capability against a simple foreign threat, GMD flight testing to date will not support a high level of confidence in its limited capabilities. Ground testing continues to demonstrate increasing GMD integration, but additional test data collected under realistic flight test conditions is necessary to validate models and simulations and to increase confidence in the ability of these models and simulations to accurately predict system capability.

• The inherent BMDS defensive capability against theater threats increased during the last fiscal year and DOT&E expects this trend to continue. The inherent BMDS defensive capability against strategic threats, however, is limited to simple, ballistic missile threats launched from North Korea toward the United States. The delays in intercept flight testing this fiscal year and the continuing lack of accredited BMDS level models and simulations at the strategic level impacts the ability of DOT&E to determine whether any increases in strategic defensive capability have occurred this fiscal year.
• C2BMC continues to add new functionality and update existing functionality. Communications and situational awareness have improved, but challenges remain. To date, C2BMC is not sufficiently mature to provide support for an integrated, layered defensive capability against any range of threat missile.
• The ground test program has advanced faster than the flight test program can provide validation data for the models and simulations upon which ground testing relies (especially for defense against strategic threats). The misalignment between the ground and flight test programs is partially responsible for the lack of data to verify and validate PA07 as well as forcing the cancellation of PA08. The lack of sufficient data for validation and accreditation of models and simulations negatively impacted BMDS performance assessments as the results from ground testing could not be used for these assessments with any real confidence. The decision to forego PA08 and focus on the validation of models to support PA09 was a sound one.
• Challenges associated with targets engaged by both strategic and tactical missile defense systems remained throughout FY08.
  - The MDA suffered another target failure in FTX-03 in July 2008 when the target fell short of its intended impact point and failed to properly execute a subsystem package. Critical test data were not collected.
  - The THAAD program encountered another target failure when the foreign military acquisition target expended for THAAD Flight Test 10 in September 2008 failed to sustain propulsion long enough to execute the flight test profile.
  - The MDA is continuing to develop the Flexible Target Family (FTF), which it hopes will not only reduce cost through production efficiency and modular flexibility, but also improve reliability and timeliness. Currently, the FTF's first planned target launch is planned for April 2009. However, the recently completed General Accountability Office audit of the MDA target program highlighted the challenges MDA still faces.
  - Currently, the FTF is not ready. As a result, the MDA continues to use less reliable targets that sometimes do not meet program requirements to fully demonstrate their systems' capabilities. The MDA is still several years away from a fully implemented FTF. It is questionable

whether the anticipated cost-saving will be realized. In the meantime, the MDA will continue to suffer schedule delays, retests, and partially met test objectives as the result of unreliable and inadequate older targets and target designs.
- Efforts to improve information assurance are showing progress. For example, the comprehensive penetration test against the C2BMC demonstrated its resistance to external threat efforts. MDA's use of independent evaluators such as the 92nd Information Operations Squadron this past year and the National Security Agency's Information Assurance Directorate in early 2009 is an important step in demonstrating information assurance for the BMDS.
- The BMDS program relies heavily on modeling and simulation such as the Parametric Endo-Exoatmospheric Lethality Simulation (PEELS), Kinetic Warhead Evaluation (KWEVAL), and GMDPEELS models to estimate lethality against its spectrum of threat targets. The credibility of those models is closely tied to the empirical data used to develop and validate them. While MDA conducted subscale lethality testing on strategic targets and continued to execute the THAAD LFT&E program in 2008, lethality testing has not kept up with the need to assess BMDS lethality for an expanding set of targets and engagement conditions that are part of the expanding BMDS mission. Because the current version of GMDPEELS incorporates only one accredited target model, lethality against other targets in ground tests associated with GBI endgame analysis cannot be assessed. While PEELS and KWEVAL contain many targets, models for newer untested targets need to be added and some of the existing target models could require additional test data for validation. The lack of sufficient test data for lethality model development and validation has limited past BMDS lethality assessments and, without additional lethality test and evaluation activities, will become a more significant limitation as the threat evolves.

Recommendations

- Status of Previous Recommendations. The MDA addressed seven of the previous nine recommendations. The MDA continues to improve the collection of reliability, availability, and maintainability data, and is reviewing the target program.
- FY08 Recommendations.
  1. In conjunction with the expanding BMDS mission, the MDA should review its test and analysis data requirements to support lethality simulation development and validation and formulate a long-term plan to address those requirements.
  2. The MDA should coordinate for an official designation of a BMDS Computer Network Defense Service Provider organization within the DoD to provide a comprehensive system approach for information assurance and standardize computer network defenses and responses.
  3. The MDA should conduct a flight test with Aegis BMD, the AN/TPY-2 (FBM), the Beale UEWR, and the SBX all participating to demonstrate target correlation and fusion that generates a weapon task plan and results in a successful intercept of a threat-representative target.

Aegis Ballistic Missile Defense (Aegis BMD)

Executive Summary

- Aegis Ballistic Missile Defense (BMD) intercepted both short- and medium-range targets during FY08 tests. The short-range engagements included a two-target engagement and a single-target engagement. All short-range targets were non-separating. Aegis BMD also conducted a single engagement using a medium-range separating target.
- Based on combined developmental and operational testing from FY06 to FY08, Commander Operational Test and Evaluation Force (COTF) declared the Aegis BMD 3.6 system to be operationally effective and operationally suitable. Additionally, COTF recommended transition of 18 ship sets and up to 90 SM-3 Block IA missiles from the Missile Defense Agency (MDA) to the Navy. The MDA transferred the Aegis BMD 3.6 system to the Navy in October 2008.
- Aegis BMD demonstrated the Aegis BMD 3.6.1 sea-based terminal capability in one of the FY08 intercept tests.
- Aegis BMD demonstrated long-range surveillance and track (LRS&T) capability to support the Ground-based Midcourse Defense (GMD) mission and the ability to send and receive a cue to and from the Terminal High-Altitude Area Defense (THAAD) system during exercises in FY08.
- Continuing involvement of operational testers and warfighters in flight tests has proven valuable in planning and conducting operationally-realistic tests and in exposing operational design and training issues.

- Aegis BMD can cue other BMDS sensors through tactical data links.
- A near-term sea-based terminal ballistic missile defense capability is provided with a modified SM-2 Block IV missile.

System

- Aegis BMD is a highly-mobile, sea-based missile defense system that employs the multi-mission shipboard Aegis Weapon System, with new radar and missile capabilities to engage ballistic missile threats.
  - Computer program modifications to the AN/SPY-1 radar allow LRS&T of long-range ballistic missiles.
  - A modified Aegis vertical launcher system stores and fires the new, larger Standard Missile-3 (SM-3) Block IA.
  - The SM-3 Block IA design delivers a maneuverable kinetic warhead to an intercept point in the upper atmosphere or in space.
- Aegis BMD is capable of autonomous missile defense operations and can accept external cues and tracks over tactical data links.

Mission

The Navy can accomplish three missions using Aegis BMD:

- Provide forward-deployed radar capabilities to enhance defense against long-range ballistic missile threats
- Provide all short- to long-range ballistic missile threat data to the Command, Control, Battle Management, and Communications (C2BMC) system for dissemination to U.S. Strategic Command and U.S. Pacific Command to ensure situational awareness
- Defend deployed forces and allies from short- and medium-range theater ballistic missiles

Prime Contractors

- CSC
- Lockheed Martin
- Raytheon

Activity

- In FY08, the Aegis BMD program continued to demonstrate engagement and LRS&T capabilities. The program completed the combined Developmental Test/Operational Test (DT/OT) phase of testing that supported the transition of the Aegis BMD 3.6 system to the Navy in October 2008.

- The Aegis BMD program completed three successful intercept flight tests in FY08: Flight Test Standard Missile-13 (FTM-13), Japanese FTM-1 (JFTM-1), and FTM-14.
  - An Aegis BMD cruiser successfully conducted a near-simultaneous engagement of two short-range unitary ballistic missile targets using a two-missile salvo of SM-3 Block IA interceptors during FTM-13 in November 2007.
  - A Japanese Aegis BMD destroyer successfully conducted an engagement of a medium-range separating target with an SM-3 Block IA interceptor during JFTM-1 in December 2007.
  - An Aegis BMD cruiser successfully conducted an engagement of a short-range target in the terminal phase of flight using a salvo of two modified SM-2 Block IV interceptors during FTM-14 in June 2008.
- Aegis BMD successfully conducted a shoot-down of a failed U.S. Government satellite using modified system software and a modified SM-3 interceptor in February 2008.
- COTF conducted a maintenance demonstration exercise in March 2008. The purpose of the exercise was to verify that maintainability, maintenance training, documentation, and logistic supportability are adequate to support fleet operational requirements. The test was conducted by COTF as part of their evaluation of the Aegis BMD 3.6 System.
- Aegis BMD participated in several flight and ground tests to assess Aegis BMD functionality and interoperability with the BMDS during FY08.
  - Performance Assessment 07 (PA07) in September/October 2007 used software representations of Aegis BMD, GMD, AN/TPY-2 Forward-Based Mode (FBM) radar, C2BMC, and Space-Based Infrared System (SBIRS)/Defense Support Program (DSP) to explore interoperability and functionality in a digital simulation event.
  - Ground Test Distributed-02 (GTD-02) in November 2007 demonstrated BMDS operational functionality, connectivity, and interoperability. Two Aegis BMD ships used dockside simulators and simulators at two Naval Surface Warfare Center locations.
  - Ground Test Other-03a (GTX-03a) in February 2008 used hardware-in-the-loop simulations to test the interactions among Aegis BMD, THAAD, Patriot, and other sensors and command and control interfaces. Aegis BMD demonstrated a capability to launch using an AN/TPY-2 (FBM) cue as part of the exercise.
  - Flight Test THAAD-09 (FTT-09) in June 2008 demonstrated the ability of Aegis BMD to receive a cue from THAAD over operational communication links. An Aegis BMD cruiser conducted a simulated engagement of a medium-range ballistic missile target after receipt of the THAAD cue.
  - Aegis BMD detected and tracked an intercontinental ballistic missile target during the Air Force test Glory Trip-197 in May 2008.
  - Ground Test Integrated-03 (GTI-03) in June 2008 used hardware-in-the-loop systems to test the interactions among Aegis BMD, GMD, THAAD, and C2BMC nodes, demonstrating BMDS functionality, connectivity, and interoperability in the Missile Defense System Exerciser architecture.
  - Aegis BMD participated with the AN/TPY-2 (FBM), SBX, and UEWR-Beale sensors in a sensors and target-only flight test, FTX-03, in July 2008.

Assessment

- In FY08, Aegis BMD flight testing continued to demonstrate the capability to engage short-range unitary and medium-range simple separating ballistic missile targets.
- COTF completed evaluation of the Aegis BMD 3.6 system in support of transition to the Navy in FY08. The Commander declared the system to be operationally effective and operationally suitable. Additionally, COTF recommended transition of 18 ship sets and up to 90 SM-3 Block IA missiles from the MDA to the Navy.
- SM-3 Block IA interceptors equipped with a fully capable divert system on the kinetic warhead were flown in the latter stages of DT/OT testing; however, flight tests to date have not yet exercised the full range of divert system pulse modes. Also, the full range of pulse modes of the third-stage rocket motor on the SM-3 have not been tested in a live intercept event.
- FTM-14 demonstrated the capability to intercept a short-range ballistic missile target in the terminal phase of flight with a modified SM-2 Block IV interceptor. Live intercept testing of this capability is limited, and additional testing is needed to better evaluate the effectiveness of the Aegis BMD 3.6.1 near term sea-based terminal capability.
- Test events during DT/OT demonstrated the utility of the unitary version of the Aegis Readiness Assessment Vehicle (ARAV-A) target as an affordable target for tracking and intercept tests for some mission scenarios.
- The Aegis BMD program continues to assess its interoperability with the BMDS. In FY08, the Aegis BMD flight test program incorporated other BMDS elements and components. FTM-14 and JFTM-1 provided opportunities to send and receive cues between Aegis BMD and THAAD. Aegis BMD participation during an FY08 Glory Trip event and others in past years has provided valuable data toward assessing Aegis BMD LRS&T capability in support of GMD. However, to date, GMD has not utilized Aegis BMD track data in the real-time construction of a GMD weapon task plan during a live intercept test event.
- The Aegis BMD program continues to include operational realism in its flight test program, as demonstrated during the DT/OT test phase. Aegis BMD benefits from the active participation of the operational test and warfighter communities, as their recommendations are incorporated in system design modifications; tactics, techniques, and procedures; fleet training; and follow-on flight missions.
- During FTX-03, Aegis BMD successfully supported the LRS&T mission by tracking a live target with an Aegis BMD configured Destroyer in an operationally-representative test support position. Aegis BMD track data was sent to GMD.

Post mission analysis confirmed Aegis BMD's ability to support cueing of SBX by GFC and formation of a weapons task plan for a Launch on Aegis BMD scenario.

Recommendations

- Status of Previous Recommendations. The program addressed the single recommendation from FY07.
- FY08 Recommendations.
  1. The MDA should conduct an analysis using verified and validated modeling and simulation across its engagement envelope and threat set to determine the extent to which the second pulse of the SM-3 Block IA kinetic warhead divert system would be invoked. The MDA should use this analysis to determine what, if any, additional flight testing is required.
  2. The MDA should conduct an analysis of the third-stage rocket motor zero-pulse mode using verified and validated modeling and simulation to assess its capability since this mode would be difficult to safely demonstrate in a flight test due to the requirement to fly the target nearly directly over the SM-3 launching ship endangering both the ship and its crew.
  3. The program should conduct further end-to-end testing of the Aegis BMD 3.6.1 sea-based terminal capability to allow for a more thorough assessment of its operational effectiveness.
  4. The program should continue to test and refine the interoperability of the Aegis BMD system with the AN/TPY-2 radar operating in both forward-based and theater modes.
  5. Aegis BMD should demonstrate in an intercept flight test, a launch on remote engagement using an external sensor cue.
  6. The MDA should explore the viability of expanding the use of separating versions of the ARAV for engagement scenarios in operationally realistic testing.

Command, Control, Battle Management, and Communications (C2BMC) System

Executive Summary

- The Command, Control, Battle Management, and Communications (C2BMC) system capabilities and interactions with other elements, particularly the Terminal High-Altitude Area Defense (THAAD) and AN/TPY-2 (FBM) radar, expanded significantly in FY08.
- The Missile Defense Agency (MDA) continues to correct C2BMC display inaccuracies and improve data presentation.
- Although C2BMC is still principally used as a situational awareness and deliberate BMDS planning tool, the MDA in FY08 improved sensor management and demonstrated track forwarding capabilities.

System

- C2MBC is the warfighter's interface to the fully integrated Ballistic Missile Defense System (BMDS).
- Initial configuration includes C2BMC data terminals at the Missile Defense Integration and Operations Center (MDIOC), Schriever Air Force Base, Colorado; Cheyenne Mountain, Colorado; Fort Greely, Alaska; U.S. Strategic, Northern, and Pacific Commands, and the National Military Command System.
- The current C2BMC system provides situational awareness to warfighters and the National Command Authority with information on missile events, BMDS status, and system coverage. C2BMC also provides above-element deliberative planning at the combatant command and component level, permitting a federation of planners across the BMDS. Aegis Ballistic Missile Defense (Aegis BMD) and Ground-based Midcourse Defense (GMD) elements use their own command, control, battle management systems and mission planning tools for stand-alone engagements.
- Currently, the C2BMC provides command and control for the AN/TPY-2 (FBM) radar located at Shariki Japan.
- C2BMC provides track forwarding of AN/TPY-2 (FBM) and AN/SPY-1 tracks to GMD. Additionally, it provides track forwarding of AN/TPY-2 (FBM) tracks to Aegis BMD for cueing.

Mission

U.S. Strategic, Northern, and Pacific Commands currently use the C2MBC to provide communications necessary to support ballistic missile defense engagements, as follows:

- Deliberate planning
- Collaborative dynamic planning
- Situational awareness
- Consequence management
- Network management
- AN/TPY-2 (FBM) sensor management and control

Prime Contractor

- Boeing

Activity

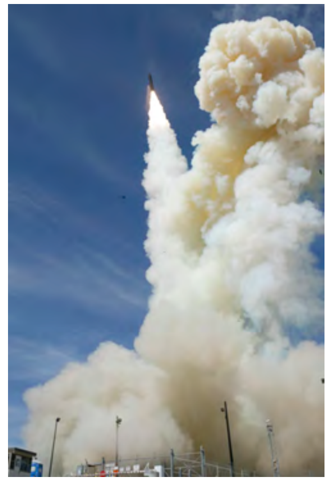
- In FY08, C2BMC participated in five ground tests (integrated hardware-in-the-loop tests and distributed tests that used operational hardware and software) and five flight tests.
- Software spiral 6.2 is operational at all Combatant Commands. Development and verification testing of software spiral 6.4 has begun and will continue into FY09. Hardware upgrade installation in preparation of spiral 6.4 is taking place at some Combatant Commands and other sites.
- C2BMC was used during the Japan Flight Test Mission-1 in December 2007. This was the first opportunity in a live fire test for C2BMC to receive and display both THAAD and Aegis BMD track data.
- In the flight test FTX-03, C2BMC demonstrated the passing of AN/TPY-2 (FBM) track data to GMD for the cueing of Upgraded Early Warning Radars (UEWR), and the passing of Aegis BMD track data to GMD for the cueing of the

Sea-based X-Band Radar (SBX). It also demonstrated the down-selection and forwarding of AN/TPY-2 (FBM) tracks to Aegis BMD for cueing.
- In FY08, C2BMC participated in two wargames associated with major combatant commander exercises: Terminal Fury 08 and Assured Response 08a.
- C2BMC capability (web browser and planner) was installed at U.S. Central Command and U.S. European Command.
- C2BMC accomplished upgrades to the BMDS network infrastructure which increased redundancy and survivability at the early warning sites, increased bandwidth between major sites and nodes, and enhanced the performance of the satellite teleport sites at Germany and Hawaii.
- C2BMC implemented the BMDS Network Operations and Security Center (BNOSC), which enables active network monitoring and analysis, a full time operations cell that will protect the networks against intrusion, manage upgrades, and provide real-time outage reporting and resolution.

Assessment
- C2BMC continues to demonstrate the ability to provide situational awareness by receiving and displaying data from a variety of sensors, and demonstrating AN/TPY-2 (FBM) track forwarding and radar management functions.
- C2BMC is a critical component of the BMDS. Its interactions with other elements continued to increase and improve in FY08, and it now has limited battle management capabilities. Warfighters manning C2BMC consoles can direct the AN/TPY-2 (FBM) radar to execute focused search plans or respond to a precision cue, as well as forward radar tracks to Aegis BMD.
- Spiral 6.4 introduces the Global Engagement Manager (GEM), which ties together sensors across different areas of responsibility allowing for global resource management, system-wide detection and tracking, and control of AN/TPY-2. However, the important initial capability of generating a single system track from multiple sensor source tracks is still in development.
- C2BMC continues to demonstrate interoperability with more elements, but requires more extensive testing to support development of tactics, techniques, and procedures.

Recommendations
- Status of Previous Recommendations. The MDA addressed six of the previous eight recommendations. The MDA continues to make progress on the remaining two FY06 recommendations.
- FY08 Recommendations. None.

Ground-Based Midcourse Defense (GMD)



Executive Summary

- The Missile Defense Agency (MDA) did not conduct a GMD intercept flight test during FY08 due to developmental test hardware problems associated with the Exoatmospheric Kill Vehicle (EKV).
- The MDA added Flight Test Other-03 (FTX-03), a non-intercept sensors-only flight test event completed in July 2008, primarily to test and evaluate multiple sensor correlation and fusing of target track data. Flight test operational realism during FTX-03 was adequate at the current level of technological maturity of GMD and met, or partially met, seven of the nine DOT&E-approved operational realism criteria.
- The MDA and the Ballistic Missile Defense System (BMDS) Operational Test Agency (OTA) Team conducted two ground tests and one digital simulation test of the GMD within the BMDS. These tests were adequate for characterization of GMD behavior; however, they were not adequate for evaluation of GMD performance due to the lack of verified, validated, and accredited (VV&A) models and simulations for that purpose.
- Collection of interceptor reliability, availability, and maintainability data was not adequate to make an assessment of GMD suitability.

System

GMD is the principal element used by the Ballistic Missile Defense System (BMDS) for the homeland defense mission. The current distributed GMD configuration consists of the following systems:

- Cobra Dane Upgrade Radar at Eareckson Air Station (Shemya Island), Alaska
- Upgraded Early Warning Radars (UEWR) at Beale Air Force Base, California, and Fylingdales, United Kingdom
- Ground-based Interceptor (GBI) missiles at Fort Greely, Alaska, and Vandenberg Air Force Base, California
- GMD Fire Control (GFC) nodes reside at the Missile Defense Integration and Operations Center, Schriever Air Force Base, Colorado; and Fort Greely, Alaska. The GFC includes In-Flight Interceptor Communications System (IFICS) Data Terminals (IDTs) at Vandenberg Air Force Base, California; Fort Greely, Alaska; and Shemya Island, Alaska.
- External interfaces include Aegis BMD; Cheyenne Mountain Directorate, Colorado; Command, Control, Battle Management, and Communications (C2BMC), Peterson Air Force Base, Colorado; Space-Based Infrared System (SBIRS), Buckley Air Force Base, Colorado; and AN/TPY-2 (FBM) radar, Shariki Air Base, Japan.

Mission

U.S. Strategic Command operators will use the GMD system to defend U.S. territory, deployed forces, friends, and allies against threat ballistic missiles (intercontinental- and intermediate-range missiles).

Prime Contractors

- Boeing
- Orbital
- Raytheon

Activity

- The MDA conducted FTX-03 in July 2008 primarily to test and evaluate multiple sensor correlation and fusing of target track data. BMDS operational sensors (AN/TPY-2 (FBM), Aegis AN/SPY-1, SBX, and UEWR-Beale) acquired and tracked the long-range, threat-representative target missile and transmitted data to the operational GFC, which generated a weapon task plan. Warfighters from the Army's 100th Missile Defense Brigade and 49th Missile Defense Battalion crews participated in the test. As planned, the interceptor was simulated.
- The MDA and the BMDS OTA Team conducted two major ground tests during FY08:
  - Ground Test Distributed-2 (GTD-02) in November 2007 was an integrated ground test using the currently fielded hardware and communications to test functionality, interoperability, and performance of the currently

fielded GMD using multiple simulated threat scenarios. Warfighters from the Army's 100th Missile Defense Brigade and 49th Missile Defense Battalion performed their wartime duties in this realistic exercise of the fielded BMDS capability.
  - Ground Test Integrated-03 (GTI-03) in June 2008 was an integrated ground test using the various BMDS element laboratories to test functionality, interoperability, and performance of the currently fielded GMD capability using multiple simulated threat scenarios. Some of the test scenarios were conducted using warfighters deployed from the Army's 100th Missile Defense Brigade and 49th Missile Defense Battalion. GTI-03 was the second element of the MDA's three element annual ground test campaign that will conclude in early CY09 with GTD-03.
- The MDA conducted Performance Assessment 07 (PA07) in September/October 2007. PA07 was a fully digital simulation test which simulated performance of the currently fielded BMDS including GMD. Multiple simulated threat scenarios stimulated digital simulations of the BMDS and its elements. A digital representation of GMD received inputs from the digital threat models, environmental models, and other BMDS models. The digital GMD representation used these inputs to simulate GMD response and performance.
- In response to emerging contingencies, a series of ground tests were conducted to assess the capability of the currently configured GMD system against potential threats to the United States and Pacific Rim allies. The BMDS OTA Team participated in these efforts, gaining valuable insights into the capabilities and limitations of the currently deployed system.

Assessment
- The MDA conducted limited combined developmental/operational flight testing of the GMD with continued emphasis to incorporate operational realism.
- Flight test operational realism was adequate in FTX-03 and met, or partially met, seven of the nine DOT&E-approved operational realism criteria. As planned, no interceptor was employed in this test. A target subsystem malfunction, currently under investigation, precluded completing the evaluation of all the planned test objectives. FTX-03 demonstrated real-time acquisition and track of a threat-representative target by four operational sensors; data transmission from the sensors to the GFC; GFC data correlation and engagement planning; human in control; and limited execution of warfighter tactics, techniques, and procedures.
- Ground tests GTD-02 and GTI-03, and digital simulation test PA07, were adequate for characterization of GMD behavior and provided insight into potential GMD functionality, interoperability, and performance. However, conformance of test article performance in test to GMD operational performance was not supported by independent accreditation of the models and simulations employed in test. Verified and validated data for GTD-02 and PA07 was either not available, or did not meet, BMDS OTA Team acceptability criteria. Data for GTI-03 was delivered to the BMDS OTA Team post-test in September and was under review at the close of FY08. Verified and validated model and simulation data of threat performances and signatures, environments, radar atmospheric propagation, radar antenna and front-end processing performances, and interceptor performance are used to accredit ground tests and digital simulation tests for use in performance assessments. The MDA and the BMDS OTA Team are working to establish mutually agreed upon data acceptability criteria for model and simulation verification and validation in support of the BMDS OTA Team's accreditation program.
- The MDA implemented a program to systematically collect reliability and availability data for the fielded GMD assets. This is a significant step forward; however, the collection of the interceptor reliability, availability, and maintainability data to date has not been adequate to make an assessment of GMD suitability. Due to a failed developmental test telemetry component within the GMD interceptor, the MDA restructured the flight test program. Flight tests are critical to determining interceptor reliability.

Recommendations
- Status of Previous Recommendations. The MDA has addressed five of the previous nine recommendations. Although the MDA has made progress, four previous recommendations remain valid.
- FY08 Recommendations. None.

Sensors

Executive Summary

- In July 2008, the Missile Defense Agency (MDA) conducted the Flight Test Other-03 (FTX-03) non-intercept sensors-only flight test that used the AN/TPY-2 (Forward-Based Mission (FBM)) radar, the Aegis AN/SPY-1 radar, the Sea-based X-band (SBX) radar, and the Upgraded Early Warning Radar-Beale (UEWR-Beale). However, a target subsystem failure precluded the collection of some important sensor data.
- The MDA used several other field test targets of opportunity and multi-sensor satellite track calibration exercises to gather data for verification, validation, and accreditation of models and simulations of critical system functions including Sensor Registration, System Track, and Discrimination. Although progress is being made, no Ballistic Missile Defense System (BMDS) sensors have high fidelity performance models and simulations verified, validated, and accredited for use by the BMDS Operational Test Agency (OTA) Team.


Cobra Dane


SBX


UEWR


AN/TPY-2

System

The BMDS sensors are:

- Cobra Dane radar: An L-band single-face (120-degree azimuth field of view), phased array radar located at Shemya, Alaska.
- SBX radar: An X-band single-face, phased array radar on a movable mount, positioned on a fifth generation twin-hulled, semi-submersible, self-propelled ocean-going platform, home-ported at Adak, Alaska.
- Upgraded Early Warning Radars (UEWRs): Ultra High Frequency fixed site, fixed orientation, phased array radars located at Beale Air Force Base, California (2 faces, 240-degree azimuth field of view), and Fylingdales, England (3 faces, 360-degree azimuth field of view).
- AN/TPY-2 (FBM) for Forward-Based (formally called Forward based X-band Transportable (FBX-T) Radar): A Terminal High-Altitude Area Defense high resolution, X-band, phased array radar with modified software to provide acquisition and tracking of ballistic missiles of all ranges in the boost phase and transition to midcourse phase of flight. The radar is operationally deployed at Shariki, Japan.
- Aegis Ballistic Missile Defense (BMD) radars: Aegis AN/SPY-1 radars modified to provide surveillance and tracking of long-range ballistic missiles.
- Space-Based Infrared System (SBIRS): An infrared satellite constellation and ground station that provides the BMDS with the initial notification of a ballistic missile launch and defended area determination.


Aegis BMD


SBIRS/DSP

Mission

U.S. Strategic Command, U.S. Northern Command, U.S. European Command, U.S. Pacific Command, and U.S. Central Command warfighters will use the BMDS sensors to:

- Detect, track, and classify ballistic missile threats targeting the United States, its allies, and its friends
- Provide situational awareness data to the BMDS Command, Control, Battle Management, and Communications (C2BMC) element
- Generate weapon task plans for ballistic missile defensive systems such as Aegis BMD and Ground-based Midcourse Defense (GMD)

Prime Contractors

- Aegis AN/SPY-1: Lockheed Martin
- AN/TPY-2: Raytheon
- Cobra Dane: Raytheon
- SBIRS: Lockheed Martin
- SBX: Boeing
- UEWRs: Raytheon

Activity

- Cobra Dane: Due to its location and field of view, Cobra Dane cannot participate in current BMDS intercept flight test events. During the past year, it participated in several ground test events, culminating in the system-level Ground Test Distributed (GTD)-02 and Ground Test Integrated (GTI)-03 events in November 2007 and June 2008, respectively. It did adequately track targets of opportunity in the missile defense mode.
- SBX: SBX collected track and discrimination data on the Glory Trip-196, -197, and -194 inter-continental ballistic missile targets from April to August 2008, and participated in several ground test events, culminating in the system-level GTD-02 and GTI-03 events. SBX also participated in the Flight Test Other (FTX)-03 non-intercept sensors and target-only flight test.
- UEWR: UEWR-Beale participated in the FTX-03 flight test. The UEWRs (Beale and Fylingdales) also participated in several MDA system-level ground-test events, culminating in the system-level GTD-02 and GTI-03 events. UEWR Beale collected data on the Glory Trip-196, -197, and -194 inter-continental ballistic missile targets from April to August 2008.
- AN/TPY-2 (FBM): The AN/TPY-2 (FBM) radar observed the Glory Trip-197 inter-continental ballistic missile target as risk reduction for future flight tests in May 2008. The MDA then moved the radar to its test site in Juneau, Alaska, in support of FTX-03. The operational radar at Shariki also participated in several ground-test events, culminating in the November 2007 GTD-02 event, the June 2008 GTI-03 event, and extended operational periods as part of certification activities.
- Aegis BMD: Aegis BMD participated in multiple live-tracking exercises, ground tests, and real-world operations during FY08, including FTX-03 and the planned FTT-10. Its ground test participation culminated in the system-level GTD-02 and GTI-03 events.
- SBIRS: SBIRS participated in several ground tests culminating in the distributed ground test GTD-02 in November 2007 and the June 2008 hardware-in-the-loop GTI-03 test events.
- BMDS Sensors: The collection of BMDS sensors were used to collect precision track information on a failed U.S. satellite. The integrated track data was used by Aegis BMD to develop a fire control solution to direct a modified SM-3 interceptor to destroy the satellite prior to re-entry.
- The MDA used several single and multi-sensor satellite calibration exercises to gather data for verifying and validating models and simulations.

Assessment

- Cobra Dane: Performance estimates for Cobra Dane are limited to the ground test results and the targets of opportunity. These estimates rely on models and simulations that are not yet verified, validated, and accredited for use in assessing performance. This will require the MDA to fly another target through the Cobra Dane field of view. The MDA has agreed that this is necessary, but has not yet scheduled this test.
- SBX: SBX has yet to successfully support a live intercept mission. SBX successfully tracked the target in FTX-03, but did not collect important test data due to a target subsystem failure.
- UEWRs: UEWR-Beale successfully tracked the target in FTX-03, but did not collect important test data due to a target subsystem failure.
- AN/TPY-2 (FBM): The second AN/TYP-2 was successfully relocated to Juneau, Alaska, to participate in FTG-04. After the MDA restructured the flight test program, the AN/TYP-2 radar successfully tracked the target in FTX-03 and transmitted this data to C2BMC.
- Aegis BMD: Aegis BMD continues to evaluate its interoperability with the BMDS, and continues to support BMDS testing and real-world activities. Aegis BMD collected valuable BMDS mission support performance data during long-range surveillance and track exercises and real-world events. During FTX-03, Aegis BMD successfully tracked the target in FTX-03, but did not collect important test data due a target subsystem failure.
- SBIRS: SBIRS continues to improve the ability to support the BMDS with timely and accurate launch and predictive impact data.
- Overall: As each sensor finishes upgrades or development, it is demonstrating the ability to provide accurate and timely data to support successful BMDS intercepts.

Recommendations

- Status of Previous Recommendations. One of the previous nine recommendations remains valid.
- FY08 Recommendation.
  1. The MDA must extend its Post Flight Reconstruction methodology to this year’s flight tests to support verified, validated, and accredited sensor models.

Technology Programs

Executive Summary

- The MDA made progress this past year on its four major technology programs.
- The Airborne Laser (ABL) lethal demonstration against a threat-representative ballistic missile is scheduled for late FY09. On September 7, 2008, the MDA successfully fired the high-energy chemical laser onboard the ABL aircraft for the first time during ground testing at Edwards Air Force Base, California.
- The launch of two Space Tracking and Surveillance System (STSS) satellites has been delayed due to recent technical problems with Space Vehicle 2. A fix is anticipated, but due to logistical constraints in scheduling, the launch date has been delayed to 2009.
- The Kinetic Energy Interceptor (KEI) made progress in developing and testing the Stage 1 and 2 rocket motors in FY08, completing two static fire tests, two burst tests, and initiating avionics qualification testing. A number of motor case components were redesigned as a result of issues discovered during earlier testing.
- The Multiple Kill Vehicle (MKV) program re-organized its Acquisition Strategy and is progressing towards a System Requirements Review in 3QFY09. In FY08, MKV completed an end-to-end simulation in an open architecture modeling framework and demonstrated key engagement management algorithms.

Systems

Airborne Laser (ABL) is a prototype missile defense weapon system consisting of:

ABL

- A modified Boeing 747-400F commercial aircraft
- An infrared surveillance system
- A megawatt-class chemical oxygen-iodine laser
- A laser turret on the aircraft nose
- Two illuminator lasers on a bench in the fuselage
- Optical benches with highly sensitive cameras, sensors, and mirrors
- Hardware and software for battle management, command, control, communications, computers, and intelligence
- Ground support equipment for storing, mixing, transporting, and loading laser chemicals

STSS

Space Tracking and Surveillance System (STSS) is a research and development system that will consist of:

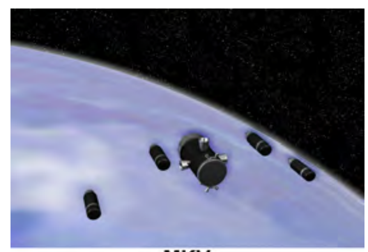
- Two flight test satellites in low-earth orbit
- The Missile Defense Space Experimentation Center, Colorado Springs, Colorado (the primary control center)
- The Low Satellite Operations Center, Redondo Beach, California (the backup control center)

Kinetic Energy Interceptor (KEI) is planned as a land-based, air-transportable battery with the following components:

KEI

- Transportable erector launcher
- High acceleration and high burnout-velocity booster rocket
- KEI fire-control/communications (KFC/C) ground suite and a KEI Interceptor Communications System

Multiple Kill Vehicle (MKV) plans for many kinetic kill vehicles to be carried aboard a single payload. Key features include:



MKV

- Liquid Axial Propulsion
- Divert and Attitude Control Propulsion
- Infrared Sensors
- Communications with kill vehicles and endgame management
- Command and control of the kill vehicles, especially assignment of targets and prevention of fratricide

Missions

Airborne Laser (ABL) – Combatant commanders will use the ABL to destroy threat ballistic missiles in the boost phase before they have an opportunity to deploy re-entry vehicles, sub-munitions, or countermeasures. Commanders will use ABL to:

- Autonomously acquire and track threat ballistic missiles using its passive infrared sensors
- Establish precise track on the missile nose and an aim point on the propellant tank using its illuminator lasers
- Destroy the missile by placing laser thermal energy on the tank or motor case to weaken the casing, allowing internal pressure to rupture the tank
- Generate and pass target cues to the BMDS and theater assets

Space Tracking and Surveillance System (STSS) – U.S. Strategic Command will use the STSS, a space-based sensor element of the Ballistic Missile Defense System (BMDS) to:

- Acquire, track, assess, and report ballistic missile and intercept events from lift-off to re-entry

- Provide a space node to support data fusion, over-the-horizon radar/sensor cueing, interceptor handover, and fire control

Kinetic Energy Interceptor (KEI) – U.S. Strategic Command will use the KEI as a primary intercept missile in the BMDS to:
- Intercept threats in boost, ascent, and midcourse phases of flight
- Intercept medium-, intermediate-, and long-range ballistic missiles
- Independently exercise command, control, battle management, and communications at the battery level, access sensor data, and communicate with the kill vehicle
- Boost alternate kill vehicles toward the interception point

Multiple Kill Vehicle (MKV) – The U.S. Strategic Command will use the MKV as the primary kill mechanism for the interceptors deployed in the BMDS to:
- Intercept long-range ballistic missiles and countermeasures in the midcourse phase of flight
- Mitigate the target discrimination problem by destroying all major objects in the field of view using many small kill vehicles

Prime Contractors
- Airborne Laser: Boeing
- Kinetic Energy Interceptor: Northrop Grumman
- Multiple Kill Vehicle: Lockheed Martin
- Space Tracking and Surveillance: Lockheed Martin

Knowledge Point Progress
For the technology and other programs, the MDA uses knowledge points to measure development progress by focusing on the set of critical activities that define each program's risk. The MDA defines a technology Knowledge Point as a technology development event that provides critical information for a key technology decision. This approach allows the MDA to make informed decisions on advancement of a development activity.

ABL
- Knowledge Point #5: Aircraft and Support Systems Ready for High Power System Integration. The MDA completed this knowledge point on time in December 2007.
- Knowledge Point #6: Conduct First Light into the Laser Calorimeter. The MDA completed this knowledge point on September 7, 2008, ahead of the originally planned date in 1QFY09.
- Knowledge Point #7: Conduct First Light through the Beam Control/Fire Control Subsystem. The MDA expects to complete this during 1QFY09.
- Director Knowledge Point: Demonstrate the capability of the ABL to successfully negate a threat representative SRBM Foreign Military Asset (FMA) during boost phase.

STSS
- Knowledge Point #1: Ground Acceptance Test. In FY08, the MDA completed this knowledge point by conducting the ground tests necessary for flight readiness certification.
- Knowledge Point #2: Space Vehicle Integration. Although environmental testing of both Space Vehicles was completed in November 2007, recent technical problems with Space Vehicle 2 have further delayed the launch.
- Knowledge Point #3: Confirm Constellation Performance Affordability. The MDA had planned to complete this knowledge point by 4QFY08, but the completion date has slipped to FY09.
- Director Knowledge Point: After the launch of the two STSS satellites (launch date to be determined), the MDA will conduct four major flight tests to characterize sensor performance. The flight tests will serve as a risk reduction for the eventual fielding of an operational constellation of satellites.

KEI
- Knowledge Point #1: Demonstrate Overhead Non-imaging Infrared Accuracy for Boost Phase Fire Control. The MDA completed this knowledge point in April 2006; however, it is not relevant to current booster-only development, but may be useful if KEI fire control activities are reactivated in the future.
- Knowledge Point #2: Demonstrate High Acceleration Booster. KEI testing in FY08 supported progress towards Knowledge Point #2. This knowledge point is currently scheduled for completion after a booster verification flight test in FY09.
  - A Stage 2 static fire test was conducted in October 2007. A number of Stage 2 redesigns then delayed further booster testing until September 2008 when a second static fire test was successfully conducted.
  - The Stage 2 case redesign was demonstrated in a successful burst test in April 2008. A successful Stage 1 burst test followed in July 2008.
  - Qualification testing of booster avionics and structures began in FY08.

MKV
- In FY08, MKV demonstrated the first MKV end-to-end simulation operating in an open architecture modeling framework (December 2007), demonstrated key engagement management algorithms (May 2008).
- MKV Knowledge Point #1a: Kill Vehicle Selection for SM-3 Block IIA with Japan. The MDA conducted system and

payload trade studies and a joint system concept review to complete the knowledge point.

- MKV Knowledge Point #1b: Define Commonality Characteristics for All Kill Vehicles (2QFY09). The MDA will define component commonality goals and architectures (4QFY08); define common component interface standards (2QFY09); and define common SM-3 Block IIA/B payload environments and interfaces (2QFY09).
- MKV Knowledge Point #1c: Demonstrate Commonality Characteristics for All Kill Vehicles (3QFY10). The MDA will assess optimal levels of commonality in a prototype seeker ground demonstration (1QFY10) and in prototype Divert and Attitude Control System (DACS) ground tests (3QFY10). The MDA will demonstrate commonality requirements, interfaces, specifications, and hardware selection for both the SM-3 Block IIA and Block IIB (3QFY10).
- MKV Knowledge Point #2: Demonstrate Multiple Kill Capability (2QFY11). The MDA will conduct component hover testing (1QFY09), seeker captive carry testing (1QFY10), engagement management demonstrations in real-time digital simulation with hardware-in-the-loop testing (2QFY11), and lethality enhancement testing (2QFY11).
- MKV Knowledge Point #3a: Confirm Affordability of Unitary and Multiple Kill Capability (2QFY10). The MDA will establish production cost commitments (1QFY10) and confirm budget constraints by comparison with contractor cost data reports (1QFY10).
- MKV Knowledge Point #3b: Validate Affordability of Unitary and Multiple Kill Capability (2QFY13). The MDA will verify and validate production cost commitments (2QFY13) and achieve engineering manufacturing readiness level 2 on the production line (2QFY13).
- MKV Knowledge Point #4a: SM-3 Block IIA Unitary Kill Vehicle Readiness for Flight Testing (1QFY12). The MDA will:
  - Demonstrate a prototype of the SM-3 Block IIA unitary kill vehicle DACS (TBD)
  - Perform ground test verification of SM-3 Block IIA unitary kill vehicle seeker performance (4QFY11)
  - Conduct a static fire test of a flight configured SM-3 Block IIA unitary kill vehicle DACS (1QFY12)
  - Perform a ground test demonstration of a flight configured SM-3 Block IIA unitary kill vehicle (1QFY12)
- MKV Knowledge Point #4b: Demonstrate Multiple Kill Vehicle Integrated System Capability from Midcourse Interceptor (3QFY15). The MDA will conduct ground testing of flight-configured payloads (2QFY12) and conduct integrated system intercept flight testing (3QFY15).

Recommendations

- Status of Previous Recommendations. There were no previous recommendations.
- FY08 Recommendations. None.

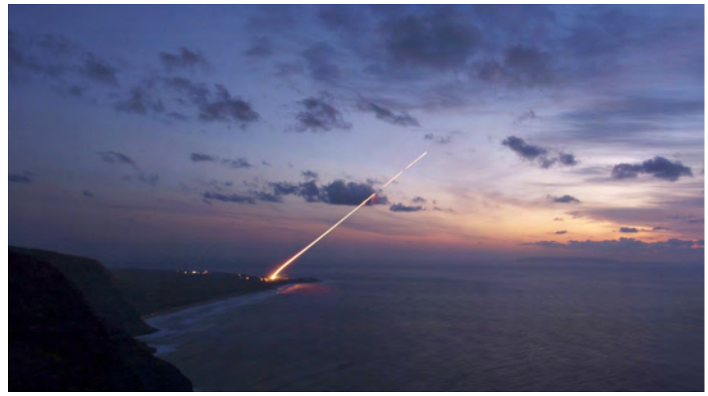
Terminal High-Altitude Area Defense (THAAD)

Executive Summary

- The Terminal High-Altitude Area Defense (THAAD) system intercepted two targets in FY08 flight tests. THAAD intercepted separating targets for the first time.
- THAAD testing was again adversely impacted by the failure of the flight test target. The failure of a foreign military acquisition target during Flight Test THAAD-10 (FTT-10) precluded the first salvo interceptor launch as well as the first flight test of a "cold-conditioned" interceptor.
- THAAD continued execution of the Government Ground Test Program, which is a critical component of the Army Materiel Readiness Release Process.
- THAAD continued integration testing as part of the Ballistic Missile Defense System (BMDS) in FY08. It successfully received a cue from Aegis Ballistic Missile Defense (BMD) during ground tests.
- THAAD executed the seventh of nine high-speed sled tests to characterize lethality against different threat payloads in FY08.
- Affordability re-structuring in FY08 slipped the upcoming four flight tests by more than six months. There are test location issues for two of these flight tests, planned for FY10, which will likely further impact the schedule. Target performance and configuration issues must be resolved to successfully execute the remaining flight tests.
- The MDA intends to transition the first two fire units to the Army in FY10 and FY11.

System

- The THAAD ballistic missile defense system consists of five major components:
  - Missiles
  - Launchers
  - Radars (designated AN/TPY-2 (TM) for Terminal Mode)
  - THAAD Fire Control and Communications (TFCC)
  - Unique THAAD support equipment



- THAAD can accept target cues from the Aegis BMD, satellites, and other external theater sensors and command and control systems.
- THAAD will complement the lower-tier Patriot system and the upper-tier Aegis BMD system.

Mission

U.S. Strategic Command intends to deploy and employ THAAD, a rapid response weapon system, to protect critical assets worldwide. THAAD is designed to destroy the full-range of theater ballistic missile threats to troops, military assets, and allied territories using hit-to-kill technology. Commanders can use the THAAD Kill Vehicle to intercept an incoming threat ballistic missile in the high endoatmosphere or exoatmosphere, minimizing the effects of weapons of mass destruction on battlefield troops and civilian populations.

Prime Contractors

- Lockheed Martin
- Raytheon

Activity

- Flight Test THAAD-08 (FTT-08) took place in October 2007. THAAD successfully intercepted a threat-representative short-range unitary target in the exoatmosphere. The interceptor was "heat conditioned" before the test to simulate operations in a hot environment.
- FTT-09 occurred in June 2008. THAAD successfully intercepted a simple, spin-stabilized, non-reorienting separating target in the low endoatmosphere. This was the first THAAD intercept of a separating target.
- The THAAD government ground test qualification program continued, with the missile component completing a successful 40-foot drop test in April 2008, and the fire control unit and radar beginning mobility testing. Combined contractor/government electromagnetic environmental effects ground qualification testing also continued for the missile and launcher.
- The THAAD LFT&E program continued, with a high-speed sled test using a lethality surrogate of a new threat payload in December 2007, and a series of light gas gun development shots in preparation for FY09 light gas gun data shots. The THAAD program is using the test data to assess the lethality

of THAAD against a variety of targets and to support the development, verification, and validation of simulation tools. Two other sled tests against another new threat payload are scheduled for FY09.
- Ground Test Other-03a (GTX-03a) in February 2008 and Ground Test Integrated-03 (GTI-03) in June 2008 used hardware-in-the-loop systems and simulations to test the interoperability between THAAD, Aegis BMD, Patriot, GMD, C2BMC, and other sensors.
- THAAD participated in two Aegis BMD flight tests: Japanese Flight Test Standard Missile-1 (JFTM-1) in December 2007 and FTM-14 in June 2008. THAAD and Aegis BMD exercised two-way communication and track exchange and correlation. THAAD successfully acquired a target via a cue from Aegis during FTM-14. Lessons learned from these events support modifications to THAAD interoperability and radar software.

Assessment

- In FY08, THAAD made significant progress, with two successful intercept tests of threat-representative targets under various intercept geometries and intercept altitudes. These included the use of a separating target for the first time. Flight tests against threat-representative short- and longer-range targets are scheduled for FY09 and FY10.
- So far, THAAD has successfully completed eight flight tests, five of which were intercept tests. Only FTT-04 and FTT-10 did not meet planned test objectives, both because the intended targets failed in flight.
- The program expanded operational realism during THAAD flight tests, particularly in the planning for FTT-10, by continuing to use warfighters to operate the THAAD radar, launcher, and fire control; denying the Soldiers detailed knowledge of launch times; and upgrading some hardware and software to final configurations.
- Hardware integration issues on the radar Prime Power Unit may cause some schedule delays in the THAAD government ground test qualification program.
- THAAD continued integration into BMDS-level testing. Preparations for FTT-10 also demonstrated communication links between THAAD, Aegis BMD, C2BMC, the Pacific Command Joint Operations Center, the Pacific Air Operations Center, and the 94th Air and Missile Defense Command.
- THAAD expanded its live fire sled test program in FY08 to address two new threat warheads. Even after sled tests complete in FY09, additional testing of these payloads and additional simulation analyses may be required to assess THAAD lethality against these targets and to develop and validate lethality models.
- Although the content of the flight test program has stabilized, some issues remain. Target performance remains a significant challenge to program execution. In FY08, an affordability restructure further delayed the remaining four planned flight tests by more than six months. Target configuration and development for the last two of these tests, planned for FY10, are still in process. Because of the longer range of these targets, it is also likely that the THAAD test program will have to move to the Reagan Test Site in the Marshall Islands to mitigate debris concerns.

Recommendations

- Status of Previous Recommendations. Although the MDA has made progress on the one previous recommendation, further emphasis is required.
- FY08 Recommendations. None.

Live Fire Test & Evaluation Program

Live Fire Test & Evaluation Program

Live Fire Test and Evaluation Program

EXECUTIVE SUMMARY

Title 10, Section 139 requires DOT&E to prepare an annual report summarizing the operational test and evaluation activities (including Live Fire testing activities) of the DoD during the preceding fiscal year. This section of the DOT&E Annual Report to Congress satisfies the requirement for an annual LFT&E report.

In FY08, DOT&E executed oversight of 122 LFT&E survivability and lethality acquisition programs. Of those 122 programs, 18 programs operated under the waiver provision as permitted by Section 2366. LFT&E published the following five reports in FY08: High Mobility Artillery Rocket System Improved Cab Protection LFT&E; H-1 Helicopter Upgrades Beyond Low-Rate Initial Production (BLRIP); Stryker Mobile Gun System BLRIP; T-AKE cargo ship BLRIP; and, the SSGN *Ohio* submarine BLRIP. In addition, LFT&E provided input to individual system assessments contained in this report. DOT&E also supported quick-reaction efforts, including warfighter requests and congressional inquiries, and managed several survivability and lethality technology investment programs.

DOT&E continues to oversee ballistic testing of body armor as reported in last year's annual report. Additionally, DOT&E sponsored limited user evaluations of Army and Marine Corps combat helmet pad suspension systems, and provided Congress a report of the results. In FY08, DOT&E published its policy for force protection, including non-lethal weapons. DOT&E is engaged with the Services to achieve the goals for this effort as established by DOT&E. In the FY09 National Defense Authorization Act, Congress amended Title 10, Section 2366. The new language provides the Secretary of Defense authority to designate programs for oversight pursuant to Section 2366, mirroring authority already granted the DOT&E in Section 139 for operational test and evaluation. In FY09, DOT&E will work with the Services to identify those programs that, due to their direct contribution to warfighter survivability and lethality, warrant DOT&E oversight under this new provision.

In addition to satisfying acquisition program oversight requirements, the LFT&E program funds and exercises technical oversight of investment programs that develop joint munitions effectiveness data; develops advanced technologies and analytical methods to increase aircraft survivability; conducts vulnerability test and evaluation of fielded air, land, and sea platforms; and, conducts munitions lethality testing. LFT&E investment programs also supported quick-reaction efforts in FY08 aimed at addressing warfighter needs.

- **Joint Technical Coordinating Group for Munitions Effectiveness (JTCG/ME).** The JTCG/ME publishes weapon effectiveness manuals, collateral damage estimation tables, methodology, and automated tools that enable the warfighter's weaponeering and mission planning processes. DOT&E oversight of the JTCG/ME and its connection to acquisition programs ensures that weapons effectiveness data are available to warfighters when the Services field new weapons.
  - The JTCG/ME continues to produce critical Joint Munitions Effectiveness Manual (JMEM) weaponeering and collateral damage estimation products in support of mission planning and execution by all combatant commands and joint and Service staffs in all theaters of current operations including Operations Enduring Freedom (OEF) and Iraqi Freedom (OIF).
  - The JTCG/ME has provided Collateral Effects Radii table updates into the Chairman of the Joint Chiefs of Staff Manual 3160.01b-Collateral Damage and Weaponeering Guides for rapidly fielded systems to include: Excalibur - Unitary (155 mm GPS Guided Projectile), Laser Joint Direct Attack Munition, Focused Lethality Munition, and the Griffin air-to-surface missile.
- **Joint Aircraft Survivability Program (JASP).** The JASP serves as the DoD's focal point for aircraft survivability, establishing survivability as a design discipline and furthering the advancement of aircraft survivability by investing in development and implementation of new technologies.
  - The Joint Combat Assessment Team (JCAT) of the JASP continued its deployment to OIF in support of Combined Forces Aviation. JCAT continued operations from bases in Al Asad, Balad, and provided a senior uniformed presence with Multi-National Corps-Iraq C3 Air at Camp Victory in Baghdad. JCAT uses data gathered from combat, threat exploitation, and Live Fire testing to provide combat commanders information to influence mission planning and tactics.
- **Joint Live Fire (JLF).** JLF is a formal program to test and evaluate fielded U.S. systems against realistic threats. The program places emphasis on addressing urgent needs of deployed forces, testing against emerging threats, and assisting acquisition programs by testing legacy systems and identifying areas for improvement. DOT&E funds, establishes goals and priorities, and oversees the efforts of the JLF program.
  - During FY08, JLF continued its support to the Joint Improvised Explosive Device Defeat Organization (JIEDDO) and to the Standardized Military Operations in Urban Terrain (MOUT) Target and Testing Board (SMTTB). In partnership with JIEDDO, JLF continues to extensively characterize improvised explosive

munitions in environments and emplacements that mimic actual combat conditions. Test results provide combat commanders immediate feedback regarding their vulnerabilities and aids in the development of survivability mitigation techniques, both in materiel and in tactics, techniques, and procedures. With the SMTTB, JLF is characterizing weapons effects in MOUT environments, to include behind wall debris following impacts from breaching munitions. Characterizing behind wall debris is critical in fully understanding weapons effects and to better characterize collateral damage.

In addition to these programs, DOT&E also participates in focused initiatives that directly support warfighters or address issues of significant importance to Congress.

QUICK REACTION

DOT&E coordinates and sponsors activities in response to congressional directives and that contribute directly to warfighter survivability in current areas of operation. In FY08, DOT&E participated in or sponsored three such efforts: Personnel Body Armor, Combat Helmets, and JIEDDO.

Personnel Body Armor. As reported last year, DOT&E is overseeing Army body armor testing to "… definitively and officially determine the facts regarding the protective qualities of the body armor we are currently providing our troops and that of any other commercially available comparable and competing system."[1] The test program consists of two phases. Phase 1, completed in June 2008, was ballistic testing in accordance with the Army solicitation. That testing, conducted by the Army's Test and Evaluation Command (ATEC), was adequate to support Program Executive Officer - Soldier's source selection process and ultimately led to contract awards in October 2008. DOT&E provided an interim report documenting the Phase I effort to Congress in October 2008. Pursuant to procurement requirements, ATEC began First Article Testing in November 2008, of all vendors that received contracts via the source selection. ATEC completed First Article Testing in December 2008 and will next execute Phase 2 of the body armor test program. Phase 2 consists of additional ballistic testing to characterize the range of performance of selected solutions in order to determine current performance levels prior to setting future performance requirements. ATEC should complete Phase 2 testing in 4QFY09. Upon completion, DOT&E will provide a final report to Congress that encompasses all phases of the effort.

Limited Field User Evaluations of Army and Marine Corps Combat Helmet Pad Suspension Systems. The DoD conducted limited user evaluations of the pad suspension systems in the Army's Advanced Combat Helmet and the Marines Corps' Lightweight Helmet. Both the Army and Marines conducted their testing and evaluations during 4QFY08, the former at Fort Benning, Georgia, and the latter at the Officer Candidate School at Quantico, Virginia. Although the Services planned and conducted their tests independently, they shared test plans and designed the tests to be nearly identical. Soldiers and Marines wearing typical combat clothing, equipment, and weapons ran through a series of drills including marches, obstacle courses, and equipment compatibility exercises. Following completion of these exercises, the participants completed survey forms that identified their favorability of each pad system tested in terms of form, fit, and function. Each Service completed a comprehensive report. Subsequently, in 1QFY09, DOT&E prepared a summary that was provided to Congress with the Service reports. The evaluations for both Services concluded that the currently fielded pad suspension system is not inferior to any of the other pad systems evaluated. Both Services continue to aggressively pursue a next generation combat helmet and improved helmet suspension systems.

Joint Improvised Explosive Device Defeat Organization (JIEDDO). DOT&E continued to support the JIEDDO through participation on the Joint Test Board, the Joint Requirements and Resources Advisory Board, and the Joint Integrated Product Team. DOT&E also continues to fund IED and MOUT Joint Live Fire test programs, both of which support JIEDDO objectives.

1 May 21, 2007, letter from Senators Levin and McCain to the Secretary of Defense

JOINT TECHNICAL COORDINATING GROUP FOR MUNITIONS EFFECTIVENESS (JTCG/ME)

The JTCG/ME produces, distributes, and regularly updates Joint Munitions Effectiveness Manuals (JMEMs). JMEMs provide the warfighter with computerized operational tools and data for rapid evaluation of alternative weapons and their delivery against specific targets. JMEMs help the warfighter effectively accomplish mission objectives, while accounting for collateral damage, and are critical enablers to the warfighter's weaponeering process.

In FY08, in support of increasing combined and coalition operations, the JTCG/ME developed and released two updated JMEMs. The first was the JMEM Weaponeering System (JWS) DVD v1.2.1 (1,250 copies to 800 accounts) that provides air-to-surface and surface-to-surface weaponeering tools. This DVD included new and updated warhead data, delivery accuracy updates, approximately 375 new targets with associated effectiveness data, and an updated Building Analysis Module. Secondly, the JTCG/ME also released the Joint Anti-Air Combat Effectiveness (J-ACE) CD-ROM v3.2.1 (250 copies to 210 accounts). The update included an interface to F-22 aero performance data, and new threat air-to-air and surface-to-air missile performance models. This JMEM is used by the community of fighter pilots to develop air superiority tactics and by the Strategic Command for global strike mission planning.

In addition to these two JMEM releases in FY08, the JTCG/ME developed and released beta versions of the JWS v2.0 and the J-ACE Air Superiority (AS) v4.0. These upgrades represent major product architecture improvements to efficiently support a target-centric weaponeering paradigm. These products are both scheduled for operational release in early 2009.

The JWS v2.0 is a combined product of the JMEM Air-to-Surface (JMEM/AS) and JMEM Surface-to-Surface (JMEM/SS) communities. It represents a combination of the formerly separate JMEM/AS Weaponeering System (JAWS) and JMEM/SS Weapons Effectiveness (JWES) products. It includes target vulnerability for approximately 200 calculated targets; descriptive information, data, and graphics in the Browse section; computer programs and methods needed to accomplish weaponeering in the Weaponeering section; step-by-step guides to weaponeering in the Training Checklists and Wizards; and Help files. JWS v2.0 provides the capability to evaluate the effectiveness of any number of combinations for various air-to-surface and surface-to-surface weapons against a variety of target types in real-time or in the form of quick, pre-calculated data.

The J-ACE AS v4.0 contains Joint Anti-air Model v3.2.2 which can read Eglin P5-format Time-Space-Position Information (TSPI) data files, new Threat Modeling and Analysis Program (TMAP) models for red and grey air-to-air missiles, Missile and Space Intelligence Center (MSIC) TMAP Surface-to-Air missiles, and logic checks for maximum off-bore sight launch angle limits. Additionally, J-ACE 4.0 contains additional AIM-9M/X and AIM-120C effectiveness data and architectural and graphical user interface improvements.

Also in FY08, the JTCG/ME continued JMEM development efforts to support Information Operations. Specifically these efforts, performed in coordination with the Strategic Command, resulted in the accreditation and/or fielding of the Computer Network Attack Risk and Effectiveness Analyzer and the Effectiveness of psychological operations Influence Calculator. Initiatives related to JMEM development for other non-traditional effects (e.g., non-lethal, High Energy Laser, High Power Microwave) continue.

JOINT AIRCRAFT SURVIVABILITY PROGRAM (JASP)

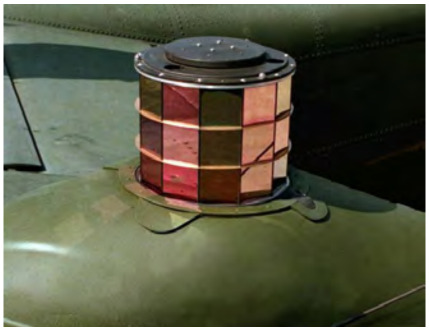
The mission of the JASP is to increase the economy, readiness, and effectiveness of DoD aircraft through coordination and development of susceptibility and vulnerability reduction technology and assessment methodology. The JASP coordinates the inter-Service exchange of information to increase the survivability of aeronautical systems in a combat threat environment. Working with joint and Service staffs, other government agencies, and industry, the JASP identifies new capabilities that require aircraft survivability research, development, test, and evaluation and ensures capabilities are conceived and developed in a joint warfighting context. DOT&E establishes objectives and priorities for the JASP as well as exercising oversight of the program.

In FY08, the JASP worked with the defense acquisition community, the Department of Homeland Security, the Federal Aviation Administration, the Transportation Security Administration, and the National Aeronautics and Space Administration to address critical issues regarding aircraft survivability. Accordingly, JASP funded 61 multi-year survivability projects for $9.6 Million and delivered 38 reports in FY08. The following summaries illustrate current JASP efforts in susceptibility reduction, vulnerability reduction, survivability assessment methodology, and combat damage assessment.

Susceptibility Reduction

The JASP transitions susceptibility (the degree to which an aircraft is open to effective attack) reduction technology and techniques to the warfighter, addresses urgent susceptibility requirements emerging from combat theaters, and reduces aircraft susceptibility against future systems.

Rotorcraft Aircraft Survivability Equipment Effectiveness Against Man Portable Air Defense System (MANPADS)/Optimizing AN/ALQ-144A Effectiveness. This joint Army Research Laboratory and Naval Air Warfare Center study initiated major Army and Navy follow-on efforts that will ultimately improve the employment of Aircraft Survivability Equipment (ASE) on rotorcraft. This study challenged basic beliefs on the effectiveness of current ASE, and the results, validated by flight tests and modeling, have prompted improvement in the overall survivability of rotorcraft.



Rotorcraft Visual Jury Test. In partnership with the Army's Aviation Applied Technology Directorate, the JASP completed testing to quantify the visual effectiveness of optimized single color paint schemes in July 2008. Engineers collected data for four colors against both desert and sky backgrounds. Material developers will use this quantitative data to make paint scheme determinations for rotorcraft operating in desert terrain and sky background conditions.

Imaging Infrared Seeker Countermeasures. Countermeasures development for missiles with infrared seekers remains a key research area for the JASP. In FY08, JASP, along with the Air Force Research Laboratory and the Naval Research Laboratory, initiated a project to investigate and develop countermeasures against a new class of infrared seekers. This project applies established modeling and simulation and hardware-in-the-loop processes to determine the optimum countermeasures against missiles with imaging infrared seekers.

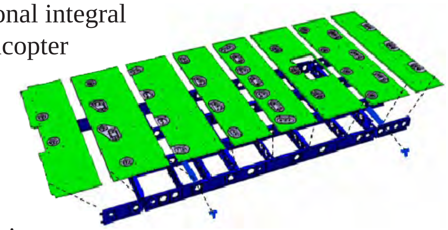
Millimeter Wave (MMW) Electronic Attack Transmitter. In partnership with the Naval Research Laboratory, the JASP is developing countermeasures technology and techniques for MMW radars. While MMW radars are not currently a threat in OIF/OEF, they are of increasing concern. Using previously developed hardware components, this project will demonstrate the feasibility of generating new radar jamming waveforms against these modern radars. The techniques, if successful, will be useful against a wide variety of modern short range, dual frequency surveillance, and targeting radars.

Second Generation Processing for Missile Warning Systems. This JASP project is part of a larger Air Force Research Laboratory project to develop and field an affordable visible missile warning system based on high performance charge-coupled devices or complimentary metal-oxide semiconductor-based detectors. Innovative spatial, spectral, and temporal algorithms extract threats from high clutter environments, but require very high data throughput. The JASP effort combines and optimizes existing algorithm capabilities for integration with a real-time processor coupled to a missile warning system.

Vulnerability Reduction

Vulnerability reduction technologies increase an aircraft's capability to withstand the threat environment. In FY08, JASP emphasized work in the areas of developing lighter-weight opaque and transparent ballistic protection systems and fuel containment technologies for fuel system components.

Multi-functional Structures for Ballistic Protection. The Aviation Applied Technology Directorate (AATD) at Fort Eustis, Virginia, together with United Technologies demonstrated an affordable, multi-functional integral armor solution for a helicopter floor that improves ballistic protection and provides significant weight reduction. The prototype floor provides the same ballistic protection and offers a weight savings of 48 percent, compared to current approaches.

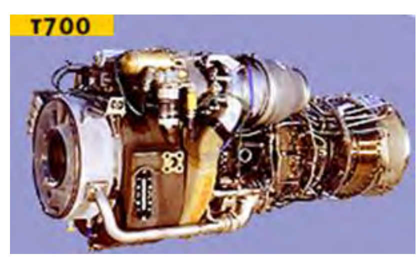


Spaced Armor for Rotorcraft. AATD worked with BAE Systems and Bell Helicopter Textron to design, model, fabricate, and demonstrate two spaced-armor system concepts for rotorcraft that will yield at least a 30 percent weight reduction compared to appliqué steel systems for a given armor-piercing projectile threat.

Development of Transparent Armor Systems. AATD, together with BAE Systems, demonstrated transparent armor concepts for rotorcraft that yielded a 30 percent weight reduction over current systems while lowering manufacturing costs and substantially improving multiple-hit performance. Specifically, various transparent inorganic materials, bonded to a lightweight urethane substrate (Cleargard® variants), were ballistically tested and modeled for optimum ballistic performance.

Flammable Fluid Line Fire Protection. The 780th Test Squadron at Wright-Patterson AFB, Ohio, began development and demonstration of potential low cost, lightweight technologies to reduce the vulnerability of flammable fluid lines to ballistic impacts by increasing fire suppressant concentration and decreasing fluid loss. Under this project, the JASP is comparing technologies such as self-sealing sleeves, spray-on polymers, enhanced powder panels, and rigid foam line wraps against existing self-sealing technologies on standard fuel lines.

Survivable Engine Control Algorithm Development (SECAD) Turboshaft Application. The Naval Air Warfare Center Weapons Division (NAWCWD), China Lake, California, together with General Electric Aircraft Engines, began applying the SECAD methodology to turboshaft engines in cooperation with the T-700 Project Office. Specifically, GE developed damage detection algorithms for integration into the engine controls on the UH-60M helicopter.



Electrical Power Battle Damage. The Naval Air Warfare Center Aircraft Division, Patuxent River, Maryland, began work to improve the electrical power distribution of H-60 helicopters resulting from small arms battle damage to preserve the aircraft's mission capability. The project goal is to characterize electrical system dynamic response to battle damage with and without improved arc fault circuit breakers and confirm the improved system response through live fire testing.

Joint Flare Dispenser Vulnerability Reduction. The NAWCWD, China Lake, California, began to investigate and test novel technologies to mitigate or eliminate the effects of ballistically induced flare initiation in internally installed flare dispensers. The goal is to develop technology that is lightweight, low-cost, capable of installation on future platforms, and retro-fittable to legacy platforms. JASP will assess the ability of the technology to reduce pressure and temperature in the bay behind the flare dispenser on a representative airframe.

Survivability Assessment Methodology

The JASP continued to invest in improving the credibility of significant models and simulations used to design and develop aircraft survivability, and to assess the survivability of U.S. aircraft to realistic threats.

Fire Prediction Model. The Army Research Laboratory recently completed a series of tests to generate data that will validate parts of the Fire Prediction Model and enable development of penetration equations for modern self-sealing fuel tank materials. This test series established penetration data for seven different threats (five fragment masses and two projectiles) fired into fuel tank surrogates and flat plates. The fuel tank tests included shots into the fluid filled region and the space above the fuel, the ullage. Shots into the ullage verified that shots into flat plates resulted in the same project velocity slowdown and were appropriate for penetration calculations. Shots into the fluid region provided information on leakage rates.

Enhanced Surface-to-Air Missile Simulation. The NAWCWD, China Lake, California, teamed with the Air Force Aeronautical Systems Center to validate six threat models in the Enhanced Surface-to-Air Missile Simulation (ESAMS). The six threat systems were chosen based on a combination of frequency of use by the ESAMS users and availability of sufficient data for validation decisions. The study used the latest threat data available from the Missile and Space Intelligence Center. NAWCWD also collaborated with the Air Force Research Laboratory to compile information related to the capability, accuracy, and usability of the Modeling System for Advanced Investigation of Countermeasures (MOSAIC) and document it in an accreditation support package. This is the first step to making MOSAIC available for distribution and user support. MOSAIC will be the first standard code to address infrared threats and countermeasures against them.

Cross-Agency Model Integration. JASP is demonstrating a process for the integration of new Missile and Space Intelligence Center (MSIC) infrared and radio frequency Threat Modeling and Analysis Program (TMAP) threat system models into the corresponding engagement simulations. This project marks the first time TMAP models have been adapted for use in all digital simulations outside of MSIC. Once the integration is complete, testing will commence to verify that the integrated models give the same predictions as the legacy stand-alone models.

JOINT COMBAT ASSESSMENT TEAM (JCAT)

During FY08, JCAT deployed 14 Navy and four Air Force personnel to Iraq to serve with the Multi-National Corps-Iraq in support of OIF. JCAT-Forward locations included Al Asad Air Base in the western Al Anbar Province, Balad Air Base north of Baghdad, and Camp Victory, Bagdad. Due to extensive coalition air and ground engagement with Al-Qaida in Iraq (AQI), a temporary detachment in Mosul, Iraq, was established to complete battle damage assessments and provide training to the maintenance troops. Near real-time JCAT analysis of Mosul Surface-to-Air Fire reports in support of the U.S. aviation assets was credited as a key contributor to the elimination of the Mosul AQI anti-aircraft cell. The JCAT Army component also provided support to the warfighter in Afghanistan, providing training and completing aircraft battle damage assessments. The JCAT support includes inspecting damaged or destroyed aircraft, acquiring available maintenance documentation, and conducting interviews with aircrew and intelligence personnel. JCAT provides consultation to weapons, tactics, and logistics personnel. JCAT also provides comprehensive briefings to commanders in charge of daily air operations. These efforts provide valuable information to commanders allowing them to adjust their tactics, techniques, and procedures based on accurate threats assessments. These efforts resulted in 2,281 work days of which 1,798 days saw JCAT forward-deployed in Iraq. A total of 51 aircraft evaluations were completed, 49 of which were determined to be actual combat damage.

JCAT provides professional training to the engineers and other support personnel that work aircraft survivability within the United States. Navy JCAT members hosted the 2008 Threat Weapons and Effects Training Seminar at Eglin AFB, Florida. This year's classified symposium was a resounding success as almost 230 people were in attendance. Attendees included industry partners and 12 U.S. government agencies including all four U.S. military Services, the Department of State, the Department of Homeland Security, the Federal Aviation Administration, the Department of Energy, the FBI, and the Alcohol, Tobacco, and Firearms agency. A Man Portable Air Defense System (MANPADS) live fire demonstration shot against a Cobra Aircraft on the Eglin AFB Test Range was one of the many highlights. The Naval Air Systems Command (NAVAIR) sponsored a JCAT Day to provide essential combat-related aircraft survivability data and training to acquisition professional and engineering personnel. JCAT briefed at a total of nine symposia, provided 12 senior executive briefings, and published six articles in widely read professional publications.

The JCAT personnel worked closely with Survivability/Vulnerability Information Analysis Center (SURVIAC) engineers to upgrade the Combat Damage Incident Reporting System database and data reduction capabilities. This SURVIAC database is a repository of all U.S. aircraft battle damage events for use by aircraft survivability engineers and operators alike. Design changes will provide additional in-depth information on OIF hostile fire incidents to engineers working on next-generation aircraft survivability equipment. JCAT is continuously improving the data content and quality of the aircraft battle damage assessment engineering reports. The FY08 report improvements included capturing maintenance repair data (non-mission capable days, cost to repair), local weather observations, and lunar luminescence data.

JOINT LIVE FIRE (JLF)

The Joint Live Fire Program consists of three groups: Aircraft Systems (JLF/AS), Armor/Anti-Armor (JLF/A/AA), and Sea Systems (JLF/SS). Following are examples of projects funded by JLF or completed FY08 JLF programs.

Aircraft Systems Program

Thorough analysis of historical and recent combat events shows that our U.S. military aircraft, both fixed- and rotary-wing, continue to have some degree of vulnerability against various enemy threats. The trend to purchase fewer and more expensive aircraft makes it imperative that we continue to reduce aircraft vulnerability. The goal of JLF/AS is to identify vulnerable areas in current aircraft platforms and understand the mechanism involved in the threat and aircraft reaction, and provide this information to the survivability engineers to improve aircrew and aircraft survivability. This also leads to more effective combat utilization of our assets and aids in mission planning.

AH-64 Fire Extinguishing Technology. JLF/AS completed the final year of this multi-year investigation by assessing the effectiveness of Solid Propellant Gas Generators (SPGGs) in extinguishing aircraft fires, particularly within engine nacelles. These tests use commercially available SPGGs with an active agent embedded within the unit. Data generated from this test indicated the technology was economically feasible to pursue as a possible replacement of current Halon 1301 systems. The Army Apache Equipment program manager is currently evaluating the results of these tests.

Fragment Restraint Solution for HH-60 A/L. The goal of this testing was to find a hardware solution to reduce system-level ballistic vulnerability of the onboard oxygen generating system for the HH-60A and HH 60L Black Hawk MEDEVAC helicopters. The solution was not intended to stop threat projectiles, but to contain any resulting fragments in the aircraft's confined space. The data, report, and recommendations were provided to the Army's HH-60A/L MEDEVAC Program Office. The fragment restraint solution was found to be very effective and kits are currently being procured and sent to MEDEVAC squadrons in theater.

H-60 Main Rotor Mast Ballistic Vulnerability. A review of available documentation showed that the H-60 main rotor shaft and shaft extension have not been tested against small caliber armor-piercing, incendiary projectiles typically found in current combat operations. As an assembly, these critical components retain and drive the main rotor. Test results and other findings will expand the ballistic vulnerability knowledge for helicopter main rotor shafts and extensions. The mast and mast extension demonstrated significant tolerance against the threats tested. Each assembly

tested was subjected to multiple ballistic impacts without evidence of structural failure.

JLF/AS/JASP MANPADS Vulnerability Assessment Capabilities Roadmap. A long-term goal previously expressed by DOT&E/LFT&E was the development of a MANPADS roadmap that encompassed live fire test, evaluation, and modeling. This tool would document current test and evaluation capabilities, delineate known test and evaluation requirements, and define critical test and analysis gaps. It could then be used to guide future live fire projects and funding decisions. Two glaring shortfalls became immediately apparent: a lack of characterization data to validate system-level models; and, an invalidated fly-out/endgame model for the purposes of hit point prediction. JLF/AS will use these findings to drive project selections and funding for the coming fiscal year.

Armor/Anti-Armor Systems Programs

The armor/anti-armor program seeks to fully characterize current threat weapons and munitions, providing critical empirical data to organizations such as the Joint IED Defeat Organization and the Joint Technical Coordinating Group for Munitions Effectiveness. The program also responds to critical warfighter survivability issues such as combat helmet protection and survivability from weapons effects when traveling in tactical vehicles. The armor/anti-armor program has also been instrumental in the understanding of weapons effects in Military Operations in Urban Terrain (MOUT) environments. Below are Armor/Anti-Armor projects conducted during FY08.

IED Characterization for Blast and Fragmentation – Buried Configuration. IEDs used in a sub-surface/shallow-buried configuration are a frequently used threat facing coalition forces in theater. For that reason the development and evaluation of crew survivability models, new armor kits, and other protection systems requires a well characterized threat. The objectives of this test include determining the detailed fragmentation characteristics (mass, velocity, shape factor, and spatial distribution) and peak blast overpressure levels resulting from the function of a single test item as a shallow-buried IED.

Tactical Wheeled Vehicle (TWV) Fuel Fire Testing and Analysis. JLF initiated a set of experiments that will test and evaluate simple low cost fuel tank fire protection concepts against IED threats. The test setup and data collection is being coordinated with a fire prediction model (FPM) developer in order to make enhancements to an existing FPM to address the IED threat. Three low cost concepts are being examined: a 1-inch thick e-glass overwrap; a tank-in-tank design with water in the void between the tanks; and, a tank-in-tank design with a fire extinguishing powder in the void between the tanks. To date, JLF has tested the three concepts against a shaped charge threat and an explosively formed penetrator. JLF will next test the concepts against a fragmenting artillery round. Generic 55 gallon drums are being used in the preliminary tests. JLF will conduct follow-on tests with successful concepts that are more representative of TWV fuel tanks.

Full Vehicle Blast Data. JLF continued external blast damage testing on full vehicles into FY08, continuing work from FY07 on a different class of targets. Testing in FY08 was conducted to assess the vulnerability of a passenger tactical truck, an AH-1 attack helicopter, and a UH-1 utility helicopter to external airblast loads. Testers detonated bare explosive spheres at various positions and made careful assessments of the resulting blast damage. Instrumentation was used to characterize the applied airblast load to the target. Engineers then analyzed data to develop contours of lethal miss distances (the distance from a detonation that a person or equipment must be to survive) with respect to mobility, firepower, and catastrophic target kills. The JTCG/ME currently uses simple models and database look-ups to estimate airblast effectiveness of a weapon-target pair. Results from this program will provide ground truth data for this important class of targets, and serve as a benchmark for the development of methods utilizing three-dimensional contours of kill level for materiel targets.

Advanced Combat Helmet and Pad Suspension Systems Analysis. This study consists of testing the Army Advanced Combat Helmets with the four current pad designs used by Soldiers and five new pad suspension systems to help identify appropriate Quality Assurance procedures as well as develop better protection against blast, blunt, and ballistic threats. This testing will help identify what characteristics of pads will protect the Soldier from several threats and ultimately reduce the amount and severity of Mild Traumatic Brain Injuries (MTBI)

and other head injuries. Several impact surfaces and velocities were used to test the pad and helmet shells at several temperature conditions and three headforms (headforms represent the human head and are used for blunt impact and blast testing). JLF will also conduct shock tube testing to simulate blast events in order to record the dynamic response of the Advance Combat Helmet and performance of the pads.

MOUT Secondary Debris Characterization. In FY08, JLF continued testing direct fire projectiles, both foreign and domestic, against several wall types to collect secondary debris data. A major focus of the 2008 JLF MOUT program concerns the use of high performance concrete as a target material. High performance concrete technologies for building materials (appliqué, structural element, or protection barrier) are propagating worldwide. There is significant interest in the urban operations, warfighter, and intelligence communities on the effects of munitions against this material. The 2008 JLF MOUT testing program has been designed to look at a spectrum of weapons (tank rounds, medium caliber projectiles, rocket-propelled grenades and other emerging threats) to evaluate the response of this material. JLF is comparing effects against this material and effects against conventional strength concrete for some of the weapon/target pairings.

Testing to Collect Data in Support of Expanded Fast Air Target Encounter Penetration (FATEPEN) Accreditation Assessment. JLF has completed testing to potentially expand the accreditation range of the engineering penetration and damage prediction model FATEPEN to larger weight fragments. FATEPEN is utilized by both the JTCG/ ME and the Joint Aircraft Survivability Program for the analysis of fragmenting warheads. This testing will provide a greater degree of confidence in assessing fragment lethality and vulnerability/lethality of U.S. and foreign weapon systems.

Dual-Use Manufactured Mannequin with Instrumentation Embedded (DUMMIE). The DUMMIE program is developing the requirements and production feasibility for a LFT&E specific Anthropomorphic Test Device (ATD) that testers can use for both shock/ acceleration and fragmentation data collection. Currently two different ATDs are utilized to collect shock/acceleration and fragmentation data. Automotive industry mannequins are currently adapted for shock and acceleration data collection while plywood mannequins are utilized for fragmentation data collection. A dual-use mannequin, specifically designed for LFT&E, would provide greater fidelity data during both shock and fragmentation events and would also be able to discern the primary incapacitation mechanism between shock and fragmentation. Certain asymmetric threats present both incapacitation mechanisms.

Validation of the Current Penetration and Deflation Algorithms for Steel-Belted Radial Tires as Used in Mine Resistant Ambush Protected (MRAP) Vehicles. Through the JLF program, DOT&E sponsored ballistic tests at the Army Research Laboratory on steel-belted radial tires as used on MRAP and other military vehicles to determine the accuracy of the tire penetration and deflation algorithms developed in the mid-1990s for non-steel-belted radial and bias-ply tires. The penetration phase of testing, which included shots on the sidewall and tread sections of MRAP tires, measured residual velocities of fragments and provided data for computation of ballistic limit (V50) estimates. This testing revealed that the current penetration equation requires an update for accurate vulnerability/lethality assessments. Likewise, deflation testing, firing fragments into fully inflated and loaded tires, demonstrated that the previously developed deflation algorithm did not adequately represent the deflation rate for steel-belted tires. JLF will update equations and document recommendations in an official report to aid in increasing future modeling accuracy.

Sea Systems Program

The JLF/SS made significant progress in 2008 toward assessing the survivability of submarines and surface ships. JLF/SS has made particular progress by leveraging major Navy programs. Examples of these and other efforts are discussed below.

Ship Shock Trial Alternatives. This project is helping to develop and validate key components of an alternative to the traditional at-sea Full Ship Shock Trial (FSST). The FSST involves underwater explosion testing against new acquisition ships. The goal of the FSST alternative effort is to provide an integrated testing and simulation capability that is environmentally friendlier without trading-off meaningful assessments of the ship's mission capability/degradation resulting from threat encounters. The task leverages the Navy FSST Alternative program, and is coordinated with several major Navy acquisition

programs (Littoral Combat Ship (both designs), LPD-17, LHA 6, DDG 1000, and CVN 78).

Test Alternatives to Underwater Explosion (UNDEX). This project is evaluating a more environmentally acceptable alternative to underwater explosive ship shock testing. The technical objective is to implement a cost-effective operational ship trial that also provides significant and relevant data to advance the validity of advanced simulations. This project leverages a Navy Small Business Innovative Research program to demonstrate the utility of underwater airguns as the non-explosive loading source. These airguns are currently used by the oil industry. The United States is collaborating with the United Kingdom's Ministry of Defence to assess an airgun array's potential as a surrogate for the traditional FSST. In March 2008, test engineers subjected a decommissioned Royal Navy destroyer in Portsmouth Naval Shipyard to a 16 airgun array prototype. Data from this test series are under study to determine if airgun arrays can generate UNDEX-like environments that realistically stress the mission capabilities of Navy warships.

Well Deck/Vehicle Stowage Fire Protection. This project examined the effectiveness of two types of total flooding high expansion foam systems. JLF tested these foam systems against a mixed solid and liquid fuel fire threat in a well deck area, and against a shielded solid fuel fire. The Naval Research Laboratory conducted this project at the ex-*Shadwell* fire test facility in Mobile, Alabama. One of the high expansion systems tested used fresh air drawn from outside the well deck area to create the foam. The other system used fire combustion gases within the well deck area to create the foam. Both systems proved to be effective in all fire scenarios tested. Engineers used data from these tests to assess system design parameters and to develop techniques and tactical procedures for the use of these systems onboard ships.

Network Fire Model Enhancements. This project provided funds to the Naval Research Laboratory to support further development of the Fire and Smoke Simulator (FSSIM). This investment improved the model's fidelity for three-dimensional fire and smoke spread in ship-representative structures. The model can support current and future platform designs and aid engineers and architects in providing designs that limit or can manage smoke and fire spread through installed design elements. The FSSIM enhanced model is available to ship designers through the NRL.

Information Assurance

Information Assurance

Information Assurance (IA) and Interoperability (IOP) Evaluations

Summary

- DoD awareness and preparation to meet the growing threats to military information systems and networks continued to improve in FY08, but significant gaps still exist between potential adversary actions and demonstrated defensive capabilities.
- Collaboration suites designed to improve warfighter situational awareness may achieve interoperability goals, but in some cases have introduced network vulnerabilities. The Joint Staff has communicated this concern to operational commanders as a near-term response; for the longer term, opportunities to accelerate implementation of the classified Public Key Infrastructure program should be considered.
- Exercise constraints that preclude the realistic employment of sophisticated attack mechanisms can lead exercise participants to a false sense of security. SECDEF guidance to plan for, implement, and regularly exercise the capability to fight through cyber/kinetic attacks that degrade the Global Information Grid needs to be fully implemented.
- Most vulnerabilities found during FY08 assessments are basic in nature and can be remedied by qualified local personnel. However, many organizations lack a full complement of trained personnel. This finding is serious given the fact that the threats presented during these exercises were below what might be expected from a top-tier nation-state.
- Approximately 75 percent of the fielded systems observed do not have current interoperability certifications.

Process

DOT&E oversees the execution of the Information Assurance (IA) and Interoperability (IOP) assessment program. Participating Service and Agency teams perform the assessments and assist the Combatant Commanders (COCOMs) and Services in designing the exercises in which the assessments take place. DOT&E aggregates and analyzes assessment data to provide feedback to the Military Services and DoD agencies. The IA/IOP assessment process includes the following:

- Blue Teams – Perform technical and non-technical assessments, including scans and surveys of networks, network personnel, and network policies and practices.
- Green Teams – Assist the Exercise Authority in interpreting the results of an assessment, addressing shortfalls, and coordinating remediation and training, as required.
- Red Teams – Perform live network assessments via penetration testing and other activities as part of the exercise scenario and in support of the exercise opposition force.
- IOP Teams – Conduct assessments focused on specific mission threads or events as part of the exercise scenario to examine information flow in support of stated missions, tasks, or objectives.

To improve assessment rigor, this year the IA and IOP assessment program:

- Developed, validated, and implemented a standardized set of IA metrics and analytical methods that quantify operational performance attributes and outcomes
- Initiated development of operational performance metrics for IOP assessments, and mission accomplishment/impact metrics for IA assessments
- Instituted a process to formally provide exercise findings regarding specific system issues to the cognizant Services' acquisition leadership
- Created a dedicated IOP team to plan and execute focused IOP assessments
- Funded Defense Intelligence Agency development of cyber threat support documents to guide the realistic portrayal of network threats during COCOM and Service exercises
- Supported ongoing efforts at the Defense IA Program Office to establish standard enterprise metrics and efforts by the Enterprise Solutions Steering Group to assess the return on investment for selected IA products purchased and licensed by DoD

DOT&E remains partnered with the Joint Staff and the Assistant Secretary of Defense for Networks, Information, and Integration (ASD[NII]) in the oversight and coordination of the IA/IOP assessment program. DOT&E has expanded the reporting process to ensure that assessing organizations report significant findings to Service acquisition authorities, Service Chief Information Officers, and specific program offices, where appropriate, for investigation and resolution.

FY08 Assessment Activities

In FY08, the OTAs performed 19 of 20 planned assessments. These included 12 COCOM and seven Service exercise assessments (Table 1). Five of these assessments involved units preparing to deploy to Iraq and Afghanistan.

The OTAs employed the DOT&E six-step IA Assessment Process for 10 major acquisition systems under DOT&E oversight in FY08. Since the IA certification process tends to focus on design and preparations for operations ("Protect"), OT&E events have been reviewed to ensure additional focus on the operational aspects ("Detect," "React," and "Restore").

The OTAs assessed the following acquisition systems with enhanced IA and IOP focus as indicated:

- Dry Cargo/Ammunition Ship, T-AKE (IA and IOP)
- Amphibious Assault Ship, LPD-17 (IA and IOP)
- Teleport Generation 2 (IA and IOP)
- Global Broadcast Service, GBS (IA and IOP)
- Global Positioning System, GPS (IA and IOP)
- Wideband Global Satellites, WGS (IA)
- Communications Processing System Release 3, CPS-3 (IA)
- Business Systems Modernization, BSM, BSM-E (IA)
- Combat Information Transport System, CITS (IA)
- Public Key Infrastructure, PKI (IA and IOP)

Assessment

DoD awareness and preparation to meet the growing threats to military information systems and networks continued to improve in FY08, but significant gaps still exist between potential adversary actions and demonstrated defense capabilities. The inability to detect penetrations or presence of an advanced adversary was a frequently noted shortfall. This gap may place mission accomplishment at risk.

Assessments of IA in fielded exercises are limited by security considerations and competing objectives that must be met by exercise planners. These constraints can lead participants to a false sense of security. COCOM staffs are seeking new approaches to ensure that warfighters are prepared to successfully operate in realistic threat environments with degraded systems. SECDEF guidance to plan for, implement, and regularly exercise the capability to fight through cyber/kinetic attacks that degrade the Global Information Grid needs to be fully implemented. Given their interdependency, assessors need to examine IA and IOP simultaneously during exercises.

Assessors continue to find most vulnerabilities are basic in nature, and easily remedied by local personnel with adequate skills. Many organizations lack a full complement of trained personnel. This remains a root cause of most problems that exercise Red Teams exploit. This finding must be tempered with the fact that the threats presented during these exercises fall substantially below what might be expected from a top-tier nation-state.

Collaboration suites improve warfighter interoperability often at the expense of introducing network vulnerabilities. FY08 exercise assessments identified two fielded collaboration suites that Red Teams have repeatedly exploited. While the technical solutions to closing these gaps are straightforward, the difficulty with simply closing the vulnerabilities highlights the challenge in balancing IOP and IA. These systems enhance information exchange for the warfighter, but for certain configurations, they also introduce serious vulnerabilities. DOT&E shared these findings with the Services, who have initiated several actions in response to these findings, including:

- Guidance to motivate implementation of stronger passwords
- Revision of system software documentation to improve security settings
- Other measures to provide an additional layer of security for collaboration suites

Additionally, the Joint Staff has communicated the specific vulnerabilities to operational commanders so they can reassess their local policies and the associated operational risks imposed across the DoD enterprise. For the longer term, opportunities to accelerate implementation of the Public Key Infrastructure program should be considered.

Interoperability assessments have revealed that:

- Approximately 75 percent of the fielded systems observed do not have current interoperability certifications.
- Many interoperability problems are remediated with local workarounds; however, the latter are often not well documented or consistent across DoD networks.
- Some major C2 systems, such as Command Post of the Future, Fusion Net, and Combined Information Dissemination Network Environment, are not fully interoperable with other C2 systems with which they are expected to operate.
- Network authentication and trust methods (such as Public Key Infrastructure) are not consistent among federal agencies. Each entity identifies, reports, and addresses network events (both IA and IOP) via differing processes.
- There are differing priorities for information sharing in classified networks across federal agencies. Some reduce access in the interests of security, while others broaden access among U. S. agencies and even coalition partners in the interest of information sharing.
- Introduction of enterprise solutions has generally helped standardize procedures and provided efficiencies, but it has also contributed to interoperability challenges. New tools are sometimes not compatible with existing tools (such as network scanners and discovery tools). Technology upgrades often impact training and support. Where network services are outsourced (e.g., Navy Marine Corps Intranet), or in cases where Services have committed to long-term licensing agreements, the hosting of new C2 applications may require significant contractual adjustments in order to achieve desired levels of interoperability.

General exercise assessment trends and findings include the following:

- *Intrusions Rates*. Red Teams report that penetration of warfighter networks has become more challenging over the last three years, although intrusion success rates remain high. Long-duration, stealthy intrusion efforts are more often successful and less frequently detected than short-duration exercise scenarios permit.
- *Maintenance.* Assessments generally found overall support, budgets, and spares to be adequate. Software configuration was the only maintenance factor that routinely adversely impacted network performance.
- *Boundary Defenses.* While boundaries for unclassified networks generally meet required standards, boundary protections for most classified networks assessed do not

meet specified requirements, and appear to rely on presumed network isolation and encryption for protection.

- *Configuration.* Network boundary defenses are seriously undermined by low compliance with port and protocol configuration requirements. Users do not fully comply with System Technical Implementation Guides in many fielded systems. Red Teams report that known, but un-patched, vulnerabilities commonly enable network intrusion and exploitation.
- *Credentials and Authentication.* Common Access Card (CAC)-enabled applications are less vulnerable to compromise and intrusion. Combined use of CAC and upgraded passwords significantly reduce intrusions. Public Key Infrastructure credentials are not standard across U.S. Federal agencies and departments, inhibiting interoperability, information sharing, and system-to-system trust between DoD and other agencies.
- *Network/System backup.* Few assessed networks have effective back-up practices for individual systems and critical applications.
- *Automated Management Tools*. The majority of military information networks and systems are regularly scanned for vulnerabilities. Use of anti-virus and anti-spyware software is nearly 100 percent for all networks assessed. However, network audit logs, while usually properly configured, are infrequently reviewed, and automated tools for identification and analysis of abnormal activities have not been generally available. The recent introduction of an enterprise host-based security suite for DoD should increase the use of these tools. FY09 assessments will examine the benefits realized from implementing the host-based security suite.
- *Manning*. Manpower requirements for new systems and applications generally do not address additional network support personnel requirements.

Review of assessments of acquisition programs and systems under DOT&E oversight has shown:

- Compliance with DoD IA controls remains incomplete for many systems. The lack of timely patches, use of weak or default passwords, the use of incorrect configurations, and the use of unnecessary ports and services significantly reduce the readiness of new systems to operate effectively on DoD networks.
- Continuity and recovery plans are often lacking for newly fielded systems.
- IA protection against external threats is typically substantially better than protections against internal/insider threats.
- OT&E often yields very limited data on the operational aspects of IA. During many operational test events, the representative IA environment (including firewalls and intrusion detection systems) were not available, inhibiting a full evaluation of those networks and systems.

Exercise assessments and OT&E continue to identify shortcomings in both the information assurance and interoperability of fielded systems. System limitations often compel users to choose between interoperability and network security. Local solutions to IA and IOP shortfalls that are inconsistent with other enterprise efforts often exacerbate the problem. The full implications of a system's use need to be clearly understood before a decision is made to employ it in an operational network. The risk to operational success increases when network administrators and defenders lack the tools to rapidly detect, assess, and respond to network exploitations or attacks.

FY09 Goals and Planned Assessment Activities

DOT&E has identified 22 COCOM and Service exercises for assessment in FY09, with the goal of performing at least one IOP and one IA assessment at each COCOM and Service during the fiscal year. Table 2 lists the planned assessments. Eight of the exercises will be for units preparing for deployment to Iraq and Afghanistan. The FY09 assessments will focus on the following:

- Increasing the rigor of IOP and IA assessments to be more operationally realistic and threat representative, and examining mission assurance under degraded network conditions
- Identifying and tracking IA and IOP problems found in OT&E; preparing and executing exercise assessments that examine current status of problems and/or solutions
- Transmitting critical finding to Service leadership

Recommendations

- Status of Previous Recommendations. The following are the FY07 recommendations and their status at the end of FY08:
  - FY07 #1: Exercise authorities should permit more realistic network attacks to exercise detection capabilities, and network Continuity of Operations and recovery plans; a Joint Staff recommendation to high-level COCOM and Service authorities would be helpful. SECDEF issued Guidance to the Force to plan for, implement, and regularly exercise the capability to fight through cyber/kinetic attacks that degrade the Global Information Grid. Additionally, the Vice Chairman of the Joint Chiefs of Staff sent a message to Commander, U.S. Joint Forces Command requesting more realistic threat portrayal during exercises. These initiatives should be reflected in FY09 exercise planning.
  - FY07 #2: The Joint Staff and/or U.S. Strategic Command should undertake the development of standard network manning and training templates based on network function, complexity, and required maintenance. There is no ongoing DoD-wide effort to identify the manning baselines, and the associated personnel training and qualification requirements, for managing, administering, and operating networks of different size, complexity, and functionality. This issue has been briefed to and is under the consideration of the IA Senior Leadership panel.
- FY08 Recommendations.
  1. To enhance the value of exercise assessments, exercise authorities for each COCOM and Service should work with appropriate Defense Agencies to incorporate the portrayal of representative nation-state cyber threats during at least one of their major exercises each fiscal year. (Due to security and other concerns, certain aspects may need to be

conducted on segregated networks or as "table-top" events for senior decision-makers.) Additionally:

- National Security Agency, Defense Intelligence Agency, and exercise planners should develop threat assessments and threat-representative exploits to portray realistic cyber threats during selected exercises.
- Exercise planners and assessing organizations should develop exercise plans consistent with other training objectives that exercise the capabilities needed to fight through cyber/kinetic attacks that degrade normal network operations.
- The U.S. Strategic Command Joint Task Force for Global Network Operations should expand participation in all major COCOM exercises where networks are to be subjected to exercise cyber attacks at the nation-state level.

2. The Joint Staff and Services should more strictly enforce adherence to the interoperability certification and re-certification process.

Table 1. Information Assurance and Interoperability Exercise Events in FY08

Exercise Authority	Exercise / Event	Lead OTA	Support OTA
Joint Staff	CWID 08	JITC	MCOTEA
CENTCOM	AOR -1 (OEF)	ATEC	
	AOR - 2 (OIF)	ATEC	
EUCOM	Austere Challenge 08	ATEC	JITC
	Flexible Leader 08	ATEC	
JFCOM	CJTF – Horn of Africa	JITC	
NORTHCOM	Vigilant Shield 08	AFOTEC	JITC
	Ardent Sentry 08	AFOTEC	MCOTEA, AFIOC
PACOM	Terminal Fury 08	ATEC	JITC
SOUTHCOM	Blue Advance 08	ATEC	
	PANAMAX 08	ATEC	
STRATCOM	Bulwark Defender 08	JITC	
	Global Storm 08	JITC	ATEC, AFIOC, MCOTEA
TRANSCOM	Turbo Distribution 08	JITC	
USFK	Key Resolve 08	ATEC	AFOTEC
USA	Unified Endeavor 08-1	ATEC	JITC, MCOTEA
	Unified Endeavor 09-1, Phase 1	ATEC	JITC
	Unified Endeavor 09-1, Phase 2	ATEC	JITC
USN	JTFEX 08-4	COTF	AFIOC, JITC

CENTCOM – Central Command
EUCOM – European Command
JFCOM – Joint Forces Command
NORTHCOM – Northern Command
PACOM – Pacific Command
SOUTHCOM – Southern Command
SOCOM – Special Operations Command
STRATCOM – Strategic Command
TRANSCOM – Transportation Command
USFK – U.S. Forces, Korea
USA – Army
USN – Navy

AOR – Area of Responsibility
CJTF – Commander Joint Task Force
CWID – Coalition Warrior Interoperability Demonstration
JTFEX – Joint Task Force Exercise
OEF – Operation Enduring Freedom
OIF – Operation Iraqi Freedom

ATEC – Army Test and Evaluation Command
AFIOC – Air Force Information Operations Center
AFOTEC – Air Force Operational Test and Evaluation Center
COTF – Commander, Operational Test and Evaluation Force
JITC – Joint Interoperability Test Command
MCOTEA – Marine Corps Operational Test and Evaluation Activity

Table 2. Planned Information Assurance and Interoperability Assessment Events for FY09

Exercise Authority	Exercise / Event	Lead OTA	Support OTA
AFRICOM	CPX 09	ATEC	JITC
CENTCOM	Internal Look 09	ATEC	
EUCOM	Austere Challenge 09	ATEC	JITC
JFCOM	CWID 09	JITC	AFIOC, ATEC, COTF, MCOTEA
NORTHCOM	Vigilant Shield 09	AFIOC	JITC
PACOM	Terminal Fury 09	ATEC	COTF, MCOTEA
	Talisman Saber 09	ATEC	COTF, MCOTEA
SOCOM	Able Warrior 09-2	MCOTEA	JITC
SOUTHCOM	PANAMAX 09	ATEC	JITC
STRATCOM	Global Lightning/Bulwark Defender 09	JITC	
	Global Storm 09	JITC	
TRANSCOM	Turbo Challenge 09	JITC	
USFK	Key Resolve 09	ATEC	JITC
USA	2nd ID CPX 09 (USFK)	ATEC	
USA	Unified Endeavor 09-1 Phase V	ATEC	
	Unified Endeavor 09-2	ATEC	
	Unified Endeavor 09-3 Phase I	ATEC	
	Unified Endeavor 09-3 Phase II	ATEC	
	Unified Endeavor 09-3 Phase V	ATEC	
USN	Joint Task Force Exercise 09-2	COTF	
	Joint Task Force Exercise 09-3	COTF	
USAF	Black Demon 09	AFIOC	
USMC	Unified Endeavor 09-1 Phase IV	MCOTEA	

AFRICOM – African Command
CENTCOM – Central Command
EUCOM – European Command
JFCOM – Joint Forces Command
NORTHCOM – Northern Command
PACOM – Pacific Command
SOUTHCOM – Southern Command
SOCOM – Special Operations Command
STRATCOM – Strategic Command
TRANSCOM – Transportation Command
USFK – U.S. Forces, Korea
USA – Army
USN – Navy
USAF – Air Force
USMC – Marine Corps

AOR – Area of Responsibility
CJTF – Commander Joint Task Force
CPX – Command Post Exercise
CWID – Coalition Warrior Interoperability Demonstration
JTFEX – Joint Task Force Exercise
OEF – Operation Enduring Freedom
OIF – Operation Iraqi Freedom

ATEC – Army Test and Evaluation Command
AFIOC – Air Force Information Operations Center
COTF – Commander, Operational Test and Evaluation Force
JITC – Joint Interoperability Test Command
MCOTEA – Marine Corps Operational Test and Evaluation Activity

Test & Evaluation Resources

Test & Evaluation Resources

Test and Evaluation Resources

The Director is required under the law to assess the adequacy of the planning for, and execution of, operational testing and evaluation of systems under oversight. The test workforce, ranges, and test facilities, as well as assets used in threat representation, are important elements in assessing the adequacy of operational and live fire testing. One means DOT&E uses for assessing test adequacy planning is to monitor DoD and Service-level strategic plans, investment programs, and budget decisions. DOT&E also conducts studies of resource needs and alternative solutions to meet such T&E resource needs through its Threat Systems program.

Summary

During the preceding year, there has been progress in resolving long-standing test resource deficiencies associated with some target programs, notably contract award for development of the Multi-Stage Supersonic Target (Threat D target). Incremental progress was also made in addressing deficiencies associated with other target and instrumentation requirements. Of continuing concern are Real-Time Casualty Assessment capabilities, the QF-4 replacement and 5th Generation Air-Superiority Target (5th Generation), Anti-Ship Cruise Missile (ASCM) target fidelity, Electronic Warfare test environments, and an Urban Environment Test Capability. Other deficiencies, such as a high-speed automotive test track and increasing sensor and weapon capabilities, remain consistent with previous reports. Increased emphasis on means to test countermeasures for IEDs, infrared surface-to-air missiles, Computer Network Attack, and Urban and Littoral warfare continue to reshape test resource planning.

During FY08, Service investment in T&E resources continued to address near-term, specific program needs. Concurrently, a number of T&E infrastructure facilities faced growing pressure to consolidate or close. The current demand for some of these facilities is low and future use cannot be predicted with certainty. Consequently, strong incentive exists to close test facilities for which there is not a solid customer base. When major test facilities are closed, the cost of reconstituting their capability significantly affects the defense budget.

OSD-funded test resource investment programs, such as the Central T&E Investment Program (CTEIP), Resource Enhancement Program, and DOT&E's Threat Systems Program, continue to provide sponsorship of critical solutions for test resource deficiencies. These investment lines sponsor studies and projects that reach across the spectrum of T&E resources. Recent projects include aerial and land targets, target control systems, and upgraded threat systems to evaluate weapons and sensors.

As DoD implements Integrated Testing, DOT&E will closely monitor the adequacy of T&E infrastructure to support operational and live fire testing and the early developmental testing of system acquisitions. To realize Integrated Testing's promise of efficiency in terms of cost and schedule, exposure to robust and operationally relevant test environments early in developmental testing is necessary. Identification and documentation of test resource requirements in program Test and Evaluation Master Plans is essential in order to develop budgets that will support an adequate T&E resource base.

Resource Shortfalls

The following are important to achieve adequate OT&E in the future:

Aerial Targets

Full-Scale Aerial Targets remain a concern due to the declining supply of QF-4 airframes. Progress continues toward a replacement for the QF-4. The Air Force has completed several QF-16 airframe and engine studies and is proceeding toward the pre-System Development and Demonstration (SDD) phase in FY10. DOT&E continues to monitor the threat environment and examine options for representing future, 5th Generation fighter threats. A joint DOT&E and USD(AT&L) study on affordable 5th Generation target designs will be completed in 2009. Preliminary study results are encouraging. However, funding to support development of a next generation target has not been identified.

Anti-Ship Cruise Missile Targets

Multi-Stage Supersonic Target (MSST) (Threat D target). The MSST attained Milestone B in August 2008. The Navy is projecting Initial Operational Capability in FY14. This fails to meet test schedules for the Standard Missile-6, Rolling Airframe Missile Block 2, and the LHA 6 Ship Self-Defense System in FY10/11. This delay directly affects adequacy of testing for determining effectiveness and suitability for each of these systems.

Supersonic Sea-Skimmer. Delays in certification of the flight termination system for the GQM-163A target adversely affected the adequacy of the initial operational test and evaluation of the LPD-17 combat system. Repeated delays resulted in not conducting critical OT&E during the testing window.

Supersonic High Diver. Delays in development of the high diver variant of the GQM-163A continue due to problems concerning certification of its flight termination system. This postpones determination of whether the GQM-163A high diver variant will be an adequate surrogate for the threat.

Next Generation Subsonic Aerial Target (SSAT). The current inventory of subsonic targets (BQM-74E and BQM-34S) is showing its age. Threat representation adequacy (performance and signature) coupled with end of production requires development of a new subsonic aerial target. The Navy has outlined a notional SSAT acquisition plan that will deliver a successor target in FY12. While addressing a number of threat performance issues, the next target will not replicate one unique characteristic of ASCMs: the turning maneuver. Threat missiles change course by skidding into a turn. All existing targets and probable SSAT designs are winged vehicles and change course using a banking maneuver. This affects the radar cross section the target presents to shipboard sensors and weapons in addition to imposing limits on minimum flight altitude and use of threat seeker simulators. These factors affect target presentation realism.

Real Time Casualty Assessment

A high fidelity Real Time Casualty Assessment (RTCA) adds realism, motivates Soldiers, synchronizes the battle, and drives real-time play in Army test and training events. RTCA also generates combat loss and exchange ratios to support force effectiveness evaluations. The Army Test and Evaluation (T&E) community has an existing laser-based capability and, together with the training community, is developing a geometric pairing-based RTCA system to support the needs of both the Test and Training Communities.

Operational Test – Tactical Engagement System (OT-TES) is the Army's current laser-based, T&E RTCA system, which can support up to company size test and training events. The system is undergoing a communications upgrade required due to commercial encroachment into the current OT-TES ultra-high frequency television channel, obsolescence of encryption hardware, and need for increased data transmission rates to accommodate smart munitions testing. The communications upgrade system will enter Production Qualification Testing in 2QFY09 followed by a Limited User Test in 1QFY10. The strategy is to field a Company-on-Company capability together with player units for air defense and rotary wing aircraft.

OneTESS, the follow-on to OT-TES, will support test and training for up to brigade size units. The system recently completed Field Functional Test at the National Training Center, Fort Irwin, California. However, results were not favorable, and the Program Strategy is currently being re-worked. If successfully implemented, system fielding could occur as early as FY15. Procurement is currently limited to 6,000 player units for the National Training Center, and 600 player units for the Army's Operational Test Command.

Frequency Spectrum Management

Competition for frequency spectrum and bandwidth has begun to affect operational testing. For example, in FY08, operational testing of the EA-6B ALQ-99 Low Band Transmitter was forced to move from Naval Air Warfare Center (Weapons Division) to Naval Air Station, Fallon, Nevada. This was due to electronic emitter constraints imposed by the Federal Communications Commission and Federal Aviation Administration. Such constraints limited the times at which tests could be conducted. This resulted in a test scheduling conflict that could not be resolved except by transferring the testing to another location. At the alternate location, fewer test resources were available. Consequently, this reduced the number of test objectives that could be attempted. Limitations on testing such as occurred with ALQ-99 will become more prevalent as competition for use of radio frequency spectrum increases. This trend threatens the adequacy of operational testing and is therefore a concern.

Urban Operations

Urban operations are a feature of current and future land combat. However, there is no single initiative or program that will satisfy emerging requirements to test urban combat capabilities. Neither test technologies nor facilities and infrastructure adequate to support testing are in place. The FY07 Strategic Plan for T&E Resources proposed a study to identify urban combat T&E deficiencies. This effort is underway with the support of Joint Forces Command and the Army Test & Evaluation Command. Additionally, the urban canyon effect caused by thoroughfares as they wind among tall structures within the urban environment exacerbates the ability to obtain Time-Space-Position Information (TSPI) from participating components. To address this issue, the Test Resource Management Center (TRMC) has commissioned a Next-Generation TSPI (NG-TSPI) Study, which will specifically investigate tracking capabilities in a GPS Denied/Low GPS Signal environment.

A variety of efforts are underway to address urban combat test deficiencies. These include a projected Combined Arms Training Facility at Fort Bliss, Texas; one of the intended testing sites of the Future Combat System. Recent approval of PBD 704 provides funding in FY10-FY15 to support an Urban Environment Test Capability for testing and evaluating technologies and systems used for full-spectrum and joint military operations in a realistic urban environment. Efforts have also been made to characterize the impact of Electromagnetic Spectrum Effects and how they may affect system performance in an urban setting. Some DoD technology initiatives may contribute indirectly to test capability for urban combat systems. These include Non-Intrusive Instrumentation and position location tracking in a GPS-denied environment. Additionally, Yuma Proving Ground, Arizona, continues to expand test infrastructure and is improving capabilities of the Counter IED Test Range. This range currently supports many aspects of counter-IED and counter-terrorism testing.

Automotive High-Speed Test Track

The Army lacks the ability to conduct high-speed operational testing of up-armored wheeled vehicles. This capability is necessary to assure consistency with current Operations Enduring Freedom and Iraqi Freedom tactics, techniques, and procedures for programs such as Mine Resistant Ambush Protected Vehicle. The U.S. Army Corps of Engineers has awarded a contract for Phase One and construction is ongoing at the Automotive Technology Evaluation Facility at Aberdeen, Maryland. Designs for Phases Two and Three to complete the track are well underway. DOT&E continues to support the Army's effort to develop this needed capability to compliment the Live Fire and Roadway Simulator test capabilities at Aberdeen Proving Ground.

Network Testing in a Collaborative Environment

The scale and complexity of tests, and network testing in particular are driving testers toward greater reliance upon simulations and federations of simulations for data collection, reduction and analyses tools, and visualization systems to meet the requirements for testing families of systems, system-of-systems, and joint test events. The Army Operational Test Command (OTC), in response to the challenges imposed by testing systems-of-systems and families of systems continues to pursue use of simulation tools to support its operational test program. The OTC Analytic Simulation and Instrumentation Suite (OASIS) is the Army's approach to a federation of simulations. The core Army objective is to support a cross command collaborative environment and battle command systems integration. OTC exercised its federation of simulations in a series of increasingly complex demonstrations during FY08, and determined that OASIS is ready to field in a test support role. To date, the Army effort has been focused on Future Combat System testing. Near term test programs that may potentially benefit from OASIS include DCGS-A, JEM/JWARN JTRS, and WIN-T.

Diesel-Electric Submarine Targets

DOT&E is sponsoring an independent assessment of options that would permit *Virginia* class attack submarine testing in an anti-diesel scenario without Navy-imposed restrictions. These restrictions result in less than adequate anti-diesel interaction for *Virginia* IOT&E. Since an anti-diesel submarine scenario may be the most demanding anti-submarine warfare mission that *Virginia* could face, the lack of adequate interaction with a modern, diesel-electric submarine has precluded evaluation of *Virginia* anti-submarine warfare effectiveness.

Target Control Systems

The 2005 Defense Science Board (DSB) Task Force on Aerial Targets identified the need for common and interoperable Target Control Systems (TCSs) across the Services. The FY06 Addendum to the Strategic Plan for T&E Resources restated this need. With passage of time, legacy TCSs have become progressively more difficult to sustain. In FY08, the Services continue to operate unique TCSs. Near term TCS investments are spread across the Services without corporate guidance to promote interoperability. During FY08, DOT&E funded a study to examine existing TCSs and identify Common Control Elements (CCEs) that may be suitable for incorporation in existing and future TCSs at different DoD ranges. This is consistent with recommendations made in the 2005 DSB report. The study group identified five CCEs. Two of these concerned increased interoperability between TCSs. In FY09, a demonstration of one of these two CCEs will be conducted and the study group will consider plans to implement the second CCE. DOT&E has also started a project to examine the applicability of open standards to the targets community.

2007 Strategic Plan For T&E Resources – Capability Gaps

Undersea and Littoral Warfare Test Resources

There is a continuing need to develop test range capability for littoral warfare programs. A Record of Decision under National Environmental Policy Act procedures is expected to be issued in 2009 concerning the proposed East Coast Undersea Training Range. Recently, the Navy added a fourth site to those under consideration for the Range. This will require an additional period of public comment. Currently, the Navy's position is that the East Coast Underwater Training Range will be used only for training. Upgrades to permit its use as a test resource are not programmed beyond the limited funds allocated for the Portable Underwater Tracking System – a Resource Enhancement Program (REP). Consequently, a shallow water/littoral test capability will remain a T&E resource deficiency as identified in the 2007 Strategic Plan.

Multiple Small Craft Scoring Capability

Identified as a T&E capability gap in the OSD Test Resource Management Center's 2007 Strategic Plan, the ability to score small craft swarming attacks on surface ships is essential to evaluate near-term naval warfare programs' weapons and sensors as well as tactics, techniques, and procedures. Currently, scoring capabilities are limited to non-real time solutions across a limited target field. DOT&E selected, and CTEIP funded, a technology development effort under the Target Management Initiative program that became the Surface Target Vector Scorer. The CTEIP Joint Improvement and Modernization program funded the Soft Impact Location Capability project to address another T&E capability gap. The technologies under examination in these projects may also have applicability to land-based testing.

Time-Space Position Information in a GPS-Denied Environment

In future combat environments, GPS data may be denied. Similarly, in realistic test events, GPS data may be denied. This will affect not only the accuracy of the weapon system under test but also the accuracy of TSPI associated with the test. Other sources of TSPI exist to provide data needed for evaluation of weapon performance, but the fidelity of such data is not equal to that obtainable from GPS. Consequently, alternate means of obtaining TSPI of sufficient quality to support adequate evaluation of high performance weapon systems is required. In pursuit of this objective, a 2008 TRMC study will develop Use Cases in which the Next Generation-TSPI System must work in the GPS-denied environment. One of those use cases addresses urban canyon operations previously discussed.

Joint Test & Evaluation Program

Joint Test & Evaluation Program

Joint Test and Evaluation Program

The Joint Test and Evaluation (JT&E) Program provides non-materiel solutions to critical warfighting issues. It charters operational test projects that improve joint warfighting capabilities with existing equipment. The program develops solutions to joint operational problems and measures the associated improvements through enhanced tactics, techniques, and procedures (TTP). It also measures improvements brought about by enhanced testing methodologies. The JT&E Program's objective is to provide rapid solutions to issues identified by the joint military community. The program is complimentary to, but not part of, the weapons acquisition process.

The program managed 10 joint tests that focus on emerging needs of today's warfighters in FY08:

- Joint Command and Control for War on Terror Activities (JC2WTA) *
- Joint Mobile Network Operations (JMNO)
- Joint Test and Evaluation Methodology (JTEM)
- Joint Integrated Command and Control for Maritime Homeland Defense (JICM) *
- Joint Command and Control for Net-Enabled Weapons (JC2NEW)
- Joint Airspace Command and Control (JACC)
- Joint Air Defense Operations-Homeland (JADO-H)
- Joint Electronic Protection for Air Combat (JEPAC)
- Joint Non-Kinetic Effects Integration (JNKEI)
- Joint Fires Coordination Measures (JFCM) Joint Test *

The JT&E Program instituted a quick reaction test (QRT) capability in 2004 to respond to pressing warfighter needs. The program managed 10 QRTs during FY08:

- Joint Sniper Defeat (JSD)
- Joint Combat Outpost (JCOP)
- Engage On Remote (EOR) *
- Joint Base Expeditionary Targeting and Surveillance System-Combined (JBETSS)
- Joint Communications Redundancy (JCR)
- Joint Contingency Operations Base (JCOB) *
- Joint Theater Ballistic Missile Early Warning (JTBMEW) *
- Joint Tactical Tomahawk Targeting (JHAWK) *
- Joint Integration of Nationally-Derived Information (JINDI) *
- Joint Logistics Global Combat Support System (JLGCSS) *

(* indicates projects closing in 2008)

ACTIVE JOINT TESTS

JOINT COMMAND AND CONTROL FOR WAR ON TERROR ACTIVITIES (JC2WTA)

Sponsor/Charter Date: Navy/February 2006

Purpose: To develop joint TTP that enable a commander embarked on an *Ohio* class submarine to effectively exert command and control (C2) of distributed Special Operations Forces (SOF) without compromising the clandestine posture of the submarine. The JC2WTA project closed on September 30, 2008.

Products/Benefits to the Warfighter

The test products included a planners TTP handbook, flipbook, and interactive multi-media DVD. The Planners Handbook for SOF/SSGN Integration provides information, lessons learned, and recommendations for the effective employment of this submarine in support of SOF operations.

Customer Feedback: Lieutenant General Fridovich, U.S. Southern Command (USSOCOM) wrote to DOT&E, "Thank you so much for your support and your faith and vision in our test!! You made this effort educational and enjoyable."

JOINT MOBILE NETWORK OPERATIONS (JMNO)

Sponsor/Charter Date: Marine Corps/February 2006

Purpose: To develop TTP that improve the ability of joint tactical forces to digitally communicate directly with each other and provide tactical forces and mobile users access to information resources and network services when crossing Service network boundaries.

Products/Benefits to the Warfighter

The use of JMNO TTP will:

- Improve mobile network access while maintaining quality of service
- Enhance mobile users' connectivity to their home network resources while maneuvering
- Enable interoperability while maintaining robust information assurance

JOINT TEST AND EVALUATION METHODOLOGY (JTEM)

Sponsor/Charter Date: DOT&E/February 2006

Purpose: To improve testing throughout the acquisition life cycle using a realistic joint mission environment. JTEM is developing methods and processes for defining and using a live, virtual, and constructive joint test environment to evaluate system-of-systems performance and joint mission effectiveness, in order to institutionalize testing in a joint mission environment.

Benefits to the Warfighter
JTEM will deliver Capability Test Methodology version 3.0 in February 2009 that will include:
- Methods and processes guides
- New evaluation and analytic methods
- A measures framework for joint mission effectiveness
- Handbooks

Additional products include:
- Reusable test artifacts (architectures, measures, and joint mission threads)
- Models for live, virtual, constructive, distributed joint mission environment development
- Processes for enhanced verification, validation, and accreditation
- Recommendations on needed changes to acquisition directives and instructions
- Solutions to identified testing and acquisition process gaps, seams, and overlaps

JOINT INTEGRATED COMMAND AND CONTROL FOR MARITIME HOMELAND DEFENSE (JICM)

Sponsor/Charter Date: U.S. Northern Command/March 2006

Purpose: To evaluate C2 processes to execute U.S. Northern Command's maritime homeland defense missions by enhancing the ability to detect and defeat an adversary's ability to strike the homeland using the maritime domain. The JICM project closed on September 30, 2008.

Products/Benefits to the Warfighter
The listed JICM products directly benefit the warfighter:
- Maritime C2 Handbook consolidates maritime threat response (MTR) processes defined in existing concept of operations orders, and plans
- MTR Checklist provides a logical flow of actions to the maritime community for consideration by warfighters during an MTR event
- MTR Portal is a distributed, collaborative intranet workspace using existing DoD-licensed Microsoft software

JOINT COMMAND AND CONTROL FOR NET-ENABLED WEAPONS (JC2NEW)

Sponsor/Charter Date: Air Force/August 2006

Purpose: To improve the operational concepts and procedures for use of net-enabled weapons. The project's focus is to test and evaluate C2 processes required to exchange information between net-enabled weapons and the delivery platforms, sensor platforms, and C2 systems.

Products/Benefits to the Warfighter
JC2NEW's TTP allows a Joint Force Commander to prosecute time-sensitive targets with net-enabled weapons. Other benefits are:
- Post-launch, net-enabled weapons TTP for dynamic targeting operations
- Minimized risks to operators, friendly ground forces, and noncombatants through precise engagement of moving and stationary surface targets
- Optimized use of scarce assets through in-flight re-tasking capabilities
- Training methodologies that support net-enabled weapons use and further TTP development

JOINT AIRSPACE COMMAND AND CONTROL (JACC)

Sponsor/Charter Date: Army/August 2006

Purpose: To provide faster, more lethal access to joint airspace for surface and airborne sensors, weapons, and C2 systems to carry out missions in support of forward operating bases (FOB) and maneuver elements.

Products/Benefits to the Warfighter
Test products will detail de-centralized joint C2 processes:
- Provide the Army's Joint Combined Arm Training Division and Combined Arms Center with the JACC Handbook for Airspace C2 in Support of Maneuver Units and FOBs
- Contribute to the Air Land Sea Application Center's Airspace Control TTP
- Contribute to the Air Force's AFTTP 3-1 Theater Air Control System
- Contribute to the Army's Field Manual 3-52 Army Command and Control in the Combat Zone

JOINT AIR DEFENSE OPERATIONS-HOMELAND (JADO-H)

Sponsor/Charter Date: North American Aerospace Defense and U.S. Northern Commands/August 2007

Purpose: To test deployable homeland air and cruise missile defense (D-HACMD) TTP and planning processes.

Products/Benefits to the Warfighter
JADO-H will provide joint TTP that standardize planning to counter homeland asymmetric air threats. Collaborative tools will include:
- D-HACMD process modeling that enables the warfighter to view the entire planning process
- Checklists for critical steps in the planning process
- An exercise planning guide
- A commander's planning handbook

JOINT ELECTRONIC PROTECTION FOR AIR COMBAT (JEPAC)

Sponsor/Charter Date: Air Force/August 2007

Purpose: To develop joint TTP to improve air combat effectiveness in complex electronic attacks using situational awareness tools and off-board sensors.

Products/Benefits to the Warfighter
JEPAC provided a first draft of joint air-to-air counter-electronic attack TTP to the warfighter. Test results addressed in JEPAC's first field test directly assist tactical and operational planners in performing their mission. In addition, JEPAC developed a

training package that is currently taught by Marine Aviation and Weapons Tactics Squadron 1 and the Naval Strike and Air Warfare Center.

JOINT NON-KINETIC EFFECTS INTEGRATION (JNKEI)

Sponsor/Charter Date: U.S. Strategic Command/August 2007

Purpose: To develop TTP to assist planners to integrate electronic attack, computer network attack, and space control-negation capabilities into planning.

Products/Benefits to the Warfighter
JNKEI will improve the integration of non-kinetic effects during operational planning, thereby increasing the non-kinetic courses of action available. Additionally, JNKEI will coordinate with Service and joint doctrine and training centers to include the TTP in their publications and curriculum.

JOINT FIRES COORDINATION MEASURES (JFCM)

Sponsor/Charter Date: Air Force/February 2005

Purpose: To improve the effectiveness of joint fires areas (JFAs) by establishing standardized operational TTP. The JFCM project closed on December 31, 2007.

Products/Benefits to the Warfighter
JFCM provided JFA TTP that enables a Joint Force Commander to integrate fires in support of the campaign plan without further coordination with the JFA establishing authority. JFA TTP allows the Services to educate, train, and equip warfighters to train to one TTP that works in all theaters and battlespaces.

Customer Feedback:
- Brigadier General Biscone, U.S. Central Command (USCENTCOM): "CENTCOM DJ-3 [Operations office] endorses the Joint Fires Area (JFA) tactics, techniques, and procedures (TTP) and supports transitioning the TTP into Joint Doctrine."
- Lt General North, Commander, U.S. Central Command Air Force (USCENTAF): "It is imperative that we take immediate, proactive steps to standardize multi-Service TTP and strengthen operational cohesion across the joint force. The Joint Fires Area concept holds substantial merit and implementation efforts should proceed unabated."
- Lt General North, Commander, USCENTAF: "Our success today depends on Airmen, Sailors, Soldiers, and Marines employing time-tested multi-Service TTP to orchestrate complex, lethal attacks with efficiency and precision."

QUICK REACTION TESTS

JOINT SNIPER DEFEAT (JSD)

Sponsor/Charter Date: Army Infantry Center/September 2007

Purpose: To focus on mitigating the threat snipers pose to coalition forces. Many new technologies have emerged to help warfighters combat the sniper threat, but the rapid development and distribution of these systems outstripped training on the equipment.

Products/Benefits to the Warfighter
Warfighters will benefit through reduction of casualties from sniper attacks, the second greatest threat to coalition forces in Afghanistan and Iraq, and increased situational awareness and force protection measures. The JSD Handbook includes guidance on the use of sniper defeat systems that have been fast tracked to operational theaters, as well as non-materiel sniper defeat solutions such as exposure reduction and counter-sniper observation.

JOINT COMBAT OUTPOST (JCOP)

Sponsor/Charter Date: U.S. Central Command and the Army Engineer Research and Development Center/February 2008

Purpose: To develop TTP to defend against a vehicle-borne IED attack against a combat outpost.

Products/Benefits to the Warfighter
The JCOP QRT will provide TTP to defend against IED attacks directed against combat outposts. Through the combined efforts of the Army Test and Evaluation Command QRT team, the Joint Staff and Central Command Force Protection Directorates, the JCOB Handbook will address many of the materiel and equipment challenges that joint forces conducting contingency operations face on the asymmetric battlefield.

ENGAGE ON REMOTE (EOR)

Sponsor/Charter Date: North American Aerospace Defense Command (NORAD)/February 2008

Purpose: To develop TTP that enhance air defense targeting by providing fire-control-quality data via tactical data link from surface-based sensors to the aircraft cockpit.

Products/Benefits to the Warfighter
The EOR TTP enhances NORAD's ability to successfully engage a variety of asymmetric threats to include low-speed and low-visibility unmanned aerial vehicles. The specific benefits of EOR are:
- Increased pilot situational awareness and reduced workload in a high demand environment
- Enhanced survivability against asymmetric threats
- Updated National Capital Region Integrated Air Defense System and Deployable Homeland Air and Cruise Missile Defense concept of operations

JOINT BASE EXPEDITIONARY TARGETING AND SURVEILLANCE SYSTEM-COMBINED (JBETSS-C)

Sponsor/Charter Date: U.S. Central Command/June 2008

Purpose: To provide urgent TTP for the employment of the Base Expeditionary Targeting and Surveillance System-Combined systems.

Expected Products/Benefits to the Warfighter
A handbook will be fielded to Joint Force Commanders in USCENTCOM to provide protective measures to reduce the risk of combat injuries and death at forward operating bases, joint security sites, main supply routes, and combat outposts.

JOINT COMMUNICATIONS REDUNDANCY (JCR)

Sponsor/Charter Date: U.S. Northern Command/2008

Purpose: To develop joint TTP for the employment of strategic and backup operational communications procedures.

Expected Products/Benefits to the Warfighter
The JCR QRT will provide TTP that addresses alternate combatant command communications backup procedures.

JOINT CONTINGENCY OPERATIONS BASE (JCOB)

Sponsor/Charter Date: Army/August 2006

Purpose: To develop joint force protection TTP for U.S. military contingency camps established during security, stability, transition, and reconstruction operations. The JCOB project closed on October 15, 2007.

Benefits to the Warfighter
The JCOB force protection handbook for contingency operations bases provided TTP against rockets, artillery, mortars, and vehicle-borne IEDs, and reduced risk of personnel injury. The test was co-sponsored by the Joint Staff and USCENTCOM Force Protection Directorates.

JOINT THEATER BALLISTIC MISSILE EARLY WARNING (JTBMEW)

Sponsor/Charter Date: Army/August 2006

Purpose: To develop joint TTP that provide precise theater ballistic missile early warning to U.S. Forces Korea, Combined Forces Command. The JTBMEW project closed on October 15, 2007.

Benefits to the Warfighter
The JTBMEW operator's handbook standardized use of the complex early warning system and increased confidence and accuracy in warnings.

Customer Feedback: Outbriefs to Major General Morgan, head of Operations, U.S. Forces Korea and Brigadier General Keltz, head of the 7th Air Force Air Operations Center, in October 2007, established the development and coordination of early warning requirements with U. S. Pacific Command Missile Defense Agency, Joint Theater Air and Missile Defense Organization, and U.S. Strategic Command and the development of early warning exercise objectives to exercise, assess, and improve its overall capability.

JOINT TACTICAL TOMAHAWK TARGETING (JHAWK)

Sponsor/Charter Date: U.S. Special Operations Command (USSOCOM) and Commander, Second Fleet/April 2007

Purpose: To provide multi-Service TTP for employment of the Tactical Tomahawk weapon system by special operations and other expeditionary forces. The JHAWK project closed on April 9, 2008.

Products/Benefits to the Warfighter
JHAWK QRT delivered an executable TTP for third party targeting of the Tomahawk cruise missile by units such as special operations teams in striking time sensitive targets.

Customer Feedback:

- Rear Admiral Kernan, USSOCOM: "Tactical TOMAHAWK (TACTOM) cruise missiles are uniquely suited to support the prosecution of targets in the Global War on Terror. Since initial fielding of TACTOM … no Joint Tactics, Techniques, and Procedures (JTTP) have been devised for the tactical targeting of this new global strike capability."
- Lieutenant Colonel Janney, USSOCOM: "… Have forged a partnership that built, tested, and validated a TTP that will work, today, within the real world political and Service-cultural constraints that are really out there."

JOINT INTEGRATION OF NATIONALLY-DERIVED INFORMATION (JINDI)

Sponsor/Charter Date: Air Force Warfare Center and the U.S. Pacific Command/January 2007

Purpose: To improve methods to provide nationally-derived information from regional cryptologic centers to front-line forces through integration of long-haul architectures and tactical data links. The JINDI project closed on April 4, 2008.

Products/Benefits to the Warfighter
JINDI TTP enhances situational awareness by disseminating actionable intelligence into a common, tactical data link. The TTP benefits the national intelligence community by providing it the necessary methodologies for the receipt of near-real time tactical information to enable them to better focus their intelligence collection strategies and threat reporting priorities in direct support to tactical forces.

JOINT LOGISTICS GLOBAL COMBAT SUPPORT SYSTEM (JLGCSS)

Sponsor/Charter Date: The Joint Staff and the U.S. Joint Forces Command/February 2007

Purpose: To develop TTP for the Global Combat Support System that allows the Services to integrate the supply chain by obtaining supply transactions in support of the warfighter. The JLGCSS project closed on April 25, 2008.

Benefits to the Warfighter

JLGCSS provided the combatant commander a fused joint logistics picture that provides actionable joint logistics knowledge so that the proper items are delivered at the proper place at the proper time.

Customer Feedback: Joint Staff J4, Logistics, Lieutenant General Christianson praised the QRT methodology used to develop the capability mapping and how it incorporated the validation event results. He stated that once you establish a sound methodology, you can use it to examine many processes.

The Center for
Countermeasures

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Countermeasures

The Center for Countermeasures

The Center for Countermeasures (the Center) is a joint activity that directs, coordinates, supports, and conducts independent countermeasure/counter-countermeasure (CM/CCM) test and evaluation activities for U.S. and foreign weapon systems, subsystems, sensors, and related components in support of DOT&E, weapon system developers, and the joint warfighter. The Center's testing and analysis helps in confirming the operational effectiveness and operational suitability of major acquisition programs' CM/CCM subsystems, ideally, early on in their development cycle.

Specifically, the Center:

- Performs early CM assessments
- Determines performance and limitations of precision-guided weapon systems and subsystems against CMs
- Develops and evaluates CM/CCM techniques and devices
- Tests CMs in the operational environment
- Provides analysis and recommendations on CM/CCM effectiveness
- Supports warfighter experimentation

During FY08, 50 percent of the Center's activities were in support of DOT&E oversight programs. Additionally, the Center participated in Operational Test/Developmental Test (OT/DT), live fire, experimental, and exercise support related to the CM/CCM mission area. Significant testing and exercise support activities were Global War on Terror focused. The Center performed 24 activities this year. The following are representative of this year's activities:

OPERATIONAL TEST/DEVELOPMENTAL TESTS

- **Air Force:** CV-22

  Sponsor: The Air Force Operational Test and Evaluation Center CV-22 Integrated Test Team

  Purpose: The Center supported OT-IIIC phase of the CV-22 IOT&E Directed Infrared Countermeasures flight test.

  Benefit to the warfighter: This assessment of the Infrared Countermeasures (IRCMs) determined the ability to protect the CV-22 tilt rotary aircraft against threat man-portable air defense system (MANPADS).

- **Navy:** Department of the Navy Large Aircraft Infrared Countermeasure (DoN LAIRCM)

  Sponsor: Navy Program Executive Officer, Tactical Aircraft Programs (PMA-272)

  Purpose: The Center supported the DoN LAIRCM program's DT, Quick Reaction Test, and live fire testing. The Center performed a series of five tests to assess effectiveness and suitability of the integration of a modified IRCM system on the Navy's CH-53D/E, CH-46E, and MV-22 platforms.

  Benefit to the warfighter: The assessment of this threat detection and IRCM on Navy platforms leveraged the Air Force's previously developed IRCM systems.

- **Army:** U.S. Army IRCM and Threat Acquisition Test

  Sponsor: U.S. Army Office of the Project Manager for Close Combat Systems and Research, Development, and Engineering Command (RDECOM)/Armament Research Development and Engineering Center

  Purpose: The Center performed IRCM flare sequence testing to improve the IRCM effectiveness for the CH-47D, MH-60G, and AH-64D helicopters.

  Benefit to the warfighter: This allowed the Program Offices to identify and utilize preferred flare sequences and threat acquisition information as a part of their warfighting strategy.

- **Army:** Laser Detecting Set

  Sponsor: Program Executive Office Intelligence, Electronic Warfare, and Sensors, Aircraft Survivability Equipment

  Purpose: The information gathered during this program assisted in validation of a U.S. Army and Evaluation Command material release for a laser warning system currently installed on the Army's UH-60M and AH-64D helicopters.

  Benefit to the warfighter: The Army uses this laser detection system in support of Special Operation Aviation and it is considered vital to force protection.

- **Marine Corps:** Night Targeting System Upgrade (NTSU) and Target Sight System (TSS)

  Sponsor: Air Test and Evaluation Squadron NINE (VX-9)

  Purpose: The Center evaluated the performance of the NTSU and TSS systems in the target acquisition tasks of detection, recognition, and identification in both benign and CM environments.

  Benefit to the warfighter: This system assists the aircrew or pilot to detect, recognize, identify, and target threat systems at long ranges and under adverse weather conditions.

LIVE FIRE TESTS

- **Navy:** Joint Standoff Weapon (JSOW) Unitary Block II

  Sponsor: Commander, Operational Test and Evaluation Force

  Purpose: The Center evaluated the capabilities and limitations of a precision-guided munition (JSOW-C) in a CM environment during both captive flights and a live fire event.

Benefit to the warfighter: This assisted the Program Office in the identification of the capabilities and limitations of JSOW in a CM environment.

- U.S. Department of Homeland Security (DHS): Counter-MANPADS Program

  Sponsor: DHS

  Purpose: The Center conducted live fire tests on two commercial airliner IRCM protection systems to determine the IRCM's applicability to protect the commercial aviation fleet.

  Benefit to civilians and warfighters: Leveraging of systems evaluated could benefit the military's large aircraft protection capabilities.

EXPERIMENTAL

- Army: CatsEye - Laser Threat Warning Sensor

  Sponsor: U.S. Army RDECOM Communications-Electronics Research Development and Engineering Center

  Purpose: The Center provided performance and CM testing for the CatsEye sensor to determine operational system capabilities/limitations and recommend system improvements to U.S. Army RDECOM.

  Benefit to the warfighter: The Army designed the program to detect, identify, and geo-locate this new technology for use on both military and commercial aircraft.

- Navy: Starlight III and Starbright

  Sponsor: Naval Research Lab and the Naval Air Systems Command, Patuxent River, Maryland

  Purpose: Starlight III and Starbright are initiatives to develop an effective active CM against laser beamrider missiles.

  Benefit to the warfighter: These experiments assisted in future development of CMs.

FOREIGN SYSTEMS

- National Ground Intelligence Agency (NGIC): Foreign False Target Generator (FFTG) III

  Sponsor: NGIC

  Purpose: The FFTG is a foreign CM system that generates false signatures to defeat U.S.- developed precision-guided weapon systems.

  Benefit to the warfighter: Information gathered from this test will assist the warfighter in defeating this CM so the target of interest can be successfully engaged.

- Air Force: Stormer Widget

  Sponsor: Air Force Research Laboratory

  Purpose: Stormer Widget is an Electro-Optic Countermeasure Technology Demonstrator developed by the United Kingdom. The Center evaluated the capabilities and limitations of the Stormer Widget system under both static and dynamic conditions.

  Benefit to the warfighter: Leveraging of this foreign evaluation and developmental technology will benefit other U.S. military programs.

JFCOM AND EXERCISE SUPPORT

- The Center participated in two Carrier Air Wing exercises at Fallon Naval Air Station, Nevada; one Alaska Command Joint Red Flag Exercise at Eielson AFB, Alaska; and one Desert Talon exercise at the Marine Corps Air Station, Yuma, Arizona. Support to these exercises consisted of observing aircraft sensor/ASE systems and crew reactions in a simulated threat/CM environment.

  Benefit to the warfighter: Presentation of CMs in an operational environment assists the warfighter in training, tactics, and procedures development for use in the Global War on Terror.

Annex - Congressional Reports

Annex - Congressional Reports

Congressional Reports Overview

DOT&E prepared eight Beyond Low-Rate Initial Production (BLRIP) reports and one Live Fire report for the Secretary of Defense and Congress between October 1, 2007, and September 30, 2008. Four of the summaries from these reports are included in this section. Five are not included due to classification issues. These are the Mk 48 Mod 7 Common Broadband Advanced Sonar System (CBASS) Phase 1 Torpedo, Stryker Mobile Gun System, High Mobility Artillery Rocket System (HIMARS) with the Improved Crew Protection (ICP) Cab, SSGN *Ohio* Class Conversion, and Joint Chemical Agent Detector reports.

DOT&E prepared three Early Fielding Reports. Two of the summary letters are included in this section. One is not included due to classification issues. This is the SSN 774 *Virginia* Class Submarine.

REPORTS TO CONGRESS

Program	Report Type	Date
XM982 Excalibur Precision Engagement Projectile	OT&E Early Fielding Report	October 2007
T-AKE *Lewis & Clark* Class of Auxiliary Dry Cargo Ships	Combined OT&E / LFT&E BLRIP Report	October 2007
Air Force Mission Planning System (MPS) Program, Increment II (F-15)	OT&E BLRIP Report	November 2007
Mk 48 Mod 7 Common Broadband Advanced Sonar System (CBASS) Phase 1 Torpedo *(Summary is not included)*	OT&E BLRIP Report	January 2008
Stryker Mobile Gun System *(Summary is not included)*	Combined OT&E / LFT&E BLRIP Report	February 2008
High Mobility Artillery Rocket System (HIMARS) with the Improved Crew Protection (ICP) Cab *(Summary is not included)*	LFT&E Report	March 2008
SSN 774 *Virginia* Class Submarine *(Summary is not included)*	OT&E / LFT&E Early Fielding Report	April 2008
Low Band Transmitter (LBT)	OT&E BLRIP Report	April 2008
SSGN *Ohio* Class Conversion *(Summary is not included)*	Combined OT&E / LFT&E BLRIP Report	May 2008
San Antonio Class Amphibious Transport Dock LPD-17	OT&E / LFT&E Early Fielding Report	May 2008
Joint Chemical Agent Detector (JCAD) *(Summary is not included)*	OT&E BLRIP Report	August 2008
USMC H-1 Upgrades (UH-1Y)	Combined OT&E / LFT&E BLRIP Report	September 2008

XM982 Excalibur Precision Engagement Projectile

The Army fielded an early version of the XM982 Excalibur Precision Engagement Projectile to deployed forces prior to completion of the Initial Operational Test and Evaluation (IOT&E) and the full-rate production decision. In accordance with the requirements of Section 231 of the 2007 National Defense Authorization Act (modifying Title 10, United States Code, Section 2399), this report provides my assessment of the demonstrated performance of Excalibur, but does not substitute for a Beyond Low-Rate Initial Production Report. It is based upon all testing to date.

- Testing to date has been adequate to assess the Increment 1a-1 performance.
- Fielding of Excalibur Increment Ia-1 to deployed forces will enhance their ability to precisely strike targets requiring low collateral damage.
- The Excalibur Increment Ia-1 met reliability, safety, and employability goals for early release to combat forces.
- The Increment 1a-1 projectile does have some limitations.
  1. Operational survivability has not yet been thoroughly evaluated (primarily the effect of Global Positioning System jamming). Survivability will be thoroughly addressed in Increment Ia-2 testing before the Initial Operational Test.
  2. Ballistic Impact Point management for those rounds that do not achieve guided flight has also been less than satisfactory. The Army should continue to improve the software, tools, and training strategies units will use to predict and manage the Ballistic Impact Point.
  3. Finally, the Army needs better precision targeting tools that meet Excalibur requirements (less than 10 meter error). In particular, light dismounted forces in close urban terrain need lighter and more precise targeting tools in order to increase flexibility and responsiveness in employing Excalibur.

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

The Dry Cargo and Ammunition Ship (T-AKE) is operationally effective and suitable under peacetime, benign conditions, but performance in a hostile environment and ability to withstand attempted intrusion or cope with actual intrusion into platform information technology systems is undetermined. Initial Operational Test and Evaluation (IOT&E) planning was adequate; IOT&E execution was not adequate because information assurance testing described in the DOT&E-approved IOT&E plan to determine vulnerability to network intrusion was not conducted. Live Fire Test and Evaluation (LFT&E) planning was adequate; LFT&E execution was also adequate but was limited in its ability to affect the ship's design.

System Overview

The primary mission of the Dry Cargo and Ammunition Ship (T-AKE) is to transfer ammunition, food, repair parts, ship store items, limited quantities of fuel, potable water, and other expendable supplies to fleet ships. A total of 11 ships of the class are being built for the U.S. Navy combat logistics force to replace the current ammunition and dry cargo replenishment capability of the T-AE (Ammunition) and T-AFS (Combat Stores) ship classes. T-AKE is a commercially designed and constructed U.S. Naval Fleet Auxiliary replenishment ship that meets American Bureau of Shipping standards and is certified by the U.S. Coast Guard. The ships are being built by the General Dynamics National Steel and Shipbuilding Company, and are designed to maintain a speed of 20 knots, to have an unrefueled range of 14,000 nm, and to be capable of transiting the Panama Canal. The operational concept for T-AKE is to serve as a shuttle ship or as a station ship and provide underway replenishment, both connected replenishment (CONREP) and vertical replenishment (VERTREP), to U.S. Navy and NATO forces at sea.

Test Adequacy

Operational testing of T-AKE was directed by an IOT&E test plan that included an integrated test approach and was approved by DOT&E for adequacy. Although the test planning was adequate, execution of the test was not adequate because the Navy did not conduct the planned operational testing of information assurance. As a result, the ship deployed with undetermined vulnerabilities to network intrusion that will remain unknown until information assurance testing is conducted and corrective measures, if required, are implemented. The integrated test approach was introduced in response to a fleet desire to reduce the duration of Post-Delivery Tests and Trials, and a desire to reduce projected testing costs. Although the approach streamlined T-AKE's schedule considerably, it may have been at the expense of information about the ship's capability to execute its mission.

Operational Effectiveness

T-AKE is operationally effective in conducting its primary mission under peacetime, benign conditions, but performance in a hostile environment and ability to withstand attempted intrusion into platform information technology systems is undetermined. T-AKE demonstrated capability to execute its primary mission of transferring supplies to the fleet. Operating in concert with an oiler (T-AO class ship), T-AKE should be capable of acting as a substitute station ship. The ship demonstrated replenishment rates that exceeded threshold rates for both connected and vertical replenishment. Cargo staging areas are of ample space and well designed for effective cargo handling and transfer. Other aspects of mission performance that were tested in accordance with the approved test plan demonstrated the required capability.

Operational Suitability

T-AKE is operationally suitable. A few areas of suitability were found to be deficient, including interoperability and documentation. The major deficiency in interoperability was the vibration and excessive flexing of the hangar doors caused by helicopter rotor downwash. This deficiency was corrected during the post shakedown availability period following the IOT&E. The documentation deficiencies should be correctable.

Survivability

Although issues of susceptibility to torpedoes and mines have not been resolved and despite the limitations expected as a result of using principally commercial construction techniques, the *Lewis and Clark* is a modern efficient supply ship with limited survivability attributes that exceed commercial requirements. Operating the ship with combatant escort in hostile environments will mitigate the risk associated with the absence of self-defense weapon systems. There remains an elevated risk associated with an asymmetric threat while berthed or when entering and leaving port as a result of the ship's reduced survivability characteristics.

Recommendations

The Navy should:

- Promptly conduct follow-on OT&E to complete the test events required to evaluate information assurance as contained in the DOT&E-approved IOT&E plan. In particular, the Navy's operational test agency, Commander, Operational Test and Evaluation Force (COMOPTEVFOR) should operationally test and evaluate the information assurance controls for providing capabilities to protect, detect, react, and restore the Information Technology systems in the event of attempted or actual intrusion.
- Conduct follow-on OT&E to demonstrate correction of deficiencies found during IOT&E. For survivability determination, the ability of the AN/SLQ-25A (NIXIE) torpedo countermeasure system to reduce the ship's susceptibility to torpedoes should be tested and evaluated.
- Conduct follow-on OT&E to demonstrate effectiveness and suitability of the Shipboard Warehouse Management System.
- Promptly complete the infrastructure upgrade necessary for Advanced Degaussing System testing so that COMOPTEVFOR can conduct the deferred phase of that testing. Conduct this testing during follow-on OT&E.
- Complete research and development of an improved Heat Sensing Detector capable of meeting the Navy's functional requirements for protecting exposed cargo holds.
- Consider modifying the requirements for future ships constructed to commercial specifications by adding relatively minor requirements from Naval Vessel Rules to include improved Firemain System design, isolation and separation, improved Chilled Water System isolation, and improved compartmentalization.
- Reduce loss of electrical power vulnerability by increasing the load center separation and adding alternate power sources through Manual Bus Transfers for vital equipment loads.
- Incorporate lessons learned from this T-AKE program into future designs of the T-AKE such as the Maritime Prepositioning Force (Future) squadron.
- In collaboration with DOT&E, identify and implement the changes in scheduling and policy required to ensure that required operational testing is completed before ships are made available for deployment.

Air Force Mission Planning System (MPS) Program, Increment II (F-15)

The F-15 Mission Planning System (MPS) version 1.2 is operationally effective but requires highly skilled system support staff to assist aircrews using mission planning equipment and preparing mission planning materials. F-15 MPS is not operationally suitable. The Initial Operational Test and Evaluation (IOT&E) of F-15 MPS was adequate and executed in accordance with the Director, Operational Test and Evaluation (DOT&E)-approved test plan.

System Overview

The basis for the F-15 MPS system is the Joint Mission Planning System (JMPS) approach, which uses tailored software packages hosted on commercial Windows personal computers. It includes basic framework software, plus automated tools that plan missions, program platform sensors, create mission media, and provide required data to the aircraft avionics systems depending on weapon system capabilities. JMPS is a Windows, PC-based common solution for aircraft mission planning for all the Services.

The Air Force is developing MPS incrementally to meet planning requirements. Increment I MPS includes legacy systems for Air Force aircraft hosted on computer workstations. Increments II through V include the newly-developed systems using the JMPS approach. Since JMPS is Windows based, it accepts commercially-available software products and requires less programming support when implementing changes or system updates. Increment II originally included multiple planning environments (multiple aircraft/weapons planning) based on JMPS. However, the program has evolved and only one environment remains within Increment II, the F-15.

F-15 MPS is a multi-user, deployable mission planning system for all F-15 aircraft. F-15 MPS may operate in an Ethernet Local Area Network (LAN) Windows workgroup environment, in a laptop/desktop configuration from a LAN, or in a standalone configuration.

Test Adequacy

The IOT&E of F-15 MPS was adequate to determine the effectiveness and suitability of the system.
The Air Force Operational Test and Evaluation Center (AFOTEC), Detachment 2 at Eglin AFB, Florida, conducted operational testing on the previous version of F-15 MPS (Version 1.1) from October 11 through November 10, 2005. Air Combat Command (ACC) fielded that system to operational fighter wings in March 2006. The Air Force contracted for a System Engineering and Integration Contractor to support the program office with system engineering activities.

The program office resumed development to reduce high priority deficiencies, leading to version 1.2 in July 2006. The program office conducted developmental testing of version 1.2 from August 1 to September 20, 2006. The testers rated the version "marginal," but recommended that it proceed to dedicated operational testing. The Air Force certified it ready for operational testing on October 4, 2006.

AFOTEC Detachment 2 conducted operational testing of F-15 MPS (Version 1.2) from November 13 through December 14, 2006. Test participants included operational aircrew members (two F-15C pilots and four F-15E Weapon Systems Officers) and a system support representative.

Operational Effectiveness

F-15 MPS is operationally effective but requires highly skilled system support staff to assist aircrews using mission planning equipment and preparing mission planning materials. Without such support, aircrews/planners cannot develop useful and acceptable mission planning materials for mission use.

Operational Suitability

F-15 MPS is not operationally suitable. Extreme care and attention from system support personnel are required to keep the system operational because of instability, poor reliability, and supportability shortfalls. Performance during testing shows that users can expect an unscheduled maintenance event requiring corrective action to occur about every 11 hours. System crashes occur because of poor integration of the MPS software components.

Testing identified effectiveness and suitability deficiencies in mission rehearsal functionality, threat display and manipulation, display/scaling of printed materials, interoperability, usability, data recovery, computer memory losses, and security.

Recommendations

Operational Effectiveness

- The Air Force should conduct end-to-end testing of mission planning systems, which includes aircraft flights and weapon releases whenever possible.
- The MPS program office should conduct frequent user test events during remaining developmental efforts. AFOTEC should remain engaged, observe test events, and report on progress.
- The Air Force should publish a Workaround Guide documenting deficiencies and corrections, review system support personnel unit manning, and continue steps to improve system integration and reduce system support workload.

Operational Suitability

- The MPS program office should apply the efforts of a system engineering and integration contractor to the maximum extent feasible.
- The MPS program office should implement a program to resolve existing deficiencies and avoid proliferating known issues to other platform planning systems. Top priority should be to resolve system instability. Without increased system stability, the Air Force requires an increase in highly skilled system support personnel to sustain operations.
- The MPS program office should implement a program to resolve potential new deficiencies created by full fielding. The MPS program office should poll users to identify critical issues that require resolution.
- The MPS program office should update the logistics support concept and implement a program to ensure the availability of trained, highly skilled system support personnel.

Corrections for deficiencies and inadequacies identified during testing require rigorous and thorough operational testing. The Air Force should review these test results when crafting test strategies and test plans for subsequent testing of later increments, and ensure the system builds on successes and learns from mistakes.

Low Band Transmitter (LBT)

The Low Band Transmitter (LBT) is part of the U.S. Navy EA-6B Prowler aircraft AN/ALQ-99 Tactical Jamming System (TJS) and is designed to provide low frequency radar and communication jamming capability to the Prowler's Airborne Electronic Attack (AEA) mission. The LBT is intended to replace the existing Band 1, Band 2, and Interim Band 2/3 transmitters on the current EA-6B aircraft. It will also be used in conjunction with the Communications Countermeasure Set (CCS) to replace the legacy USQ-113 communications jammer on the EA-6B replacement aircraft, the EA-18G.

The LBT is housed in a jamming pod carried under the wing of an AEA aircraft. The jamming pod consists of a legacy hardback structure that mounts the pod to the aircraft; a Universal Exciter Unit, consisting of two transmitters of which the LBT could be one or both; and the radome of the current TJS used on AEA aircraft.

Adequacy

Testing was done in accordance with a DOT&E-approved Test and Evaluation Master Plan and approved deviations to the Test Plan. Testing was adequate to evaluate the jamming effectiveness of LBT against communications targets and to evaluate LBT operational suitability.

Testing was not adequate to fully evaluate jamming effectiveness of LBT against early warning radar threats. Limiting factors during testing included the following:

- Testers did not operate the EA-6B in an operationally-representative environment. Testing at realistic ranges against threat radars was limited by geographical boundaries.
- The LBT jamming assignments were not operationally representative.
- Threat system electronic protection circuitry commonly found on real-world systems was not utilized during all Initial Operational Test and Evaluation (IOT&E) events.
- Limited data were collected against threat systems, impacting the ability to assess LBT performance against threat early warning radars.

Operational Effectiveness

LBT is operationally effective against communications targets. Data for fully assessing LBT operational effectiveness against threat representative early warning radars were not adequate, as the Navy conducted testing under a very narrowly defined set of operating conditions. Thus, a complete effectiveness rating is not possible. Further LBT testing should be conducted against early warning threat radars.

LBT demonstrated compliance with the Measures of Effectiveness (MOE) performance thresholds listed for the system in the Operational Requirements Letter (ORL). These thresholds included effective radiated power levels, antenna azimuth, and elevation spatial coverage.

Operational Suitability

The LBT system is operationally suitable. Although the LBT system did experience multiple hardware failures during the first two operational assessments, system reliability was not a factor during the IOT&E and observed operational performance in Iraq. Data collected during an early operational release of this system indicates that LBT reliability is improving and will provide a more reliable asset to the Navy than the legacy transmitters this system is designed to replace.

Recommendations

In order to fully assess LBT effectiveness, the Navy should accomplish the following:

- Investigate and invest in early warning radar threats to fully assess LBT capabilities against realistic threats and operationally-representative scenarios.
- Work to ensure that more facilities for testing low frequency systems like the LBT are made available.
- Complete LBT effectiveness testing against early warning radars. Once complete, ensure lessons learned are integrated into the EA-6B Improved Capability III FOT&E and EA-18G developmental and operational testing.
- Continue to track and use LBT suitability metrics using data from deployed squadrons to inform reliability growth programs.

San Antonio Class Amphibious Transport Dock LPD-17

The Navy deployed the *San Antonio* Class Amphibious Transport Dock (LPD-17) prior to completion of initial operational testing and the full-rate production decision. This report provides my assessment of the *San Antonio* Class Amphibious Transport Dock (LPD-17) performance demonstrated in testing to date, in accordance with the provisions of Section 231 of the 2007 National Defense Authorization Act (modifying Title 10, United States Code, Section 2399). In the report, I conclude the following:

- The Initial Operational Test & Evaluation (IOT&E) of the ship's Amphibious Warfare, Surface Warfare, and Air Warfare capabilities has not been completed; until the testing is done, DOT&E regards the IOT&E as incomplete.
- Testing and analysis are not sufficiently complete to assess operational effectiveness, suitability, and survivability.
- Data from remaining IOT&E and Live Fire Test & Evaluation efforts are needed to support a thorough assessment of LPD-17's survivability.

USMC H-1 Upgrades (UH-1Y)

The UH-1Y is operationally effective, suitable, and survivable. The Initial Operational Test and Evaluation (IOT&E) and live fire testing were adequate and executed in accordance with the DOT&E-approved test plan.

The AH-1Z did not complete the IOT&E. DOT&E will evaluate the AH-1Z operational effectiveness and suitability once the Navy completes adequate operational testing with production-representative aircraft and subsystems.

System Overview

The UH-1Y is an upgrade to the legacy UH-1N helicopter. The H-1 Upgrades program includes the design, development, and integration of a new rotor system, a new drive train, a redesigned tail boom and tail rotor assembly, and a new mission avionics suite for the UH-1 and AH-1 helicopters. The Marine Corps intends that replacement of the two-bladed main rotor system with the new four bladed system will increase payload, endurance, speed, and improved flight-handling qualities in comparison to the legacy UH-1N helicopter. The upgraded digital cockpit integrates communication, navigation, target acquisition, and weapon employment functions, with the goal of reducing pilot workload and increasing crew situational awareness.

The UH-1Y (along with the AH-1W and when fielded, the AH-1Z) equip the Marine Corps Light Attack Helicopter Squadron, which provides combat assault helicopter support and attack helicopter fire support and fire support coordination for aerial and ground forces during amphibious operations and subsequent operations ashore. Light Attack Helicopter squadrons deploy and operate from air-capable ships in support of combat, contingency, training, and non-combat operations. The aircraft must have the ability to operate at night and in adverse weather conditions at extended ranges while maintaining a suppressive weapons capability against surface-to-air threats.

Test Adequacy

The operational and live fire testing of the H-1 Upgrades aircraft was adequate to support an evaluation of the UH-1Y operational effectiveness, operational suitability, and survivability. There were limitations in the test planning and execution. These limitations included short shipboard operating periods, incomplete end-to-end testing of aircraft survivability equipment, and lack of opposing forces during tactical missions. The lack of finalized developmental test data precluded the use of some data to supplement operational test assessments of communications, navigation, and weapons delivery accuracy.

The Navy's Commander, Operational Test and Evaluation Force (COMOPTEVFOR) through Air Test and Evaluation Squadron Nine (VX-9) conducted the H-1 Upgrades Operational Evaluation in two phases. The Navy conducted IOT&E Phase 1 primarily during daylight conditions because of limitations of the Top Owl Helmet-Mounted Sight Display system while flying in the night environment. IOT&E Phase 1 was conducted from May 10, 2006, through January 10, 2007. The second phase of IOT&E, with the Optimized Top Owl system, included more flying in the night environment. Phase 2 was conducted from February 11, 2008, through May 27, 2008.

Two UH-1Y configured engineering and manufacturing development aircraft with updated system software flew a total of 314 flight hours in IOT&E Phase 1. During IOT&E Phase 2, two UH-1Y low-rate initial production aircraft, configured with the Optimized Top Owl Helmet-Mounted Sight Display system and production system software, flew a total of 160 flight hours. Forty percent of IOT&E Phase 2 flight hours were at night. During both phases of testing, the aircraft were operated and maintained by Marines in an operationally realistic manner reflective of fleet operations.

Operational Effectiveness

The UH-1Y is operationally effective, except at high gross weights at high altitudes due to maneuver restrictions imposed by faulty rotor blade cuffs. Defects in the rotor cuff blade attachment devices restrict the UH-1Y to a load factor of 1.7 g at high gross weights and high altitudes. The UH-1Y provides the Marine Corps a utility helicopter with a significant increase in speed and nearly double the payload and range over the legacy UH-1N aircraft. Maneuver restrictions were imposed because of structural limitations of the main rotor cuff at high gross weights and high altitudes. Current procedures during maneuvering flight require focused pilot attention inside the cockpit to monitor displays, reducing situational awareness. The UH-1Y successfully accomplished over 70 percent of assigned assault support missions during IOT&E Phase 1 and Phase 2.

The Optimized Top Owl Helmet-Mounted Sight Display system used in the second phase of IOT&E was a significant improvement over the Top Owl system, correcting many deficiencies reported during IOT&E Phase 1. The heads-up symbology increased aircrew situational awareness and decreased work-load levels during demanding tasks such as basic navigation and shipboard approaches. Weapons delivery accuracy was not improved with the use of the Optimized Top Owl system. Limited data collected during operational testing suggest that manually-aimed fire is more accurate, although both methods result in average miss distances greatly increased from that of the UH-1N using spotting and adjust fires methods.

The digital cockpit improves crew situational awareness, but the avionics upgrade needs further improvements to eliminate excessive pilot workload. Mission planning systems supported mission execution, but imposed unnecessary workload, especially during pre-mission planning. Better integration of mission planning and cockpit systems would reduce crew workload and enhance mission effectiveness. The thermal imaging sensor display was an improvement over that of the UH-1N, but target recording and reporting were difficult.

Operational Suitability

The UH-1Y is operationally suitable. During operational testing, the UH-1Y exceeded reliability thresholds for mean flight hours between failure and mean flight hours between abort. The UH-1Y requires less unscheduled maintenance support, but slightly more overall maintenance support than the UH-1N.

Suitability improved during IOT&E Phase 2. While availability was increased over IOT&E Phase 1, it fell short of the required threshold because of an immature supply system and shortage of repair parts. Maintenance was hampered by incomplete and inaccurate technical publications. The aircraft has shipboard compatibility deficiencies with the blade fold system. Currently the satellite communications system is not effective. Many human factors issues remain with the Optimized Top Owl system, which should be corrected before operational deployment of the UH-1Y:

- Situational awareness
- Crew coordination
- Passenger seating
- Environmental control

The rotor system is operating under greatly restricted life-cycle times because of structural limitations on its principal components, the yokes and cuffs. The Navy intended these parts to last 10,000 flight hours. In operational use, they are being replaced after 700 to 1,200 hours. This costs not only the actual replacement cost, but also the maintenance hours and the aircraft down time. This greatly reduced life expectancy should be corrected as soon as possible.

Survivability

Operational and live fire testing indicate that the UH-1Y aircraft is survivable in most expected threat environments. A number of features enhance the operational survivability of the UH-1Y in combat operations by reducing either the susceptibility (hit avoidance) or the vulnerability (hit tolerance) of the aircraft compared to the legacy UH 1N. The UH-1Y aircraft is ballistically tolerant to the required threat with several notable exceptions:

- Susceptibility testing is incomplete. Initial infrared signatures compare favorably with baseline aircraft, but end-to-end demonstration of APR-39 radar warning and AAR-47 infrared countermeasure effectiveness is still needed.
- Operational testing did not include live opposing forces. System performance in a reactive threat environment is not known.
- Vulnerability testing indicates that some improvements are needed for flight critical components including: transmission, fuel cell, flare dispensers, and fire suppression in the dry bays.

Recommendations

The Navy should consider these recommendations for improvement:

Operational Effectiveness

- On a priority basis, replace the rotor blade cuffs to eliminate the maneuvering restrictions at high gross weights and high altitudes. Expand the flight envelope to the required limits.
- Improve weapons delivery accuracy with the Optimized Top Owl system.
- Increase load capacity of mounting point for Improved Defensive Armament System so that the full 1,000 pounds can be carried. For crew-served weapons, the Navy should address the gun depression angle limitation imposed by the Improved Defensive Armament System.

Operational Suitability

- Complete analysis and redesign of rotor cuffs for improved structural integrity, decreased life-cycle costs, and increased aircraft maneuverability. In the interim, improve approaching g-limit warning systems and training in order to reduce focused pilot attention on g-meter during maneuvering flights.
- Improve human factors (neck strain and cord management) of the Optimized Top Owl system and provide a helmet test set and complete documentation.
- Complete electromagnetic environmental effects testing to resolve shipboard compatibility issues.

- Resolve the issue of clearance between the cyclic control and the left seat pilot's leg.
- Reduce excessive cockpit heat as a result of an expanded avionics suite.
- Address inadequate ballistic eye coverage for the helmet-mounted sight display.
- Improve training and documentation for Optimized Top Owl system procedures, Advanced Memory Unit trouble-shooting codes, and structural repair, schematics, and transportability manuals.

Survivability

- Conduct end-to-end testing of Aircraft Survivability Equipment.
- Test the main rotor gearbox, if an improved version is incorporated, in a full-up system-level test.

Vulnerability Deficiencies

- Redesign of transmission housing.
- Consider self-seal material to full height of fuel cells.
- Ensure adequate self-sealing of fuel bladders per Mil Standard T 27422.
- Consider adding fire extinguishing system as backup to current powder panels in dry bays.
- Add fire suppression/extinguishing system to main transmission bay.
- Investigate methods for suppressing/extinguishing fires in oil cooler bay.
- Consider adding backup fire extinguishing bottles in engine bay.
- Consider reducing vulnerability of main rotor actuators.
- Consider relocation/redesign of forward flare buckets.
- Exclude combustion products from flares ignited by threat from occupied spaces and flammable materials.

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