Director, Operational Test and Evaluation

FY 2009 Annual Report

December 2009

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.

J. Michael Gilmore
Director

INTRODUCTION

I was confirmed by the Senate on September 21, 2009, as the Director, Operational Test and Evaluation, and sworn in on September 23. It is a privilege to serve in this position. I will work to assure that all systems undergo rigorous operational test and evaluation to determine whether they are operationally effective, suitable, and survivable. I will also assure that both civilian and military decision makers know the test results so that they can make informed decisions about acquiring those systems and how to employ them.

With pleasure I submit this report, as required by law, summarizing the operational and live fire test and evaluation activities of the Department of Defense during Fiscal Year 2009.

Because I was confirmed late in the 2009 Fiscal Year, most of the content in the main body of this report is based on what occurred before my tenure began. This Introduction, in contrast, provides my views regarding how I will execute the duties of the office I now hold. For example, I will institute changes in test and evaluation to better support rapid acquisition of improved capabilities for our nation's deployed forces. I will also make certain that ongoing initiatives are aligned fully with the important changes brought about by the Weapon System Acquisition Reform Act of 2009.

ACQUISITION REFORM ACT OF 2009

Fielding systems quickly and successfully depends critically on starting programs right and having sufficient, competent oversight. These are central tenets of the Weapons System Acquisition Reform Act of 2009. Implementing the letter and intent of the Act is an important task. The law affects the requirements process; requests for proposals; development planning – especially with respect to reliability growth; the workforce; and contractual support with respect to conflict of interest.

The Act recognizes that "unrealistic performance expectations" and "immature technologies" are among the root causes of trouble in defense programs. I believe the test and evaluation community can, during the requirements-setting process, identify such potential problems early in the life of programs. Last year, DOT&E added four staff members to work within the Department's requirements-setting process – currently the Joint Capabilities Integration Development System (JCIDS) – to assure that requirements for major acquisition programs are feasible, testable, and relevant. DOT&E participation in requirements-setting is discussed further in the Initiatives section of this Introduction under the topic "Engage early in the requirements process."

The Weapons System Acquisition Reform Act of 2009 provides for a Director of Systems Engineering and a Director of Developmental Test and Evaluation (DT&E). I plan to work closely with them both to assure that all test and evaluation activities of the Department of Defense are fully integrated and to reinvigorate robust systems engineering and development planning within the Department. Of particular importance is the Act's emphasis on reliability, availability, and maintainability in major defense acquisition programs. The Act calls on the new offices to report on whether the Services have plans for adequate numbers of trained personnel to improve reliability, availability, maintainability, and sustainability as an integral part of rigorous systems engineering and developmental testing. DOT&E continues to support training events in reliability growth and is requiring reliability growth to be addressed specifically in future test and evaluation plans. Such emphasis has been, and will continue to be, a priority for DOT&E. Later in this Introduction I review the progress the Department has made this year toward improving reliability.

The Act requires the Secretary of Defense to revise the Defense Supplement to the Federal Acquisition Regulation to provide uniform guidance and tighten existing requirements to guard against organizational conflicts of interest by contractors in major defense acquisition programs. This will affect how we obtain contract assistance, and in response DOT&E will increase its use of Federally Funded Research and Development Centers and bring jobs into the government.

NEW INITIATIVES

I reviewed with the senior leadership of DOT&E the state of OT&E in light of the urgent needs of our deployed forces, the new legislation, and the existing priorities under which DOT&E has operated.

I will direct the energies of DOT&E into the following four initiatives, which subsume the office's previous 2009 priorities, address the Acquisition Reform Act of 2009, and incorporate the intent of the Secretary of Defense. The initiatives I will undertake are the following:

1. Field new capability rapidly,
2. Engage early to improve requirements,
3. Integrate developmental, live fire, and operational testing, and
4. Substantially improve suitability before IOT&E.

The relationship between the office's previous priorities and the 2010 Initiatives is illustrated in Table 1 below. In the following sections, I will examine the 2010 initiatives and the office's performance with respect to the priorities that guided DOT&E actions during FY09.

TABLE 1. RELATIONSHIP BETWEEN DOT&E'S 2009 PRIORITIES AND 2010 INITIATIVES

2009 Priorities / 2010 Initiatives	1. Improve Suitability	2. Instill Operational Realism in Testing	3. Provide Timely and Accurate Information	4. Engage Early	5. Institutionalize Continuous Process Improvement
1. Field rapidly		✓	✓	✓	✓
2. Engage early in requirements		✓	✓	✓	✓
3. Integrate testing	✓	✓	✓	✓	✓
4. Substantially improve suitability	✓	✓		✓	✓

1. Field new capability rapidly

Secretary of Defense Gates has made clear that his top priority is to get the capabilities needed by our fighting forces to them as quickly as possible. The test and evaluation community has played a key role in fielding new capabilities rapidly—a role that I want to further strengthen and make even more helpful. Examples include the Mine Resistant Ambush Protected Vehicle (MRAP), MQ-9 Reaper, and the A/AO-10 C. In these cases, actions taken by Service Operational Test Agencies saved weeks to months in the time-to-field. Many adopted the approach of combining testing with the training of the first unit to be equipped, which shortened the timeline, provided real-time rigorous and objective feedback on system performance, and assured that the tactics, techniques, and procedures (TTPs) our forces need to employ new equipment were ready as the equipment was deployed.

Probably the best example of successful rapid acquisition is the MRAP Combat Vehicle. According to Brigadier General Michael M. Brogan, USMC, Commander, Marine Corps Systems Command, in testimony before the House Armed Services Committee on October 8:

> The entire program was accomplished within the existing acquisition regulation. All of the actions normally required of an acquisition category 1-D program have been done by MRAP. They weren't all done in a normal sequence, and many of them were tailored. But they have all been accomplished. The key was to view those regulations as permissive, not prohibitive, to see opportunities and not challenges, to look for possibilities and not obstacles and always the focus was on the 19-year-old lance corporal that we are charged to support.

At the same hearing, General Brogan also said that the involvement of DOT&E was a key factor in the success of MRAP – important vulnerabilities were discovered through testing, and design changes were accomplished in near real-time; testing also played a key role in developing TTPs. MRAP is now regarded as a model for rapid acquisition.

To extend DOT&E's efforts to support rapid fielding as far as possible, I have begun a systematic review of programs to assess whether there are remaining candidates for early fielding or accelerated testing. If testing has already confirmed that the system would be effective and suitable in the current theaters of operation, those findings will be identified to fielding authorities. If only a small amount of testing remains in order to make the determination, we will examine the possibility of accelerating testing. We will assess risk and assure that accelerated testing reveals full capabilities and limitations. In addition to programs themselves, I am reviewing T&E procedures to see if they can be streamlined to better support rapid fielding. I am also reviewing the mechanisms we have to provide feedback to Program Offices to assure that when testing indicates equipment has problems, we get the fix into theater quickly.

Developing TTPs is critical to assuring that our forces can make full use of new capabilities as soon as they are fielded. The Joint Test and Evaluation (JT&E) program has been very successful assisting Combatant Commanders (COCOMS) with Quick Reaction Tests that evaluate TTPs. The Quick Reaction Tests provide quick-turn, evaluated solutions, in this case within 10 months. We will continue to stress the availability of that resource to the Combatant Commanders and seek ways to conduct those tests more quickly. The JT&E Program, established in 1972, expanded its reach to the combatant commands with the addition of five new members on its Senior Advisory Council this year. The council now has representatives from Joint Staff, the Services, and seven of the 10 combatant commands. Central Command and Northern Command have been the most active in using the JT&E Program as a means of solving issues as evidenced by their sponsoring seven projects each.

The JT&E projects address a wide range of issues. For example, the Joint Sniper Defeat project developed TTPs for employing new technology to detect the direction of sniper fire and target a specific area when friendly forces are under sniper attack. The Joint Command and Control for Net-Enabled Weapons project developed the concept of operations and procedures for post-launch redirection of weapons like the Tomahawk cruise missile. The procedures allow a change of targets after a missile launch so that if a more valuable target emerges during fly-out it can be attacked.

One consequence of efforts to rapidly field new capability is that systems are committed to combat operations before full-rate production. Under that circumstance, Congress has required DOT&E to submit Early Fielding Reports. In FY09, DOT&E delivered two such reports in compliance with Title 10, Section 2399 of U.S. Code. Copies of these and all our reports were provided to the Combatant Commanders to support their fielding decisions and to make joint warfighters and commanders aware of systems' capabilities and limitations with respect to performance and mission accomplishment. DOT&E has established points of contact with each Combatant Commander to assure that they are aware of the capabilities and limitations – both the strengths and weaknesses – of systems that might be deployed to their theaters. In addition, DOT&E uses a classified website to make available DOT&E Annual Reports, Beyond Low-Rate Initial Production (BLRIP) Reports, and Early Fielding Reports to the Combatant Commanders and others who need them.

2. Engage early to improve requirements

The Department's experience indicates that unless programs start with clear, sensible, and rationalized requirements, the program and its testing suffer tremendously and to the detriment of our fighting forces. The DOT&E experience has been that no amount of testing can compensate or correct for unjustified or unrealistic performance expectations.

Program requirements are often identified but not supported by a rigorous analytic rationale. Such a rationale is essential for performing proper engineering trade-offs and making test decisions during design and development. In other cases, requirements are inconsistent with program funding and schedules or with Combatant Commanders' expectations. In the case of the Joint High Speed Vessel, for example, initial concepts of operations stated that the Combatant Commanders would use the vessel to conduct missions, such as support of Special Operations forces and providing joint command and control, that were inconsistent with the program's funding and threshold requirements. That funding and those requirements specified a commercial ferry to be used in benign environments. DOT&E's reporting on the results of an early operational assessment for the JHSV highlighted these issues for action by the Services and Combatant Commanders.

To engage early in the development of requirements, the test community must become involved in what is currently called the Joint Capabilities Integration and Development System (JCIDS). Participation in JCIDS fulfills a long-standing recommendation of the National Academies.

DOT&E staff members who assess programs are taking the following actions to assure that systems have adequate requirements and are tested in realistic operational environments:

- First, staff are reviewing requirements as they are developed within JCIDS to assure they are unambiguous, testable, operationally relevant, and technically realistic.
- Second, staff are reviewing the Test and Evaluation Strategy (TES) and Test and Evaluation Master Plan (TEMP) for each project and working with developmental testers to assure that testing in operational environments is initiated during development and continues with increasing stress of the system through operational testing.
- Third, staff are identifying operational concerns to Program Offices at the earliest possible time so that they can be resolved in a timely manner.

It is important to identify early in a program's life whether their requirements may necessitate the development of new test resources such as threats or targets. In 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, would require DOT&E to declare the IOT&E inadequate, and (2) there is not an adequate program to develop the lacking test capability. Only one test-critical resource shortfall (aerial target drones) has been so categorized this year.

3. Integrate developmental, live fire, and operational testing

DoD Instruction (DoDI) 5000.02 currently requires "integrated testing" but continues to treat developmental and operational testing as entirely separate. For example, the instruction states:

> The Program Manager shall design DT&E objectives appropriate to each phase and milestone of an acquisition program. ... The O(perational) T(est) A(gency) and the PM shall collaboratively design OT&E objectives appropriate to each phase and milestone of a program, and these objectives shall be included in the Test and Evaluation Master Plan.

There will always be a need for dedicated operational testing to confirm systems work in combat. Nonetheless the separateness of developmental testing from operational testing has caused problems in the development process that have been documented by the Defense Science Board and the National Academies. Most notably the lack of operational realism in early testing hides failure modes and limitations that then become evident only at the end of a program when fixing the problems is expensive, time-consuming, and, often, simply not possible. The solution is to introduce greater realism into testing earlier in order to understand those failure modes. I will move the department forward to integrate developmental, live fire, and operational test and evaluation.

A key means to achieve integrated testing, endorsed by DOT&E and the Operational Test Agency Commanders in April 2009, is Design of Experiments (DOE). DOE comprises the early use of rigorous scientific and statistical methods to plan and execute tests, and evaluate their results. Properly used, DOE will result in more effective and efficient T&E. The DT&E and OT&E offices are working together with the Operational Test Agencies and Developmental Test Centers to develop ways to apply DOE across the whole development and operational test cycle for a program, not just for individual test events. One important advantage of DOE is that it allows a rigorous and objective statement to be made of the confidence levels we have in the results of the testing. The Weapons System Acquisition Reform Act of 2009 makes specific mention that, for cost estimates, the confidence level used in establishing an estimate must be disclosed along with the rationale for selecting such confidence level, and, if such confidence level is less than 80 percent, the justification for selecting a confidence level of less than 80 percent. The evaluation of performance revealed through testing should be stated with similar rigor whenever possible. I intend to move T&E forward to use DOE in all test programs and thus provide that rigor.

Developing a workforce of persons skilled in all aspects of DOE can take many years, and we will work to establish necessary training capabilities. But in the near term, we will continue to emphasize the process as outlined in the DOT&E / Operational Test Agency Commanders Design of Experiments agreement, i.e., begin in early concept exploration to identify driving factors and conditions and continue to explore them throughout the product life cycle. This process aligns with accepted system engineering best practices for the development, production, and fielding of reliable systems.

Getting early operational realism into developmental testing can occur only if the resources needed to do so are identified and allocated. This particularly relates to developmental testing conducted before IOT&E. Currently, DOT&E staff members are becoming more engaged in the planning of early testing to assure that performance requirements will be tested in relevant environments for operational testing. As a metric of our progress toward achieving this goal, the percent of programs with a realistic test environment documented in the TEMP at Milestone B is 86 percent, and at Milestone C is 94 percent. Further, only 7 percent had resource gaps that DOT&E had to identify at Milestone A, and 13 percent had gaps at Milestone B. The challenge will be to identify and use the needed test resources in the early stages of development to find problems and failure modes at a time when they are easier to fix.

4. Substantially improve suitability before IOT&E

Suitability, and specifically reliability, is the principal area in which systems are found to be deficient during operational testing. The Defense Science Board Task Force on Developmental Test and Evaluation (DT&E), which was chartered by the USD(AT&L) and DOT&E to examine the reasons behind high suitability failure rates, found the following:

> …the single most important step necessary to correct high suitability failure rates is to ensure programs are formulated to execute a viable systems engineering strategy from the beginning, including a robust reliability, availability, and maintainability (RAM) program, as an integral part of design and development. No amount of testing will compensate for deficiencies in RAM program formulation.

The new Weapons System Acquisition Reform Act of 2009 and DoDI 5000.02 require a reliability growth program.

Reliability is also the main driver of life-cycle costs and warfighter confidence in systems, maintenance force size, spare parts needs, and, ultimately, mission success. Increased reliability and how to establish a good reliability growth program have been a chief policy initiative of DOT&E for a number of years. We have made some progress in this area through implementation of formal reliability policies by the military services, incorporation of formal reliability growth planning within development programs, and by conducting reliability testing throughout programs' development.

In December 2008 the Department reissued DoDI 5000.02 with new guidance addressing reliability. The Instruction required the following:

> P[rogram] M[anager]s for all programs shall formulate a viable Reliability, Availability, and Maintainability (RAM) strategy that includes a reliability growth program as an integral part of design and development. RAM shall be integrated within the Systems Engineering processes, documented in the program's Systems Engineering Plan (SEP)

and Life-Cycle Sustainment Plan (LCSP), and assessed during technical reviews, test and evaluation (T&E), and Program Support Reviews (PSRs).

For this policy guidance to be effective, the Services must incorporate formal requirements for early RAM planning into their regulations, and assure development programs for individual systems include reliability growth and reliability testing; ultimately, the systems have to prove themselves in operational testing. Incorporation of RAM planning into Service regulation has been uneven. The Air Force, instead of following the DoDI 5000.02, changed its regulation to read:

> The PM shall implement a reliability growth program if the initial mandatory sustainment KPPs and supporting materiel reliability KSA are not met.

This regulation achieves the exact opposite of the guidance in DoDI 5000.02. It guarantees that reliability problems will be found too late to be corrected cost-effectively. Clearly more work needs to be done to implement the DoD Instruction.

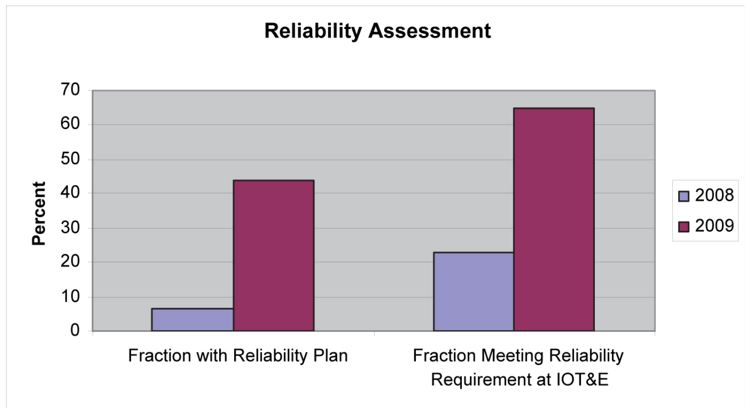

FIGURE 1. PROGRAM RELIABILITY PLANNING

A second way of measuring progress is to consider actual program planning. Currently, 44 percent of programs on oversight and reviewed this year have a reliability plan, and 45 percent of programs are tracking reliability. Of the programs on DOT&E's current oversight list that have completed IOT&E, 66 percent met their reliability requirements. While these numbers represent an improvement from 2008 (see Figure 1), there is substantial room for continued improvement.

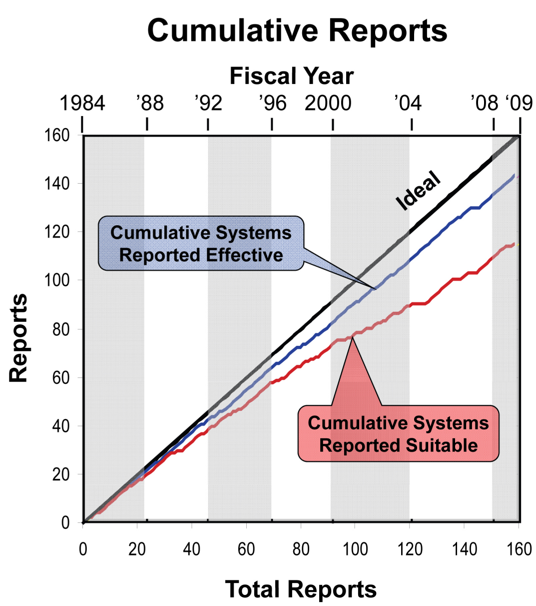

FIGURE 2. BEYOND LOW-RATE INITIAL PRODUCTION REPORT FINDINGS

Yet another way to monitor progress is to examine the results of testing as reflected in the reports we send to the Secretary and the Congress. This final measure responds slowly to the efforts we are making because programs take a long time to get to the final operational test, and improved processes at the end of a program have a difficult time compensating for problems that occurred before our efforts began. This fiscal year, we provided eight Beyond Low-Rate Initial Production reports for programs on oversight. Of those, two were not suitable for combat compared to two of nine the year before. The chart from last year's annual report has been updated in Figure 2 with the data from FY09 and shows no improvement in suitability. Over the 25 years of DOT&E's existence, about 75 percent of defense systems are found to be suitable in operational testing. As noted in the discussion of Figure 1, the current measure is worse than this.

Positive steps the Department took this past year to improve suitability include the following:

- In June 2009, the Department published the Department of Defense Reliability, Availability, Maintainability, and Cost Rationale Report Manual (RAM-C) on realistic reliability, availability, and maintainability requirements and estimates describing methods for developing their life-cycle cost.
- The Department designated as a DoD Standard the ANSI/GEIA Standard 0009, Reliability Program Standard for Systems Design, Development, and Manufacturing to make it easy for program managers to incorporate the best reliability practices in requests for proposals (RFPs) and contracts. This is very important, because if the RFP does not ask for a reliability growth program, the contractor will not bid it; and, if reliability growth is not included in the subsequent contract with the winning bidder, they will not provide it. Designation as a DoD Standard allows (but does not require) program managers to incorporate compliance with the standard in contracts.

Actions taken specifically by DOT&E to improve suitability include the following:

- DOTE continues to support a training course for all of DoD in reliability growth engineering and testing.
- DOT&E continues to revamp its in-house training program, training staff to engage early in the development process by addressing requirements, operationally realistic test environments, and integrated testing.
- DOT&E now offers, as part of its professional development program, special training in RAM and DOE.
- DOT&E participates in the Program Support Reviews conducted by the System Engineering office of the USD(AT&L).

These initiatives will improve the reliability of our systems and should cause more systems to be evaluated as "suitable" during IOT&E. We have refined this priority into the initiative to "Significantly Improve Suitability before IOT&E." It continues to be at the center of our attention as an organization. Going forward, DOT&E will work to assure that programs incorporate reliability growth planning, testing, and data collection at their inception, and practice reliability growth throughout their duration.

AREAS OF PARTICULAR CONCERN

Body Armor

During the last year, there was concern expressed by the Government Accountability Office (GAO) about the Army's testing of body armor. GAO observed both Preliminary Design Model testing of new plate designs and then, further testing between November and December 2008, called First Article Testing, on those designs. GAO was concerned about the degree to which the Army followed its established testing protocols during these tests and whether the body armor purchased based on the tests would provide the needed protection to our Soldiers. The report noted however, "GAO did not provide an expert ballistics evaluation of the results of testing."

Protecting our Soldiers is critical and I have engaged the National Academies and its experts to review the Army's testing of body armor and make recommendations for improvement or correction regarding any and all of the issues raised in GAO's report. The Army has embraced the need for this independent review by the National Academies.

Missile Defense

DOT&E has begun a study of the Department's new four-phased, adaptive approach for missile defense in Europe. The goal of our study is to determine how the Missile Defense Agency's plan for testing should be changed to incorporate realistic operational assessment of the capabilities provided under the phased adaptive approach. We will examine what can be tested, when it can be tested, and what rigor, objectivity, and confidence we can have in the test and evaluation results.

OT&E MISSION ACCOMPLISHMENTS, FISCAL YEAR 2009

During this fiscal year, my office monitored 322 Major Defense Acquisition Programs (MDAPs) and special interest programs. We approved 50 Test and Evaluation Master Plans and Test and Evaluation Strategies, two LFT&E Strategies included in the Test and Evaluation Master Plans, and 70 Operational Test and Evaluation Plans for specific test events.

During FY09, DOT&E delivered eight BLRIPs (three of which were combined OT&E and Live Fire Reports) one report solely on live fire, and four Early Fielding reports to the Secretary of Defense and Congress (see Table 2).

TABLE 2. DOT&E REPORTING DURING FISCAL YEAR 2009

Program	Report Type	Date
Battlespace Command and Control Center (BC3) Air Force Central Command (AFCENT) Increment 1 Testing	OT&E Early Fielding Report	October 2008
MH-60S Block 3A Armed Helicopter Weapon System (AHWS)	Combined OT&E / LFT&E BLRIP Report	October 2008
Surface Electronic Warfare Improvement Program (SEWIP) – Block 1B2	OT&E BLRIP Report	October 2008
Logistics Vehicle System Replacement (LVSR)	LFT&E Report	December 2008
Guided Multiple Launch Rocket System (GMLRS) - Unitary (classified Annex)	Combined OT&E / LFT&E BLRIP Report	December 2008
MQ-9 Unmanned Aircraft System (UAS)	OT&E BLRIP Report	March 2009
Joint Biological Point Detection System (JBPDS)	OT&E BLRIP Report	June 2009
Air Force Mission Planning System (MPS) Increment III (F-16)	OT&E BLRIP Report	July 2009
Battlespace Command and Control Center (BC3) Air Force Central Command (AFCENT) Increment 2 Testing	OT&E Early Fielding Report	September 2009
MC-12W Liberty Project Aircraft (LPA)	OT&E Early Fielding Report	September 2009
Extended Range Multi-Purpose (ERMP) Unmanned Aircraft System Quick Reaction Capability	OT&E Early Fielding Report	September 2009
EA-18G Airborne Electronic Attack (AEA) Aircraft (classified Live Fire Report)	Combined OT&E / LFT&E BLRIP Report	September 2009
B-2 Radar Modernization Program (RMP) Mode Set One (MS 1)	OT&E BLRIP Report	September 2009

CONCLUSION

I am proud of the work DOT&E has done during this past year and I am honored to have been given the responsibility to lead this outstanding organization. I will build on DOT&E's success by helping to field new capabilities rapidly, engaging early in the requirements process, integrating developmental and operational testing, and substantially improving suitability at IOT&E. I am committed to assuring the Defense Department's operational testing and live fire tests are rigorous, objective, and clearly reported.

J. M. Gilmore

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Director

TABLE OF CONTENTS

TABLE OF CONTENTS

TABLE OF CONTENTS

TABLE OF CONTENTS

DOT&E Activity and Oversight

DOT&E Activity and Oversight

Activity Summary

DOT&E activity for FY09 involved oversight of 322 programs, including 44 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 FY09 included approval of 50 Test and Evaluation Master Plans (TEMPs) / Test and Evaluation Strategies, as well as 70 Operational Test Plans, and two Live Fire Test and Evaluation (LFT&E) Strategies for inclusion in the TEMP. In FY09, DOT&E prepared 14 reports for the Secretary of Defense and Congress that included eight Beyond Low-Rate Initial Production Reports, one LFT&E Report, and four Early Fielding Reports.

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

AC-130 Link-16 Tactical Data Network

Acoustic Rapid Commercial Off-the-Shelf (COTS) Insertion Sonar System Revision B, Change 1

Aegis Enterprise

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

AN/ALR-69A Radar Warning Receiver

Anniston Chemical Agent Disposal Facility, Chemical Demilitarization Program

B-2 Extremely High Frequency Satellite Communications and Computer Upgrade Increment 1, Annex

Ballistic Missile Defense System (BMDS) Integrated Master Test Plan

Battle Control System – Fixed Increment 3, Release 3.1

C-5 Fleet

C-5 Modernization Program

Cartridge 5.56 mm Ball Lead Free Slug M855

Deliberate and Crisis Action Planning and Execution System (DCAPES) Increment 2a Version 4.1.0.0

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

Distributed Common Ground System – Navy, Version 1.0

EA-18G Growler Revision D

EA-6B Improved Capability (ICAP) Block 4 Prowler Aircraft Upgrade, Revision D

F/A-18 System Configuration Set 21X Number S1699, Revision A

F-15E Radar Modernization Program Milestone B

F-22A Increment 3.1

Family of Advanced Beyond Line-of-Sight Terminals (FAB-T) Increment 1 Version 1.0

Future Combat Systems Annex C: Spin Out Early Infantry Brigade Combat Team (E-IBCT) and Annex J: Non-Line-of-Sight Launch System (NLOS-LS)

Future Combat Systems Non-Line-of-Sight Cannon Special Interest Program

General Fund Enterprise Business System (GFEBS) Change Pages

General Fund Enterprise Business System (GFEBS)

Global Combat Support System – Joint (GCSS-J) Version 7.0.1

Global Hawk Revision C

Guided Multiple Launch Rocket System – Alternative Warhead Rocket T&E Strategy

Guided Multiple Launch Rocket System – Unitary Rocket

Joint Air-to-Surface Standoff Missile Extended Range

Joint Biological Agent Identification and Diagnostic System (JBAIDS) Update for the Platinum Path Extraction Kit

Joint Mission Planning System – Maritime (JMPS-M) for the P-3C Mission Planning Environment (MPE)

Joint Mission Planning System – Maritime (JMPS-M) for the V-22 Mission Planning Environment (MPE), Change One to Annex M

Joint Mission Planning System – Maritime (JMPS-M) Revision C, Annex 'O' for the Marine Helicopter (MH) Mission Planning Environment (MPE)

Joint Tactical Radio System (JTRS) Ground Domain, Ground Mobile Radios, Increment 1 Version 1.2

KC-130J Hercules Aircraft Revision A

Large Aircraft Infrared Countermeasures (LAIRCM)

Littoral Combat Ship (LCS) Revision 6

M915A5 Tractor Truck Line Haul 6X4

Mine Resistant Ambush Protected Vehicle, Revision 1

TEST AND EVALUATION MASTER PLANS / STRATEGIES APPROVED

Multi-functional Information Distribution System Joint Tactical Radio System (MIDS JTRS) for Core (Annex J)

Multi-functional Information Distribution System Joint Tactical Radio System (MIDS JTRS) Annex K

Precision Guidance Kit

Public Key Infrastructure (PKI) Increment 2, Milestone B, Revision 1.5

Real Time Regional Gateway

STANDARD Missile 6 (SM-6)

Surveillance Towed Array Sensor System (SURTASS) Compact Low Frequency Active (CLFA)

TB-33/BQ Towed Array System

Three Dimensional Expeditionary Long Range Radar

Warfighter Information Network – Tactical (WIN-T) Increment 2, Version 2.20

OPERATIONAL TEST PLANS APPROVED

Acoustic Rapid Commercial Off-the-Shelf (COTS) Insertion (A-RCI) Sonar System Phase III and IV Operational Test-IIIE/F Change 3

AGM-88E Advanced Anti-Radiation Guided Missile (AARGM) Operational Test-C

Amphibious Docking Ship Class Probability of Raid Annihilation Assessment

Baseline IV Tactical Tomahawk Weapon System (TTWS) Operational Test-IIIB

Battle Control System – Fixed (BCS-F) Increment 3, Release 3.1 Force Development Evaluation (FDE)

Black Hawk UH-60M Upgrade Change 1 Limited User Test

C-5 Reliability Enhancement and Re-Engineering Program (RERP)

Consolidated Test Plan of the Operational Test (OT)-IIIG2 Ship Self-Defense System, OT-IIID of the Cooperative Engagement Capability, and OT-D3 of the Evolved SeaSparrow Missile Programs

CV-22 Joint Mission Planning System (JMPS) Mission Planning Environment (MPE) 1.1.0

Defense Integrated Military Human Resources System (DIMHRS) Multi-Service Limited User Test (M-LUT)

Department of the Navy Large Aircraft Infrared Countermeasures (DoN LAIRCM) Installed on USMC CH-53E Assault Support Helicopters (Operational Test-B1)

Distributed Common Ground System – Army Version 3.1 Limited User Test

Distributed Common Ground System – Navy (DCGS-N) Operational Test-B1

Distributed Common Ground System – Navy (DCGS-N) Operational Test-C1

DoD National Airspace System (NAS) FOT&E

Enhanced Polar System (EPS) Early Operational Assessment

Excalibur XM982 Block Ia-2 Precision Engagement Artillery Projectile

Extended Range Multi-Purpose Unmanned Aircraft System Quick Reaction Capability #1 Customer Test

F-35 Joint Strike Fighter Operational Assessment (Operational Test-IID)

FA-18C/D/E/F Aircraft System Configuration Set 21X Software Qualification Test (SQT) (Operational Test-D2)

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

Future Combat Systems Annex C: Spin Out Early Infantry Brigade Combat Team (E-IBCT) Limited User Test

General Fund Enterprise Business System Release 1.2 Limited User Test

General Fund Enterprise Business System Release 1.3

Global Combat Support System – Joint (GCSS-J) Version 7.0.1

Global Combat Support System for Combatant Command/Joint Task Force (GCSS-CC/JTF) Increment 7

Global Command and Control System – Joint Global Version 4.2 Release

Global Command and Control System – Joint Operation Planning and Execution System (JOPES) Version 4.2

Global Command and Control System – Joint Status of Resources and Training System (SORTS) Version 4.2.0

Global Command and Control System – Maritime V4.0.3

Global Positioning System Advanced Control Segment Early Operational Assessment Plan

HC/MC C-130J Operational Assessment Plan

Improved Capability (ICAP) II Block 4 Airborne Electronic Attack (AEA) Aircraft

Joint Air-to-Surface Standoff Missile Extended Range Operational Assessment Plan

Joint High Speed Vessel (JHSV) Operational Test-B1

Joint Mission Planning System (JMPS) F-16 Mission Planning Environment (MPE) Version M4.3

Joint Mission Planning System – Maritime (JMPS-M) for the Navy Legacy Helicopter Mission Planning Environment Program

Joint Mission Planning System (JMPS) F-15 Version 2.0 Mission Planning Environment (v2.0 MPE) Force Development Evaluation Annex

Joint Mission Planning System (JMPS) RC-135 Mission Planning Environment (MPE) IOT&E

Joint Mission Planning System RC-135 Mission Planning Environment (MPE) IOT&E

Joint Primary Aircraft Training System (JPATS) T-6 Avionics Upgrade Project (AUP)

Joint Tactical Radio System: Handheld, Manpack, and Small Form Fit (JTRS HMS) Phase 1, Small Form Fit (SFF) C Version (V) 1, Rifleman Radio Limited User Test

KC-130J Hercules Aircraft Operational Test-IIID

M915A5 Tractor Truck Line Haul 6X4

Mark XIIA Mode 5 Identification Friend or Foe (IFF) Operational Test-C1

Mine Resistant Ambush Protected Ambulance Limited User Test

Miniature Air Launched Decoy (MALD) IOT&E

Mobile User Objective System (MUOS) Operational Assessment (OT-D1)

Multi-functional Information Distribution System – Low Volume Terminal (MIDS-LVT) Shipboard Integration Operational Test-D-2

MQ-9 Reaper Joint Direct Attack Munition (JDAM) Force Development Evaluation

MV-22 Osprey Operational Test-IIIE FOT&E

Navy Enterprise Resource Planning (Navy ERP) FOT&E Operational Test-DIA Plan

Navy Enterprise Resource Planning (Navy ERP) Operational Test-C2A for Release 1.1

Net-Centric Enterprise Services (NCES) IOT&E

P-8A Operational Assessment

Real Time Regional Gateway

Small Diameter Bomb II (SDB II) Early Operational Assessment

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

Spider XM7 Network Command Munition System FOT&E

Stryker-Mobile Gun System (MGS) Engineering Change Order (ECO) Validation

USAF Warfare Center F-22A Mission Data Load Mission Data Optimization

USAF Warfare Center MQ-9 GBU-38 Joint Direct Attack Munition

USMC H-1 Upgrades Program Operational Test-IIIA

Vertical Launch Anti-Submarine (VLA) Rocket Torpedo MD-54 (OT-IIC) Change Transmittal 1

Virginia Class Submarine Operational Test-IIIA-1

Virginia Class Submarine Operational Test-IIIA-2

Virginia Class Submarine Program Rev A Information Assurance Red Team Test Procedures

Vulnerability Lifecycle Management System (VLMS) Spiral 1.5 Operational Utility Evaluation (OUE)

Warfighter Information Network – Tactical (WIN-T) Increment 1a Initial Operational Test

Warfighter Information Network – Tactical (WIN-T) Increment 1b and Increment 2 Limited User Test, Change 1

LIVE FIRE TEST AND EVALUATION STRATEGIES AND TEST PLANS

MRAP Family of Vehicles

Medium Tactical Vehicle Replacement

REPORTS TO CONGRESS FOR FY09

Program	Report Type	Date
Battlespace Command and Control Center (BC3) Air Force Central Command (AFCENT) Increment 1 Testing	OT&E Early Fielding Report	October 2008
MH-60S Block 3A Armed Helicopter Weapon System (AHWS)	Combined OT&E / LFT&E BLRIP Report	October 2008
Surface Electronic Warfare Improvement Program (SEWIP) – Block 1B2	OT&E BLRIP Report	October 2008
Logistics Vehicle System Replacement (LVSR)	LFT&E Report	December 2008
Guided Multiple Launch Rocket System (GMLRS) – Unitary (classified Annex)	Combined OT&E / LFT&E BLRIP Report	December 2008
MQ-9 Unmanned Aircraft System (UAS)	OT&E BLRIP Report	March 2009
Joint Biological Point Detection System (JBPDS)	OT&E BLRIP Report	June 2009
Air Force Mission Planning System (MPS) Increment III (F-16)	OT&E BLRIP Report	July 2009
Battlespace Command and Control Center (BC3) Air Force Central Command (AFCENT) Increment 2 Testing	OT&E Early Fielding Report	September 2009
MC-12W Liberty Project Aircraft (LPA)	OT&E Early Fielding Report	September 2009
Extended Range Multi-Purpose (ERMP) Unmanned Aircraft System Quick Reaction Capability	OT&E Early Fielding Report	September 2009
EA-18G Airborne Electronic Attack (AEA) Aircraft (classified LF Report)	Combined OT&E / LFT&E BLRIP Report	September 2009
B-2 Radar Modernization Program (RMP) Mode Set One (MS 1)	OT&E BLRIP Report	September 2009

During FY09, 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 781 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 FY09.

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 Directive 5000.01, 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 LFT&E. 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 128 LFT&E acquisition programs during FY09.

PROGRAMS UNDER DOT&E OVERSIGHT
CALENDAR YEAR 2009
(As taken from the January 2009 Official T&E Oversight List)

DoD PROGRAMS

Ballistic Missile Defense System (BMDS) Program

- Aegis 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 (Personnel and Pay) Program (DIMHRS PERS/PAY)

Defense Security Assistance Management System (DSAMS) Block 3

Defense Travel System (DTS)

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

Global Command & Control System – Joint (GCCS J)

Integrated Air and Missile Defense (IAMD) Roadmap Programs

Joint Biological Agent Identification and Diagnosis System (JBAIDS)

Joint Biological Point Detection System (JBPDS)

Joint Biological Stand-Off Detection System (JBSDS)

Joint Cargo Aircraft (JCA)

Joint Chemical Agent Detector (JCAD)

Joint Counter Radio IED Electronic Warfare (JCREW) Spiral 3.3

Joint Lightweight Tactical Vehicle (JLTV)

Joint Nuclear, Biological, and 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 Radios (GMR)

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

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

Joint Warning and Reporting Network (JWARN)

Key Management Infrastructure (KMI)

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

Multi-National Information Sharing (MNIS)

Net-Centric Enterprise Services (NCES)

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

Public Key Infrastructure (PKI)

Shipboard Enhanced Automated Chemical Agent Detection System (SEACADS)

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

Teleport Generation I/II (Teleport)

Theater Medical Information Program (TMIP) Block 2

ARMY PROGRAMS

Abrams Tank Modernization (M1A2 SEP Increment 2)

Abrams Tank Upgrade (M1A1 SA / M1A2 SEP)

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

Aerial Common Sensor (ACS)

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

Apache Block III (AB3)

ARMY PROGRAMS (continued)

Armored Truck Programs including:

- Fuel Tankers
- Heavy Equipment Transporter (HET)
- Heavy Expanded Mobility Tactical Truck (HEMTT)
- M915A5 Family of Vehicles
- M939 General Purpose Truck
- Palletized Loading System (PLS)

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

Army Mission Planning System (AMPS)

Biometrics

Black Hawk Upgrades (UH-60M) – Utility Helicopter Upgrades

Bradley Modernization (M2A3v2)

Bradley Upgrade – M2A3 Fighting Vehicle Systems

CH-47F – Cargo Helicopter

Distributed Common Ground System – Army (DCGS-A)

Enhanced AN/TPQ-36 Radar System (EQ-36)

Excalibur (Family of Precision, 155 mm Projectiles)

Family of Medium Tactical Vehicles (FMTV) (including armor modifications)

Force XXI Battle Command Brigade & 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 & Surveillance Target & Acquisition (RSTA)
- Command and Control Vehicle (C2V)
- Field Recovery and Maintenance Vehicle (FRMV)
- Infantry Combat Vehicle (ICV)
- Medical Vehicle (MV) (Treatment & Evacuation Variant)
- Mk 44 Cannon 30 mm Ammunition
- Mounted Combat System (MCS)
- Multi-Function Utility/Logistics and Equipment Vehicle (MULE) Transport
- Multi-Function Utility/Logistics and Equipment Vehicle (MULE) Countermine
- Network Battle Command
- Non-Line-of-Sight Cannon (NLOS-C)
- Non-Line-of-Sight Cannon – Special Interest (NLOS-C SPI) Trainer
- Non-Line-of-Sight Mortar (NLOS-M)
- Non-Line-of-Sight Launch System (NLOS-LS)
- Recon and Surveillance Vehicle (R&SV)
- Small Manpackable Unmanned Ground Vehicle (SUGV)
- UAV Class I
- UAV Class II
- UAV Class III
- UAV 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 HIMARS Armored Cab

High Mobility Multi-purpose Wheeled Vehicle (HMMWV) Armor

High Mobility Multi-purpose Wheeled Vehicle (HMMWV) Expanded Capacity Vehicle 2 (ECV2)

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

Intelligent Munitions System (IMS)

Installation Information Infrastructure Modernization Program

Javelin Antitank Missile System – Medium

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

Joint Battle Command Platform (JBC-P)

Joint Heavy Lift Program

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

Joint Mission Planning System (JMPS)

Kiowa Warrior Replacement Program (was Armed Reconnaissance Helicopter (ARH))

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 (OneTESS)

Paladin/Field Artillery Ammunition Support Vehicles (FASSV) 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)

ARMY PROGRAMS (continued)

Sky Warrior Unmanned Aircraft System (Sky Warrior UAS) (also called Extended Range Multi-Purpose Unmanned Aircraft System (ERMP UAS)) including Hellfire Missile Upgrade and Common Sensor Upgrade

Small Unmanned Aircraft System (Raven UAS)

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 – Mortar Carrier
- Stryker – Reconnaissance Vehicle
- Stryker – Mobile Gun System
- Stryker – Nuclear, Biological, and Chemical (NBC) Reconnaissance Vehicle

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

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

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

Warfighter Information Network-Tactical (WIN-T) Increments 2

Warfighter Information Network-Tactical (WIN-T) Increments 3

Warfighter Information Network-Tactical (WIN-T) Increments 4

XM1022 Long Range Sniper Ammunition

NAVY PROGRAMS

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

Acoustic Rapid Commercial Off-the-Shelf (COTS) Insertion for SONAR

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)

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

AIM-9X – Air-to-Air Missile Upgrade including AIM-9X P3I

Air and Missile Defense Radar (AMDR)

Airborne Mine Neutralization System (AMNS)

Airborne Resupply/Logistics for SeaBasing (AR/LSB)

Aegis Modernization

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

AN/APR-39 Radar Warning Receiver

AN/WSQ-11 Anti-Torpedo Torpedo Defensive System

Anti-Torpedo Torpedo Defensive System

Broad Area Maritime Surveillance (BAMS)

BYG-1 Fire Control (Weapon Control & TMA)

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)

Consolidated Afloat Network and Enterprise Service (CANES)

Cooperative Engagement Capability (CEC) (including P3I effort)

CVN 21 – Next Generation Nuclear Aircraft Carrier

DDG 51 Guided Missile Destroyer

DDG-1000 Zumwalt Class Destroyer (formerly DD(X) Future Surface Combatant) including Long Range Land Attack Projectile

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

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) Increment 1

E-2D Advanced Hawkeye (AHE)

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

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

Electronic Patrol – X (EP-X)

Evolved SeaSparrow Missile (ESSM)

Expeditionary Fighting Vehicle (EFV)

Extended Range Munition (ERM)

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

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

NAVY PROGRAMS (continued)

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 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 Mine Resistant Ambush Protected Family of Vehicles (MRAP) (includes all variants)

Joint Mission Planning System (JMPS) - Navy

Joint Multi-Mission Submersible (JMMS)

Joint Precision Approach and Landing System (JPALS)

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

KC-130J Aircraft

LHA Replacement – New Amphibious Assault Ship

LHD 8 Amphibious Assault Ship

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

Logistics Vehicle System Replacement

LPD-17 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)

Medium Tactical Vehicle Replacement Program (USMC) (MTVR)

MH-60R Multi-Mission Helicopter Upgrade

MH-60S Multi-Mission Combat Support Helicopter

Mk 48 Torpedo Mods

Mk 54 Torpedo

Mobile User Objective System (MUOS)

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 Enterprise Network (NGEN)

Next Generation Jammer

P-8A Poseidon Program

Rapid Airborne Mine Clearance System (RAMICS)

Remote Minehunting System (RMS)

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

Sea Based Strategic Deterrence (SBSD)

Ship Self-Defense System (SSDS)

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

Small Tactical Unmanned Aerial System (STUAS) - UAS Tier II

SSGN Ohio Class Conversion

SSN 774 Virginia Class Submarine

STANDARD Missile 2 (SM-2) Block IIIB

STANDARD Missile 6 (SM-6)

Submarine External Communications System (SubECS) / Common Submarine Radio Room (CSRR)

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 including T-AKE Ships for Maritime Prepositioning Force – Future (MPF - F)

Tactical Tomahawk Weapon System (TTWS) (including Tactical Tomahawk All Up Round (AUR), Tactical Tomahawk Weapons Control System (TTWCS), and Tomahawk Command & Control System (TCCS))

TB-33 Array Fiber Optic Thin Line System

TB-34 Next Generation Fat Line Replacement Towed Array

Trident II Missile

V-22 Osprey Joint Advanced Vertical Lift Aircraft

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)

AC-27J Special Operation Command (SOCOM) Gunship

Advanced Extremely High Frequency Program (AEHF)

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

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

Air and Space Operations Center – Weapons System (AOC-WS) initiative 10.2

Airborne Signals Intelligence Payload (ASIP)

Airborne Warning and Control System (E-3 AWACS) Upgrades, including Block 40/45, Identification Friend or Foe Mode 5, and IABM integration

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) and follow-on system

C-5 Avionics Modernization Program (AMP)

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

C-17A – Globemaster III Advance Cargo Aircraft

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

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

C-130J Hercules Cargo 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)

Common Link Integration Processor (CLIP)

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) Block 20

E-4B National Airborne Operations Center (NAOC) Aircraft Replacement Program

Enhanced Polar System (EPS)

Expeditionary Combat Support System (ECSS)

F-15E Radar Modernization Program

F-22 – RAPTOR Advanced Tactical Fighter

F-35 Joint Strike Fighter (JSF)

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

Full Scale Aerial Target

Global Broadcast Service (GBS)

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

Global Hawk High Altitude Endurance Unmanned Aircraft System

Global Positioning Satellite IIIA (GPS IIIA)

Global Positioning Satellite Next Generation Control System (GPS OCX)

Global Positioning System (includes Satellites, Control, and User Equipment) (NAVSTAR GPS)

HC/MC-130 Recapitalization Program

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

Infrared Augmentation Satellite

Integrated Strategic Planning and Analysis Network (ISPAN) Block 1

Integrated Strategic Planning and Analysis Network (ISPAN) Increment 2

Integrated Space Situational Awareness (ISSA) System

Interim Gateway

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

Joint Direct Attack Munition (JDAM) including Laser JDAM

Joint Primary Aircraft Training System (JPATS)

KC-45A

Large Aircraft Infrared Countermeasures (LAIRCM)

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

Mission Planning Systems (MPS) Increments I-III including the Joint Mission Planning System (JMPS)

Mission Planning System (MPS) Increment IV

Multi-Platform Radar Technology Insertion Program (MP RTIP)

National Airspace System (NAS)

National Polar-Orbiting Operational Environment Satellite System (NPOESS)

AIR FORCE PROGRAMS (continued)

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

Objective Gateway (OG)

Rapid Attack Identification, Detection, and Reporting System (RAIDRS) Block 20

Reaper MQ 9 Hunter Killer Unmanned Aircraft System (UAS)

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)

Transformational Satellite Communications System (TSAT)

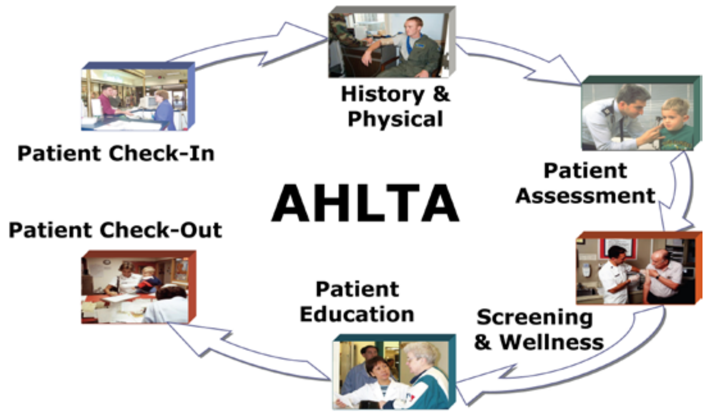
Wideband Global Satellite Communications Program (WGS)

DoD Programs

DoD Programs

Armed Forces Health Longitudinal Technology Application (AHLTA)

Executive Summary
- The Army Test and Evaluation Command (ATEC) and the Army Medical Department Board (AMEDDBD) conducted an FOT&E to verify the correction of deficiencies associated with the Dental Readiness Classification (DRC) functionality from October 20 - 31, 2008, in typical operational environments at three dental clinics.
- Of the 4,718 DRC transactions observed during the FOT&E, 4,685 (99.3 percent) were successful. The results exceeded the 99 percent threshold criterion for Medical Status Reporting.



System
- The Armed Forces Health Longitudinal Technology Application (AHLTA) is a Major Automated Information System that is designed to be used in military medical treatment facilities worldwide to support patient care. AHLTA is an enabler to the DoD's Force Health Protection Initiative.
- AHLTA is designed to integrate multiple commercial off-the-shelf medical products and introduce new techniques and procedures for recording patient encounters. It is designed to standardize medical and dental information and make it immediately available to military health care professionals worldwide.
- The system is designed to manage and record patient encounters, enable calculation of third-party billing, and perform or integrate various clinical operations that include order entry, order monitoring, and results retrieval.
- AHLTA consists of three major functional blocks:
  - Block 1 provides outpatient encounter documentation, order entry, and medical information retrieval.
  - Block 2 integrates medical, dental, and optometry information.
  - Block 3 was to replace legacy capabilities for pharmacy, laboratory, anatomical pathology, and radiology; individual medical readiness; and occupational health surveillance; however, the Milestone Decision Authority terminated the Block 3 effort on December 19, 2008, due to other competing priorities.

Mission
- The military health care providers equipped with AHLTA can create and maintain uniform, comprehensive, legible, secure, electronic health records for all beneficiaries of the Military Health System.
- A comprehensive, integrated electronic medical and dental record is critical to satisfy readiness requirements and provide quality health care services.

Prime Contractors
- Science Applications International Corporation (SAIC), Falls Church, Virginia
- Northrop Grumman Health Solutions, Chantilly, Virginia

Activity
- ATEC and AMEDDBD conducted FOT&E to verify the correction of deficiencies associated with the DRC functionality from October 20 - 31, 2008, in typical operational environments at three dental clinics: Budge Dental Clinic, Fort Sam Houston, Texas; Naval Hospital Oak Harbor Dental Clinic, Oak Harbor, Washington; and 72nd Dental Squadron, Tinker AFB, Oklahoma.

Assessment
Testing was conducted in accordance with the DOT&E-approved test plan and was adequate to verify successful implementation of the corrections. During the FOT&E, the ATEC and AMEDDBD test team observed 4,718 DRC transactions, of which 4,685 (99.3 percent) were successful. The results exceeded the 99 percent threshold criterion for Medical Status Reporting.

Recommendations

- Status of Previous Recommendations. The Program Management Office has satisfactorily resolved the matters related to the DRC functionality. While it has made some progress, the Program Management Office has not yet adequately addressed the following recommendations:
  1. Continue to improve user friendliness and system response times of both the Medical and Dental modules in order to increase productivity and usability.
  2. Complete the implementation and operational test and evaluation of an Alternate Computing Facility.
  3. Examine the information assurance penetration test findings, determine the risk for each vulnerability, and mitigate those risks that are not acceptable.
- FY09 Recommendations. None.

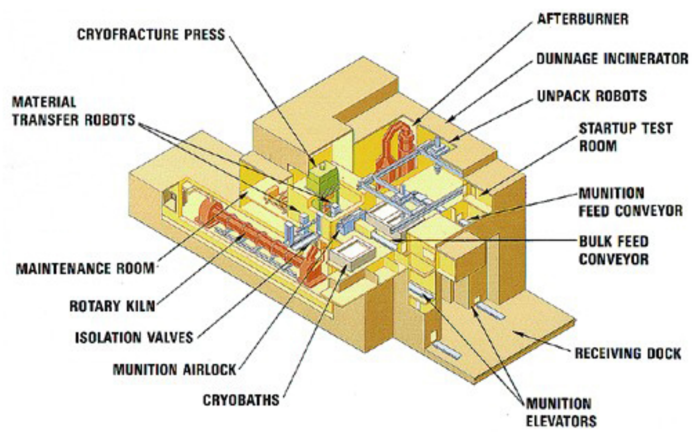
Chemical Demilitarization Program (CHEM DEMIL)

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 and the Transportable Detonation Chamber.
- 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
- Two stockpile disposal facilities are in development at Blue Grass, Kentucky, and Pueblo, Colorado. They will employ chemical neutralization of agents followed by post-treatment of the neutralized products.
- The Linear Projectile Mortar Disassembly system is a new munitions processing system being developed for use at the Anniston, Blue Grass, and Pueblo sites.
- There is one non-stockpile fixed facility: Ton Container Decontamination Facility at Pine Bluff Arsenal.
- 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



NOTIONAL DESTRUCTION FACILITY

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 (complete), miscellaneous chemical warfare material, recovered chemical weapons, former production facilities (complete), and buried chemical warfare material.

Prime Contractors

- Chemical Materials Agency, Aberdeen, Maryland
- Baseline sites: URS Corporation, EG&G Division, Gaithersburg, Maryland
- Assembled Chemical Weapons Alternatives (ACWA) sites: Bechtel National, Inc., San Francisco, California, and Parsons Infrastructure and Technology Group, Inc., Pasadena, California

Activity

- Chemical Demilitarization Programs are not traditional acquisition programs under 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/munitions 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/munitions 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.
- As of August 2009, approximately 64 percent of the total U.S. chemical weapons stockpile (originally 31,498 agent tons) had been destroyed. FY09 test activity for stockpile facilities and non-stockpile systems is summarized in the table below.

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. 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.

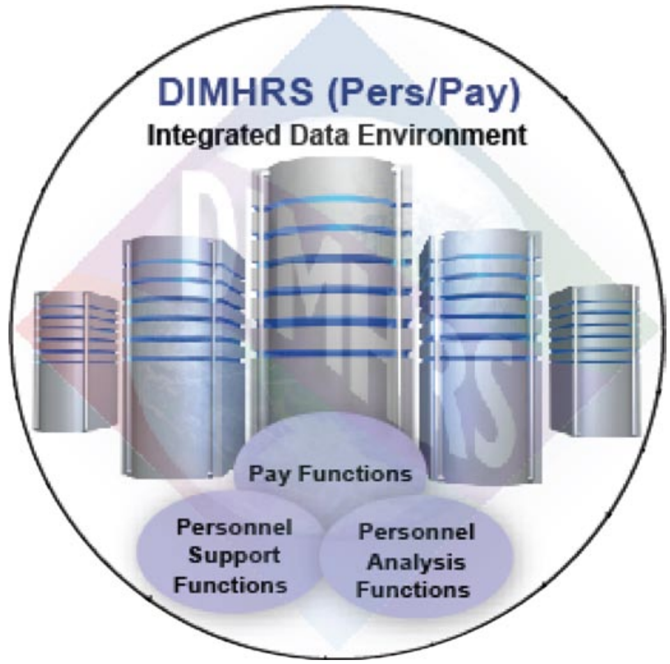
Recommendations

- Status of Previous Recommendations. There are no outstanding previous recommendations.
- FY09 Recommendations. None.

CHEMICAL DEMILITARIZATION TEST AND EVALUATION ACTIVITY

Facility/System	Technology	FY09 Activity	Agent Tested	Planned FY10 Activity
Anniston	Incineration	OT	Mustard (HT) 4.2-inch Mortars	OT Mustard (HD) 4.2 Mortars
Umatilla	Incineration	OT	Mustard (HD) Ton Containers	Operations Only
Pine Bluff	Incineration	OT	Mustard (HD/HT) Ton Containers	Operations Only
Newport	Neutralization	Closure Activities	Not Applicable	Closure Activities
Linear Projectile Mortar Disassembly	Not Applicable (Munitions Disassembly Only)	DT/OT	Mustard (HD/HT) Munitions: 155/105 mm Projectiles 4.2-inch Mortars	OT
Explosive Destruction System Phase 1	Neutralization	OT	Arsenicals German Traktor Rockets Sarin (GB)	TBD (Pending new missions and munitions)
Explosive Destruction System Phase 2	Neutralization	OT	Arsenicals German Traktor Rockets VX	FOT&E Arsenicals German Traktor Rockets
Large Item Transportable Access and Neutralization System	Neutralization	Testing Suspended (recovered munitions unavailable)	Not Applicable	Testing Suspended (recovered munitions unavailable)
Transportable Detonation Chamber	Thermal Decomposition	DT/OT	Mustard (HD)	DT/OT HD, GB, VX
Pine Bluff Ton Container Decontamination Facility	Magnetic Induction Heating	Operations	Trace Agents during Ton Container Processing	Operations

Defense Integrated Military Human Resources System (DIMHRS)



Executive Summary

- The Defense Integrated Military Human Resources System (DIMHRS) program manager initiated the government-led System Acceptance Testing (SAT) of DIMHRS in August 2008. The SAT was not completed due to deficiencies with interfaces, data conversion, and system performance.
- Following an independent review, the Deputy Secretary of Defense (DepSecDef) directed the Business Transformation Agency (BTA) to complete the DIMHRS Core Information Technology (IT) Investment; the military departments (MILDEPs) to oversee, build-out, and deploy their own pay and personnel capabilities using the DIMHRS Core IT Investment; and the Office of the Deputy Chief Management Officer (DCMO) will oversee the establishment of the enterprise-level information warehouse to meet Combatant Commander (COCOM) requirements.
- The program manager conducted DIMHRS Core IT Investment Functional Testing from May through September 2009. Time did not permit the BTA to complete the DIMHRS Core IT Investment correction of deficiencies and testing prior to transition to the MILDEPs. The outstanding DIMHRS Core deficiencies were documented and deferred to the MILDEPS for resolution. The BTA began to transition the DIMHRS Core to the MILDEPs on September 30, 2009.

System

- DIMHRS was 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 was expected to provide personnel support, analysis, and pay functions to approximately 3.1 million military personnel and 3 million retirees and survivors.
- In accordance with 2009 program restructuring, the DIMHRS Core IT Investment, developed by the BTA, will provide common data, process elements, and interfaces to achieve timely and accurate military pay. The MILDEPs will develop specific solutions, using the DIMHRS Core IT Investment to the maximum extent practical. The enterprise-level information warehouse will allow Combatant Commanders to quickly and accurately account for personnel, manage troop strength, and war plan based on personnel information.

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, of 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, Reston, Virginia

Activity

- The Program Management Office initiated the government-led SAT of DIHMRS in August 2008. The program manager halted testing in March 2009 due to deficiencies with interfaces, data conversion, and system performance.
- The DepSecDef directed a review of the DIMHRS program in November 2008 to gain a more comprehensive understanding of the status and key risks being encountered during the development process. The Director, Program Analysis and

Evaluation (D, PA&E) conducted a DepSecDef-directed DIMHRS assessment in December 2008, with DOT&E assistance. The D, PA&E identified the following problem areas: unstable configuration, unworkable interfaces, data conversion, and system performance.
- In January 2009, the DepSecDef directed the following: BTA was to complete the DIMHRS Core IT Investment. In September 2009, Under Secretary of Defense (Acquisition, Technology and Logistics (USD(AT&L)) provided supplementary guidance upon completion of the DIMHRS Core IT Investment: the MILDEPs are to oversee, build-out, and deploy their own pay and personnel capabilities using the DIMHRS Core IT Investment to the maximum extent practical; and DCMO will oversee the establishment of the enterprise-level information warehouse to meet COCOM requirements.
- The USD(AT&L) certified the restructured DIMHRS program and the DIMHRS Core IT Investment in April 2009. The DIMHRS Core IT Investment was defined as 3,209 specifications and 39 interfaces.
- The program manager conducted DIMHRS Core IT Investment Functional Testing from May through September 2009.
- The BTA began to transition the DIMHRS Core IT Investment to the MILDEPs on September 30, 2009.

Assessment
- Time did not permit the BTA to complete the DIMHRS Core IT Investment correction of deficiencies and testing prior to transition to the MILDEPs. Ninety-seven percent of the Core IT Investment specifications and 27 of the 35 Core IT Investment interfaces (reduced from 39) successfully passed testing prior to transition. Ninety software problem reports remained open at transition, seven having significant impact. The BTA will document the open DIMHRS Core IT Investment deficiencies as part of a DIMHRS Core completion report.
- The BTA attempted a full data conversion of 3.1 million records early in the program; however, the conversion was unsuccessful. No further full data conversions were attempted. The BTA successfully completed a data conversion of 7,500 records to support the payroll calculation validation. This reduced set of records represented 110 of 219 possible pay types. The payroll calculation validation showed that 64 percent of payroll data was accurate, 17 percent was inaccurate with a fix identified, and 19 percent was inaccurate or missing. The results of the payroll calculation validation did not meet the accuracy threshold of 99.5 percent. The primary cause of the unsuccessful payroll calculation validation was the inaccuracy of the converted data.

Recommendations
- Status of Previous Recommendations. The FY08 recommendations are no longer applicable due to the April 2009 program restructuring.
- FY09 Recommendation.
  1. The MILDEPs should perform a thorough analysis of the capabilities actually provided by the DIMHRS Core IT Investment to determine the best approach to building out their respective pay and personal capabilities.

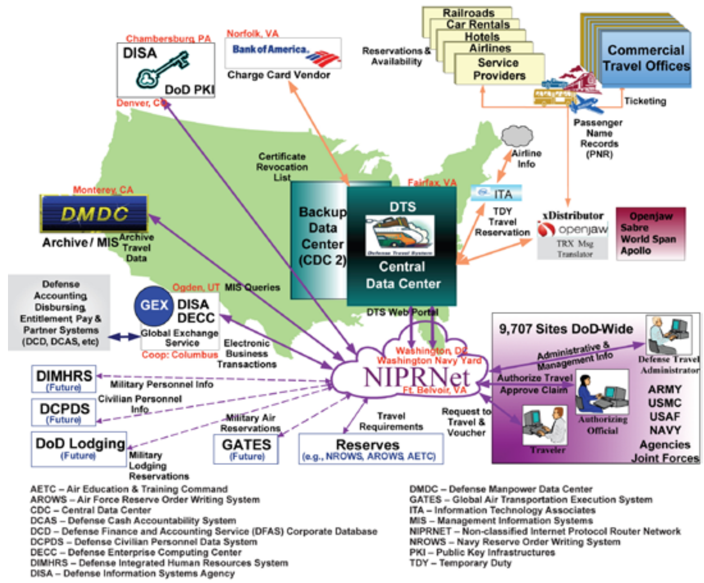
Defense Travel System (DTS)

Executive Summary

- For complex software systems such as the Defense Travel System (DTS), robust developmental testing and operational testing are critical to maintaining quality. Web-based systems with extensive live interfaces pose unique challenges for operational testing since the only full operational environment is the actual user system. Robust developmental testing and integrated developmental/operational testing must be used to mitigate this risk.
- The Army Test and Evaluation Command (ATEC) observed and analyzed developmental testing results for the combined Special Circumstances Travel (SCT)/Technical Refresh release that occurred in August 2009. The release converted proprietary software code to open-source Java programming language, incorporated the SCT functionality, and corrected prior deficiencies.
- ATEC verified that 100 percent of the test cases involving 29 SCT categories passed during the Program Management Office (PMO)-led procedural and regression testing. ATEC did not assess operational effectiveness and operational suitability since OT&E could not be conducted for this release.
- A Hewlett Packard test team acted as an independent observer to assess the contractor load testing and the overall performance of the release. The Hewlett Packard test team concluded that the load tests were consistent with the Hewlett Packard test methodology and that the contractor had mitigated all identified risks with the caveat that the test did not exercise external booking functions (airlines, hotels, etc.). The Hewlett Packard test team also concluded that modifications proposed and tested by the contractor exceeded performance expectations in terms of supported users.
- Based on these findings, the Defense Business Systems Acquisition Executive decided to place the release into production on August 8, 2009.
- While the new release performed significantly better than the 2008 Technical Refresh release, initial system performance was marginal at best. Many users had difficulty accessing the system or experienced very slow response times. Other users encountered functionality problems. After the contractor implemented several software patches, system performance gradually improved.

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 is continuing 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 a rule-based web portal to prepare travel authorizations and vouchers, to get the documentation approved, and to get reimbursed once their travel is completed.

Prime Contractor

- Northrop Grumman, Fairfax, Virginia

Activity

- ATEC conducted observations and analyses of the developmental testing of a combined SCT/Technical Refresh release from February through August 2009. The release converted proprietary software code to open-source Java programming language, incorporated the SCT functionality, and corrected prior deficiencies.
- After serious performance problems were identified in the 2008 Technical Refresh release, the PMO contracted the Hewlett Packard test to assist the PMO and the contractor in establishing better load testing practices and to verify the fixes. From July 14 - 23, 2009, the Hewlett Packard test team independently observed and assessed contractor load testing and the overall performance of the new SCT/Technical Refresh release. The Hewlett Packard test team concluded that the load tests were consistent with the Hewlett Packard test team methodology and that the contractor had mitigated all identified risks with the caveat that the test did not exercise external booking functions (airlines, hotels, etc.). The Hewlett Packard test team also concluded that modifications proposed and tested by the contractor exceeded performance expectations in terms of supported users.
- Based on these findings, the Defense Business Systems Acquisition Executive decided to place the release into production on August 8, 2009.

Assessment

- For complex software systems such as DTS, robust developmental testing and operational testing are critical to maintaining quality. Web-based systems with extensive live interfaces pose unique challenges for operational testing since the only full operational environment is the actual user system. Robust developmental testing and integrated developmental/operational testing must be used to mitigate this risk. DOT&E has engaged the PMO and ATEC to conduct a thorough review of the integrated test processes to improve system quality.
- For Major Automated Information Systems, operational testers usually conduct an OT&E on a production system at selected operational sites prior to a full deployment decision. Since DTS is a web-based system, this traditional approach is not practical. Any new DTS release placed on the enterprise web server for operational testing is in fact already fully deployed.
- To mitigate the risk of the combined SCT/Technical Refresh release, ATEC observed the developmental testing conducted by the PMO and the contractor, and analyzed the developmental testing results. The testing was conducted in a test environment with much smaller capacity than the production environment using a prorated work load. ATEC verified that 100 percent of the test cases involving 29 SCT categories passed during the PMO-led procedural and regression testing. ATEC did not assess operational effectiveness and operational suitability since OT&E could not be conducted for this release. The independent Hewlett Packard test team also concluded that modifications proposed and tested by the contractor exceeded performance expectations in terms of supported users. These conclusions appeared to be reasonable based on the test results. Both ATEC and DOT&E concurred with the assessment.
- Once fielded, the new release performed significantly better than the 2008 Technical Refresh release, but system performance was marginal at best. Many users had difficulty accessing the system or experienced very slow response times. Other users encountered functionality problems. After the contractor implemented several software patches, system performance gradually improved. However, it is not known how many functionality problems were introduced as a result of the installed patches. DOT&E has engaged the PMO in an effort to determine the root causes of these performance and functionality problems in order to identify ways to improve system quality for future releases.

Recommendations

- Status of Previous Recommendations. While ATEC attempted to validate the Technical Refresh fixes as a part of the SCT release prior to fielding, a follow-on operational assessment of DTS has yet to be conducted.
- FY09 Recommendations.
  1. The PMO should implement a test environment that more accurately replicates actual user loading in order to better support the developmental testing and integrated developmental testing/operational testing for future releases.
  2. The PMO should either strengthen its developmental testing staff or continue the practice of hiring an independent verification and validation team to authenticate contractor developmental results.
  3. ATEC and the PMO should develop and execute more robust integrated developmental/operational testing for future releases.
  4. ATEC should conduct a follow-on operational assessment of DTS at selected operational sites as soon as practicable to determine operational effectiveness, suitability, and survivability of the system.

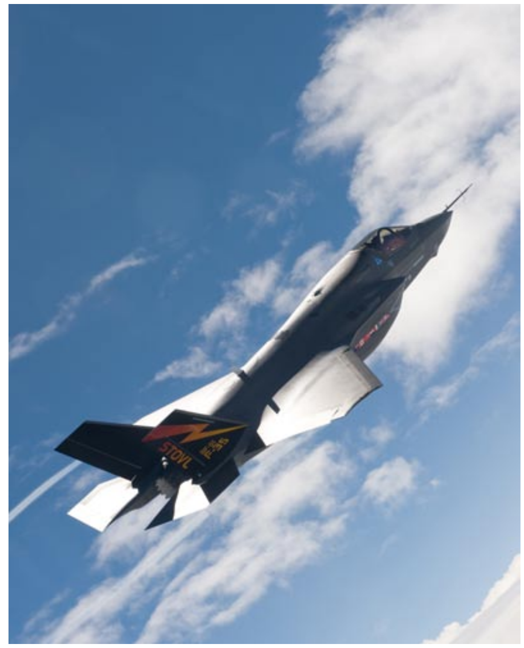
F-35 Lightning II Joint Strike Fighter (JSF)

Executive Summary

- F-35 verification and flight test did not reach the tempo planned for FY09 due primarily to late deliveries of the remaining 10 (of 13) System Design Demonstration (SDD) flight test aircraft. While other verification work continued in the hover pit, Cooperative Avionics Test Bed (CATB), and surrogate platforms, the Integrated Test Force accomplished only 16 of 168 flight test sorties planned for FY09. Completion of IOT&E of Block 3 capability could occur in early to mid-2016 provided the associated extension of SDD is supported with additional flight test aircraft, timely delivery of effective software, and an adequate pace of testing is maintained.
- Continued production concurrent with the slow increase in flight testing over the next two years will commit the DoD and Services to test, training, and deployment plans with substantial risk. Program management needs to emphasize maintaining robust engineering and test forces, early completion of detailed test plans, fully resourcing those plans, and rigorous accreditation of models and labs. Deliveries of assets for OT&E and initial training must be managed consistent with approved plans for OT&E.
- The mission capability of the low-rate initial production (LRIP) aircraft and support systems is unclear. This creates a problem for the Services as they plan for Initial Operational Capability. The process to accurately and credibly predict the mission capability of LRIP systems well before delivery needs to improve and LRIP contracts need to be tied explicitly to demonstrated progress in flight testing.
- The JSF Program Office (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 these safety systems as an acceptable system trade to balance weight, cost, and risk, DOT&E remains concerned regarding the aircraft's vulnerability to threat-induced fires.

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 take-off and landing (CTOL)
  - F-35B Short Take-off and Vertical Landing (STOVL)
  - F-35C Aircraft carrier variant (CV)



- It is designed to survive in an advanced threat (year 2012 and beyond) environment using a blend of advanced technologies. It is also designed to have 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, Aeronautics Division, Advanced Development Programs, Fort Worth, Texas

Activity

- F-35 Flight Test

  STOVL Flight Sciences, BF-1 and BF-2 Flight Test
  - SDD flight test operations added SDD STOVL test aircraft BF-2 in February 2009. First flight occurred 10 months later than envisioned in the 2007 mid-course risk reduction.
  - During FY09, the test team accumulated only 12 test flights with BF-2 and four flight test sorties for aircraft BF-1 for a total of 16 test flights of the approximately 5,000 total planned for SDD. The approved master schedule called for 168 test flights, including the completion of the first vertical landing, before the end of the fiscal year. Completion of the first vertical landing has slipped from mid-2009 to January 2010.
  - Aircraft BF-1 completed initial hover pit testing at the contractor's test facility in Fort Worth, Texas. While the testing concluded four months later than planned in the F135 engine recovery plan, all test objectives were completed and engineering staff concluded that the F135 provides sufficient thrust for STOVL operations. Discoveries included high temperatures in the shaft clutch, need for lift fan door seal change, and potential for hot gas ingestion under certain wind conditions. The test team continues to work towards achieving the full STOVL flight clearance.
  - The program planned to deploy BF-1 and BF-2 to the Navy flight test center at Patuxent River, Maryland, in mid-FY09. BF-1 ferried to Patuxent River in November 2009, and began activities towards the first vertical landing. BF-2 continued to undergo modifications and functional check flight activities in Fort Worth at the time of this report.

  CTOL Flight Sciences, AA-1 Flight Test
  - Aircraft AA-1 (the non-weight-optimized CTOL SDD test article) continued to mitigate risks for production aircraft, accumulating 36 flights during FY09.
  - AA-1 testing contributed to discoveries in air-starts, weapons bay door operations, air refueling, and noise levels. The test team also used AA-1 for training the flight test teams.
  - AA-1 deployed to Edwards AFB, California, in October 2008, to test engine-restart-in-flight and acoustic test points. AA-1 later deployed to Edwards AFB, California, in September 2009 to conduct risk mitigation ground roll hook engagements. The program plans to ferry AA-1 to China Lake, California, in FY10 for storage; it will eventually become a LFT&E asset.
- Modeling and Simulation

  Cooperative Avionics Test Bed (CATB)
  - The CATB accomplished two deployments to Edwards and a deployment to Eglin AFB, Florida during FY09. It began the first mission systems CATB test activity in March with Block 0.5 software, five months later than planned.
  - Testing included radar, electronic warfare, and communications/navigation/identification (CNI) systems. In 55 total flights during the fiscal year, the integrated test force resolved a total of seven missions systems success criteria of the 284 allotted to the CATB.

  Other Models and Corporate Labs
  - The JSF Program Office initiated a roadmap for the verification, validation, and accreditation (VV&A) of the labs and models intended to become test venues, per the mid-course risk reduction strategy of 2007. The roadmap serves as a gauge to measure the contractor's progress in completing the accreditation support packages needed before success criteria can be resolved using the models. The current roadmap indicates that 50 percent of models will be accredited during the final year of flight testing, an approach with substantial risk.
- Additional Test Venues
  - The F135 recovery path to support the first STOVL vertical landing progressed slowly as the contractor completed tests of modified engines in preparation for hover pit testing in Fort Worth. Although the full STOVL flight clearance was expected by February 2009, only the STOVL propulsion system flight clearance was available at that time. In September 2009, an F135 engine ground test encountered a broken blade in the compressor section. Root cause analysis was in progress as of the writing of this report, but flight test operations continued.
  - The first two F136 SDD engines entered ground testing. These tests accumulated approximately 40 hours of ground test time and yielded discoveries on bearing assemblies that were subsequently modified.
  - Contractor test teams conducted testing of situational awareness and attack sensors and subsystems (radar, electro-optical targeting system, distributed aperture system, and countermeasures systems) in labs and on surrogate aircraft. This was subsystem developmental testing. The JPO has not accredited these labs and surrogate aircraft for verification tasks. The test team employed the radar from a surrogate test aircraft in operational training exercise Northern Edge 09 in a multi-target, countermeasured environment.
  - The contractor successfully completed initial mission systems software stability testing in ground labs for Block 0.5 and Block 1. Contractor teams are working on stability deficiencies discovered in this testing. Impact to performance and schedule is unknown.
  - The JSF Operational Test Team (JOTT), comprised of the operational test agencies, concluded the fourth operational assessment, OT-2D, of the F-35 weapons system.
  - The contractor conducted initial structural loads testing on the STOVL test aircraft with loads up to 150 percent of the design load limit. The test team completed 92 percent of the test points approximately two months ahead of schedule. The test yielded production design changes to doors and a blade seal. STOVL flight test envelope expansion now progresses beginning with 64 percent allowable limit envelope (unmonitored), towards the mid-2011 goal

to release 80 percent of the allowable limit envelope (unmonitored). The test team placed the CTOL static test article in the test facility in the United Kingdom at the end of the fiscal year. The CV static test article had not entered static testing by the end of the fiscal year but was on track to begin in FY10.

- Activity Affecting Test Strategy and Resourcing
  - In August 2009, the JPO began the process of evaluating the impact of late delivery of the SDD flight test aircraft on completion of SDD and determining the capability that can be verified in the early production aircraft. Numerous concepts for recovering schedule were under consideration, ranging from content deferral to assuming a six-day work week for the test force through the remainder of SDD flight test.
  - The JOTT and JPO continued to refine plans for partner involvement in F-35 OT&E. Partner representatives received the program proposal on the OT&E Informed Participant process, which concludes planning for partner involvement in operational testing.
  - The contractor and Program Office continued to develop verification plans and flight test plans for the completion of SDD. The contractor re-organized senior test management to place verification activities within the purview of the Integrated Test Force.
  - The contractor continued to refine the Air System Capabilities Matrix and Capabilities Cross Reference Matrix, which are intended to present the goals for producing and increasing functionality, envelope, weapons loads, and autonomic logistics support to each LRIP lot of aircraft and support systems delivered to the Services.
  - The contractor continued product development of the Verification Simulation (VSIM) – a man-in-the-loop simulation for verification of mission effectiveness in a virtual operational environment. The JOTT identified the VSIM shortfalls that must be addressed in order for the simulation to be adequate for JSF OT&E.
  - Revision Three of the JSF Test and Evaluation Master Plan (TEMP) was completed and submitted for Service coordination. This revision of the TEMP is a significant improvement over prior versions and adequately describes content, measures, and resources for OT&E. The TEMP was approved December 11, 2009.
- Live Fire Test and Evaluation
  - The pilot-in-the-loop simulator test series of the F-35 with damage-induced failures was completed in FY09. The results from these tests provide the basis for predictions of results from full-up system-level tests using the AA-1 test article to be conducted in FY10.
  - A Live Fire ballistic test series to evaluate the potential for ballistically-induced electrical arcing to initiate fuel fires was completed and the report delivered by the end of 2QFY09 to DOT&E.

Assessment

- Concurrency of production, development, and testing increased in FY09 as verification and flight test did not attain the planned pace due to the failure to deliver SDD test aircraft. Only 16 test flights of 168 planned in FY09 and the 5,000 needed to complete SDD were accomplished and only 12 of over 3,000 SDD success criteria were verified. Flight test results, not modeling and simulation, pace the resolution of two issues: 1) when SDD will complete; 2) what capability the contractor will deliver to using commands/agencies, in the meantime.
  - This was a concurrent program with significant risk at the beginning of the FY09, during which development fell further behind and flight test did not start in earnest. Even assuming all the success that management plans to encounter in the remaining 5,000 flight test sorties, SDD flight test ends at least a year later than previously budgeted in late 2013.
  - In the last year, schedule pressure became manifest in software deliveries and flight testing. Program plans extended the end of flight test for blocks 0.5, 1, 2, and 3 each by 12 months. Missions Systems flight testing in F-35 aircraft does not begin until BF-4 ferries to Patuxent River, which experienced a delay from June 2009 to May 2010.
  - The Services and the JOTT must re-evaluate plans for IOT&E and Initial Operational Capability to account for the extension to SDD. The program must replace any aircraft originally intended for OT&E in a manner consistent with approved IOT&E plans and ensure IOT&E entrance criteria are met before the test readiness date.
  - Future extensions of SDD to complete Block 3 capability are likely if: 1) verification or test resources are cut; 2) shortcuts are taken in accreditation of labs and models intended as test venues; 3) the test team is not able to assimilate and respond to flight test data at the planned pace; 4) discoveries during flight test require pauses and modifications to aircraft that overcome schedule margins; 5) flight test events previously eliminated by the mid-course risk reduction turn out to be necessary to complete development.
- Though pace of flight test determines substantive progress towards completing SDD, the overall verification strategy still relies heavily on labs and models attaining accreditation as test venues.
  - The bulk of the VV&A effort is yet to be accomplished. Thus far, two of 35 accreditation support packages have been approved by the Program Office. Four more are in the draft/review process and 10 are needed to complete Block 1 testing in the next year.
  - However, data from F-35 hardware and software-in-the-loop ground tests and flight tests are needed to correctly implement the VV&A process. Accreditation of the labs and models needs to be event driven, subject to

disciplined oversight by the government and independent review. The program needs to protect against the tendency to use models before they are ready. The impact of not doing so will be to create more risk of discovery of deficiencies during flight test, which the reliance on models was intended to avoid.

- The mission capability of the LRIP systems is unclear. This creates an operational test planning problem for the JOTT and an IOC planning problem for the Services.
  - The process to accurately predict and verify the interim capabilities fielded with each LRIP lot is not yet complete and coherent. Expectations of capabilities provided in the early lots of LRIP aircraft need to be adjusted to the realities of what can be developed and verified before delivery.
  - The program's Air System Capability Matrix and the Capability Cross Reference Matrix focus on functionality, not levels of performance. The matrices lack necessary detail for Services and operational test agencies to determine precisely what mission capability will be delivered when the aircraft and support systems are procured and delivered.
  - Additionally, the Services and operational test agencies need to better understand when and how performance of LRIP deliveries is verified and reported. Given the developing lag in verification and test execution, closing on the capabilities planned for the first three (of eight) LRIP lots by the planned delivery dates is high risk. Lot 4 negotiations begin in early FY10. Beginning with LRIP 2, through LRIP 8, the program needs to provide to the Services and operational test agencies the intended schedule and content of verification (test venues, criteria, standards for evidence) of each contracted LRIP lot in flight sciences, missions systems, weapons integration, and autonomic logistics.
  - Because operational test assets intended for IOT&E are delivered in LRIP 3, 4, and 5, the Services and operational test agencies need to monitor the production-representative quality of these LRIP aircraft and support systems. Given the concurrency of development, production, and test, shortfalls in capability must be recognized early to ensure resources are available to modify these aircraft and support systems so they are production-representative and ready for a successful IOT&E.
- Flight sciences flight testing continues to warrant close monitoring to determine if the assumptions of the mid-course risk reduction test deletions 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 will be required and a ripple effect in SDD schedules will be further lengthened.
- Current resource plans reduce engineering staff and test personnel too rapidly in the FY10 through FY13 timeframe. Additional resource concerns include: 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 man-in-the-loop full mission model that is also adequate for OT&E, autonomic logistics verification, and network resources for sharing data and integrating plans and activity of multiple test centers/agencies.
- The JOTT OT-2D operational assessment determined that the program is on track to achieve operational effectiveness requirements but not operational suitability requirements. The JOTT concluded that current shortfalls, if not addressed in a timely manner, will prevent the system from providing the required mission capability. The report acknowledged progress in several areas identified in the previous operational assessment. While the F-35 program has progressed in air vehicle, sensors, and support systems development, the report identified several items as continuing to pose substantial operational impact to F-35 mission capability:
  - 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.
  - Identified information assurance deficiencies have the potential to impact combat operations.
  - Low observable repair process requirements may exceed realistic operational environments.
  - F-35C predicted take-off speeds continue to increase and now exceed tire limits in hot and high density altitude environments.
  - Encryption and decryption timelines impact efficient operations and transfer of intelligence data.
- Block 2 OT&E and Block 3 IOT&E will not be adequate without a verification simulation (VSIM) capability that meets the minimum standards described by the JOTT. The shortfalls identified by the JOTT in the VSIM capability planned by the contractor for verification activities must be addressed in order for the simulation to be adequate for JSF OT&E.
- Ballistically-induced electrical arcing test results showed that, in some instances, circuit protection devices are not effective in preventing electrical arc induced fires initiated from threat induced fuel spillage.
- Pilot-in-the-loop flight simulations with control system damage-induced failures identified failure modes that could result in loss of aircraft and loss of pilot. The results of these tests will be validated with the full-up system-level tests using the AA-1 test article to be conducted in FY10.

Recommendations

- Status of Previous Recommendations. The JPO and Services have made satisfactory progress on 11 of 19 recommendations from FY06, FY07, and FY08. The remaining previous recommendations, which primarily addressed test resources and integration, are valid and merit immediate attention.

- FY09 Recommendations. The program should:
  1. Focus production and test team activities on the earliest possible delivery of SDD flight test aircraft to the test centers and assure these assets arrive ready to begin productive flight test.
  2. Assure adequate resources and plans to increase the pace of flight sciences testing through the completion of SDD in FY15. This includes manpower to increase the flight test sortie rate, analyze data, and direct the integration of all flight sciences test venues.
  3. Through an Operational Test Review Team, establish a schedule using realistic plans for the completion of SDD and IOT&E of Block 3 systems that incorporates the time and flight test aircraft needed to complete SDD. Assure that the JOTT receives aircraft, ground systems, and training consistent with approved TEMP and IOT&E plans. Plan the start of IOT&E based on the entrance criteria in the approved TEMP. Move Milestone C accordingly.
  4. Stabilize the production and deliveries of systems needed for OT&E and initial training for all three variants and assure any OT&E aircraft transferred to SDD flight test are backfilled in a manner consistent with OT&E plans. Assure the JOTT is involved in configuration decisions for these lots. Realize that reducing either developmental or operational test aircraft will increase, not reduce, risk. Link production decisions to performance demonstrated in flight test.
  5. Directly engage the Services, operational test agencies, and DOT&E when LRIP capability content negotiations begin in order to assure a transparent process. Improve the process by focusing LRIP documentation on performance needed to provide the mission capability desired for that lot. Provide the information needed to understand when and how the capabilities of each LRIP lot are verified. Assure resources are available to bring OT&E aircraft and support systems to final, production representative Block 3 configuration before the intended start of IOT&E.
  6. Establish that VV&A of labs and models as test venues will be event-driven, subject to disciplined oversight by the government and independent review. Assure labs and models are not used to close verification success criteria unless formally approved for that use.
  7. Improve the VSIM so that it meets all requirements for adequate verification and operational testing, as described by the JOTT.
  8. 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 – Joint (GCSS-J)

Executive Summary

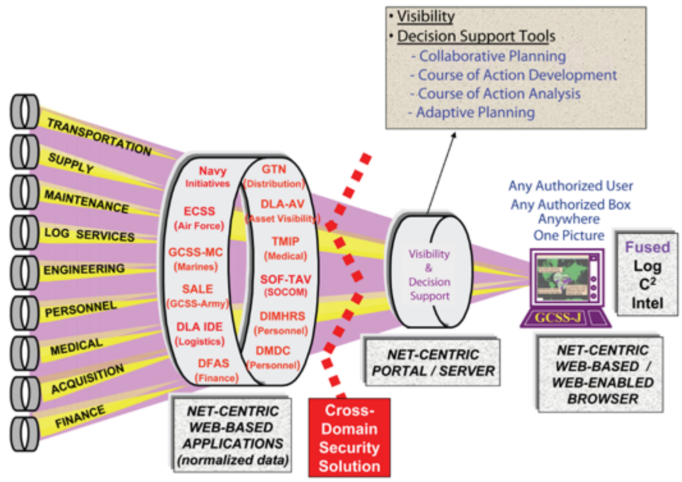
- The Defense Information Systems Agency (DISA) formally changed this program name from Global Combat Support System Combatant Command/Joint Task Force (GCSS-CC/JTF) to GCSS-Joint (GCSS-J) on March 6, 2009.
- The Joint Interoperability Test Command (JITC) conducted an operational test of Global Combat Support System-Joint (GCSS-J) version 7.0.1 Secure Internet Protocol Network (SIPRNet) May 8-21, 2009.
- The DISA Acquisition Review Board approved fielding of the GCSS-J version 7.0.1 SIPRNet on June 19, 2009, based upon a favorable DOT&E assessment.
- JITC evaluated GCSS-J v7.0.1.2 Unclassified But Sensitive Internet Protocol Router Network (NIPRNet) in accordance with the DOT&E-approved test plan and found the system to be operationally effective and suitable in a report dated July 13, 2009. DOT&E concurs with the JITC assessment.
- The DISA Acquisition Review Board approved the fielding of the GCSS-J v7.0.1.2 NIPRNet on July 16, 2009.

System

- The GCSS-J 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, distribution, and maintenance operations. It is comprised of strategic servers located in Montgomery, Alabama, and Pearl Harbor, Hawaii; a commercial off-the-shelf-based infrastructure; and Public Key Infrastructure.
- GCSS-J supports the situational awareness of the joint warfighter by providing 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-J to move and sustain joint forces throughout the entire spectrum of military operations.



C^2 - Command and Control
DFAS - Defense Finance and Accounting Service
DIMHRS - Defense Integrated Military Human Resources System
DLA-AV - Defense Logistics Agency - Asset Visibility
DLA-IDE - Defense Logistics Agency - Integrated Data Environment
DMDC - Defense Manpower Data Center
ECSS - Expeditionary Combat Support System
GCSS-Army - Global Combat Support System-Army
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
SALE - Single Army Logistics Enterprise
SIPRNET - Secret Internet Protocol Routed Network
SOCOM - Special Operations Command
SOF-TAV - Special Operations Forces - Total Asset Visibility
TMIP - Theater Medical Information Program

- Combatant Command and Joint Task Force commanders and logistics staffs use the GCSS-J to gain end-to-end visibility of combat support capability up through the strategic level, facilitating information flow across and between combat support and command and control functions.

Prime Contractor

- Northrop Grumman Mission Systems, Herndon, Virginia

Activity

- JITC conducted an operational test of GCSS-J version 7.0.1 SIPRNet May 8-21, 2009. JITC implemented a new test approach based on the Capability Test Methodology, and revised Critical Operational Issues and Criteria.
- The DISA Acquisition Review Board approved fielding of the GCSS-J version 7.0.1 SIPRNet on June 19, 2009, based upon a favorable DOT&E recommendation.

- The JITC risk assessment for the GCSS-J v7.0.1.2 NIPRNet recommended a Level 1 test (developmental testing followed by Operational Test Agency observation) in accordance with the DOT&E Guidelines for Conducting Operational Test and Evaluation for Software-Intensive System Increments. DOT&E agreed with the risk assessment.
- JITC evaluated GCSS-J v7.0.1.2 NIPRNet in accordance with the DOT&E-approved test plan and reported the system to be operationally effective and suitable on July 13, 2009.
- The DISA Acquisition Review Board approved the fielding of the GCSS-J v7.0.1.2 NIPRNet on July 16, 2009.
- DOT&E approved the Test Concept Brief from JITC for GCSS-J v7.1.0 on August 27, 2009. The v7.1.0 operational test occurred October - November 2009.

Assessment

- JITC conducted GCSS-J version 7.0.1 SIPRNet operational testing in accordance with the DOT&E-approved test plan with the exception that one of the functional modules (Joint Engineering Planning and Execution System) did not have a sufficient number of users to achieve statistical confidence.
  - The revised Capability Test Methodology, which focused on mission task accomplishment, was very effective in connecting the test results to operational impact.
- DOT&E concurs with the JITC assessment that GCSS-J v7.0.1 SIPRNet is operationally effective, operationally suitable, and survivable. DOT&E further agrees with the following JITC findings:
  - The system is effective, but users expressed desire for quicker processing of database queries.
  - The helpdesk function improved significantly; however, a continued emphasis on user support is necessary for the successful fielding of future increments.
  - Although the information assurance test was sufficient to determine that GCSS-J v7.0.1 SIPRNet does not pose additional risk to the system, it did not provide a comprehensive view of the information assurance posture of the host computing centers.
- JITC evaluated the GCSS-J v7.0.1.2 NIPRNet to be operationally effective, suitable, and survivable. DOT&E concurred with the JITC assessment.
- The support of the Director for Logistics, DJ-4, was essential in directing sufficient user community participation for adequate assessment of operational effectiveness and suitability.

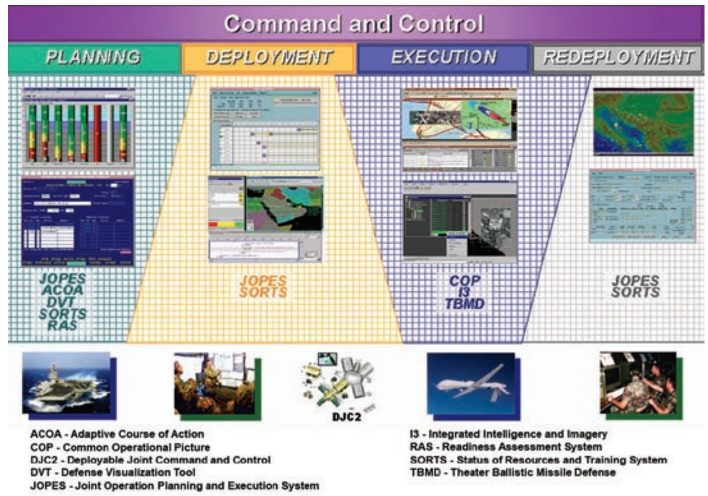
Recommendations

- Status of Previous Recommendations. DISA has taken appropriate action on the previous recommendations.
- FY09 Recommendation.
  1. The Program Office should continue the effort to improve timeliness of processing database queries.

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

Executive Summary
- The Joint Interoperability Test Command (JITC) conducted OT&E on the Global Command and Control System – Joint (GCCS-J) Global Release v4.2, the GCCS-J Joint Operational Planning and Execution System (JOPES) v4.2, and the GCCS-J Status of Resources and Training System (SORTS) v4.2 in FY09.
- Testing was adequate and in accordance with DOT&E-approved test plans.
- Testing identified deficiencies with each system. However, subsequent regression testing confirmed that corrective actions enabled adequate system operation.
- DOT&E determined that all three systems were operationally effective, suitable, and survivable.
- The Assistant Secretary of Defense (Networks and Information Integration) approved a Full Deployment Decision for the GCCS-J program in August 2009.

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 v4.2 Global Release (Force Protection, Situational Awareness, Intelligence applications)
  - JOPES v4.2 (Force Employment, Projection, Planning and Deployment/Redeployment applications)
  - SORTS v4.2 (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 (Defense Information Systems Agency (DISA))

Activity
- Operational testing of GCCS-J Global Release 4.2, JOPES 4.2, and SORTS 4.2 conformed to the DOT&E-approved test plan and was adequate.
- The JITC conducted operational testing of GCCS-J Global Release v4.2 in February 2009 at U.S. Africa Command, U.S. Pacific Command, and U.S. Special Operations Command. Testing focused primarily on the situational awareness, intelligence mission, force protection, mission performance, and mission support areas.
- In March 2009, the JITC conducted a GCCS-J Global Release v4.2 regression test at U.S. Central Command Headquarters.
- The JITC conducted operational testing of GCCS-J JOPES v4.2 and GCCS-J SORTS v4.2 in June 2009 at U.S Africa Command, U.S. Central Command, U.S. Joint Forces Command, U.S. Pacific Command, U.S. Special Operations Command, U.S. Southern Command, U.S. Transportation Command, U.S. Army Forces Command, Air Force Space

Command, U.S. Fleet Forces Command, the Joint Staff, J39, and the Joint Staff Support Center in the Pentagon.
- The JITC conducted the GCCS-J JOPES v4.2 regression test at multiple locations in July 2009.
- The JITC conducted the GCCS-J SORTS v4.2 regression test at multiple locations in July and August 2009.
- The Assistant Secretary of Defense (Networks and Information Integration) approved a Full Deployment Fielding Decision for the GCCS-J program in August 2009.

Assessment
- Operational testing of GCCS-J Global Release 4.2 identified deficiencies pertaining to system scalability, administration, documentation, and training. A regression test validated that the corrective actions were adequate. DOT&E determined GCCS-J Global Release v4.2 was operationally effective, suitable, and survivable.
- Operational testing of GCCS-J JOPES 4.2 identified deficiencies impacting JOPES ability to effectively interface with select systems. Regression testing confirmed that the corrective actions enabled JOPES to interface with required systems. DOT&E determined GCCS-J JOPES 4.2 was operationally effective, suitable, and survivable.
- Operational testing of GCCS-J SORTS v4.2 identified problems pertaining to SORTS users' ability to perform sourcing functions, launch applications, and perform queries in a timely manner; to properly exchange data with Army and Navy systems; and to synchronize data with JOPES. There were problems with data accuracy and completeness with Army and Navy feeder systems. The test identified problems with readiness reporting policies that impact Service reporting accuracy and timely feedback. A regression test in July and a second test in August 2009 validated corrective actions of all major deficiencies. Based upon the OT&E and two subsequent regression tests, DOT&E determined GCCS-J SORTS v4.2 is operationally effective, suitable, and survivable.

Recommendations
- Status of Previous Recommendations. The GCCS-J Program Management Office has made only modest progress on DOT&E's FY08 recommendation pertaining to improving the effectiveness of developmental testing. Effective developmental testing remains a challenge.
- FY09 Recommendation.
  1. The Director for Operations, The Joint Staff, J3, should review readiness reporting policies in coordination with the Commander, U.S. Joint Forces Command, to improve Service readiness reporting accuracy and timely feedback.

Joint Biological Agent Identification and Diagnostic System (JBAIDS)

Executive Summary

- The Service Operational Test Agencies (OTAs) conducted a follow-on test on the Joint Biological Agent Identification and Diagnostic System (JBAIDS) December 1-17, 2008.
- JBAIDS used in conjunction with the Platinum Path Extraction sample preparation kit improves the operational effectiveness of the currently fielded system. The Platinum Path Extraction Kit provides increased sensitivity, reduced sample processing time, and reduced risk of cross contamination.
- System modifications post full-rate production improved the reliability and suitability of the JBAIDS system. The Platinum Path Extraction Kit has a reduced logistics footprint and reduces the need for support equipment over the currently fielded set of extraction kits.

System

- JBAIDS is to provide biological agent identification and diagnostic capability for fixed-site, mobile (shelter, man portable, and trailer), and shipboard applications.
- The Services intend the JBAIDS to be a reusable, portable, biological agent identification and diagnostic system capable of identifying multiple biological warfare agents (BWAs) simultaneously.
- JBAIDS is designed to provide enhanced capabilities to the warfighter to identify conventional infectious organisms that occur naturally in the environment and in BWAs.
- JBAIDS is intended to satisfy a need to rapidly identify these BWAs in environmental samples and in clinical samples after Food and Drug Administration certification.
- JBAIDS consists of an analytical device, sample preparation kits, reagent kits, laptop computer, and other support equipment.
- JBAIDS is intended to be employed in units such as:
  - Army Area Medical Laboratories
  - Army Combat Support Hospitals
  - Army Veterinary Food Service Analysis Laboratories

1 - Polymerase Chain Reaction (PCR) Thermal Cycler
2 - Notebook Computer

  - Navy Environmental Preventive Medical Units, and aboard aircraft carriers, amphibious assault ships, and amphibious command ships
  - Marine Logistics Groups and Chemical/Biological Incident Response Force
  - Air Force Forward-Deployed or Forward-Positioned Medical Biological Augmentation Teams
  - Air Force Homeland Defense Laboratories

Mission

- Units equipped with JBAIDS identify biological agents to support a commander's force protection decisions by providing timely information for determining appropriate treatment, preventive measures, prophylaxis, and operational decisions.
- Units with JBAIDS will be tasked to provide rapid confirmatory identification of specific BWAs detected or identified by other biological detection systems employed in operational environments.

Prime Contractor

- Idaho Technology Inc., Salt Lake City, Utah

Activity

- The Service OTAs conducted a follow-on test on the JBAIDS using the Platinum Path Extraction Kit to prepare samples for analysis December 1-17, 2008, in accordance with the test plan DOT&E approved on November 26, 2008.
- DOT&E approved an update to the JBAIDS Test and Evaluation Master Plan on January 8, 2009.
- The Army Test and Evaluation Command published the OTA Follow-on Evaluation Report for the JBAIDS Platinum Path Extraction Kit Pre-Planned Product Improvement in April 2009.
- The Chemical Biological Medical System, in collaboration with the Centers Disease Control (CDC), the Food and Drug Administration (FDA), and DoD's Global Emerging Infectious Surveillance and Response System, submitted to the FDA a DoD Emergency Use Authorization to include the H1N1 (swine flu) assays on JBAIDS to leverage the use of PCR

systems worldwide. The Assistant Secretary of Defense/Chemical, Biological, Radiological, and Nuclear approved funds to integrate the CDC H1N1 assays on the JBAIDS to assist in the national emergency effort.
- The program manager is considering an assay panel expansion to address deficiencies identified in operational use.

Assessment

- JBAIDS, used in conjunction with the Platinum Path Extraction Kit, improves the operational effectiveness of the currently fielded system. The Platinum Path Extraction Kit provides increased sensitivity, reduced sample processing time, and reduced risk of cross contamination.
- System modifications post full-rate production improved the reliability and suitability of the JBAIDS system. The Platinum Path Extraction Kit has a reduced logistics footprint and reduces the need for support equipment over the currently fielded set of extraction kits.

Recommendations

- Status of Previous Recommendations. The DOT&E recommendation to refine the algorithm that translates the measured crossing threshold data into estimates of concentration from FY07 remains open. The remaining recommendations have been addressed.
- FY09 Recommendations. None

Joint Biological Point Detection System (JBPDS)

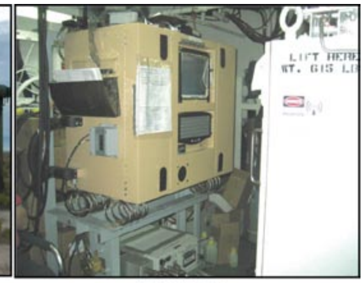
Executive Summary

- The Joint Biological Point Detection System (JBPDS) is operationally effective to support decisions to initiate medical treatment for certain biological warfare agent attacks when used in accordance with the Army and Navy concept of operations. The operational capability is limited by the performance of the JBPDS detector and identifier.
- The JBPDS is suitable for shipboard employment. The Army JBPDS Shelter variant is not suitable due to poor reliability. The JBPDS is not operationally effective or suitable when employed in accordance with the Air Force concept of operations.
- The Milestone Decision Authority approved JBPDS Full-Rate Production, Type Classification, and Full Material Release in October 2009.

System

- JBPDS provides detect-to-treat biological agent point detection, identification, and sampling capability.
- 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 agents.
- 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.
- The Services require the trigger to detect presence of a biological aerosol and to identify the biological warfare agent in less than 15 minutes.

Shelter



Shipboard

- The Navy will employ the JBPDS aboard ship.
- The Army employs JBPDS mounted in a High Mobility Multi-purpose Wheeled Vehicle or integrated into the Stryker Nuclear, Biological, and Chemical Reconnaissance Vehicle.
- The Air Force planned to employ the JBPDS at fixed site locations.

Mission

Units equipped with the JBPDS provide early warning and identification of up to 10 aerosolized biological warfare agents.

Prime Contractor

- General Dynamics Armament and Technical Products Division, Charlotte, North Carolina

Activity

- The Army Test and Evaluation Command assumed responsibility as the lead Operational Test Agency from the Air Force in January 2009 and completed an operational assessment in February 2009.
- The Joint Program Executive Office for Chemical and Biological Defense conducted an open competition for the JBPDS full-rate production contract and plans to award a contract in FY10. If the full-rate production configuration is different from that of the system that underwent previous IOT&E, additional OT&E is required to confirm operational effectiveness and suitability.
- DOT&E completed its operational evaluation and published its Beyond Low-Rate Initial Production (BLRIP) Report on JBPDS in June 2009.
- The Air Force withdrew from the JBPDS program in August 2009 based upon a review of the Service concept of operations for biological defense, existing point detection capabilities, and JBPDS performance. This resulted in the elimination of the requirement for the man-portable and trailer JBPDS variants.
- The Milestone Decision Authority approved JBPDS Full-Rate Production, Type Classification, and Full Material Release in October 2009.
- The program manager plans to complete the required Whole System Live Agent Testing in 2010 to demonstrate JBPDS performance against the remaining biological warfare agents.

Assessment

- JBPDS is operationally effective to support decisions to initiate medical treatment for certain biological warfare agent attacks when used in accordance with the Army and Navy

concept of operations. The operational capability is limited by the sensitivity of the JBPDS detector and identifier.
- The JBPDS is not operationally effective or suitable when employed in accordance with the Air Force concept of operations.
- The JBPDS is suitable for shipboard employment. The Army JBPDS Shelter variant is not suitable due to poor reliability.

Recommendations

- Status of Previous Recommendations. The program addressed the previous recommendations.
- FY09 Recommendations.
  1. The program manager should increase the detection and identification sensitivity of the JBPDS.
  2. The Army and Navy combat developers should revise the concept of operations and tactics, techniques, and procedures to account for the capabilities and limitations of the JBPDS.
  3. The program manager should improve JBPDS reliability.
  4. The Service Combat Developers should plan for routine end-to-end operator and command mission-level training.
  5. The material developer should work with the Navy to collect reliability data on the first installed shipboard system to assess the impact on reliability of changes to the JBPDS configuration since the shipboard operational test.

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

Executive Summary

- DOT&E approved the Joint Tactical Radio System (JTRS) Ground Mobile Radio (GMR) Test and Evaluation Master Plan (TEMP) on December 12, 2008.
- The JTRS GMR continues to support external test activities including the 30-Node Wideband Networking Waveform (WNW) Demonstration and the Early Infantry Brigade Combat Team (E-IBCT) Limited User Test (LUT).
- The initial assessment of the 30-Node WNW Demonstration indicates that the pre-production WNW hosted on a JTRS pre-EDM GMR could grow (scale) to a network of 30 nodes, yet performed poorly in the areas of throughput and message completion rate.
- The E-IBCT LUT provided JTRS GMR assessment insights in its role as a component of the Network Integration Kit (NIK). The LUT assessment indicates operational reliability issues and poor performance from the JTRS GMR subsystem.
- The JTRS GMR program experienced a 5-month schedule slip in schedule due to late delivery of hardware.
- The JTRS GMR has delayed contractor developmental testing of Engineering Development Model (EDM) radio sets from 1QFY10 to 2QFY10.

System

- JTRS is a family of software-programmable and hardware configurable digital radios designed to provide increased interoperability, flexibility, and adaptability to support numerous 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 installation in Army, Marine Corps, and Air Force ground vehicles.

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

- The Boeing Company, Integrated Defense Systems, Huntington Beach, California

Activity

- DOT&E approved the JTRS GMR TEMP in December 2008 to cover testing activities through the Milestone C decision in FY11.
- JTRS GMR plans to conduct contractor developmental tests that will culminate with the government System Integration Test and LUT, both in FY10, to support the program's Milestone C decision in FY11.
- JTRS GMR reported that late delivery of hardware contributed to a 5-month delay in their testing schedule.
- JTRS GMR rescheduled all three contractor developmental tests scheduled to start in 1QFY10 to 2QFY10.
- JTRS Network Enterprise Domain (NED) used pre-EDM radios to support the 30-Node Demonstration of the WNW in May - June 2009.
- The Army's Infantry Brigade Combat Team program used eight pre-EDM and three EDM GMR radios as components of the NIK to support the E-IBCT LUT in August 2009.

Assessment

- The current JTRS GMR program schedule delay is due to hardware deliveries. Delays in the availability of mature versions of the waveforms and the networking enterprise services from the JTRS NED may further delay the JTRS GMR schedule.
- The JTRS GMR testing schedule leading to the Milestone C decision remains high risk.

- The JTRS program is refining roles and responsibilities between the GMR product line and the NED product line to assure full testing of an integrated GMR product.
- The JTRS GMR program supported the 30-Node WNW Demonstration with pre-EDM GMR radios which enabled the growing ("scaling") of a WNW network to include 30 nodes. The initial assessment of this event indicates the pre-EDM GMR with pre-production WNW scaled to a minimal 30 node network (WNW objective is 250 nodes), yet demonstrated poor performance in the areas of throughput and message completion rate.
- The E-IBCT LUT demonstrated pre-EDM GMR radios as a component of NIKs to connect sensor fields, unmanned aerial systems, and small unit ground vehicles with a battalion representative test network. EDM GMR performed a limited role of transferring situational awareness information and voice communications. Twenty-three percent of the NIK failures (15 out of 64) can be attributed to the JTRS GMR subsystem, which contributed to the NIK not meeting its operational reliability requirement. Soldiers viewed the JTRS GMR (within the NIK) as complicated to operate and lengthy in start-up time compared to their current radios.
- The JTRS GMR full-rate production (FRP) decision (November 2012) and Multi-Service Operational Test and Evaluation (September - October 2012) occur after the E-IBCT FRP decision (December 2011). The JTRS GMR schedule does not support the procurement and fielding decisions for the E-IBCT.

Recommendations

- Status of Previous Recommendations. The GMR program is addressing all previous recommendations.
- FY09 Recommendations.
  1. The JTRS GMR program should begin revision of the JTRS TEMP to extend testing activities through the FRP decision in FY13.
  2. The JTRS GMR program in conjunction with JTRS NED should correct deficiencies noted in the 30 Node WNW Demonstration and the E-IBCT LUT in preparation for the program's FY10 LUT.
  3. The JTRS Joint Program Executive Office should synchronize its activities to create an integrated approach between JTRS GMR, JTRS WNW, and the E-IBCT programs.

Joint Tactical Radio System: Handheld, Manpack, and Small Form Fit

Executive Summary
- The Army completed the Rifleman Radio Limited User Test (LUT) in April 2009.
- DOT&E assessed the Rifleman Radio's performance during the LUT as supportive of mission preparation, movement, and reconnaissance. The Rifleman Radio did not demonstrate usefulness during squad combat engagements and exhibited deficiencies in operational reliability, transmission range, battery life, and concept of operations.
- The Joint Tactical Radio System (JTRS) Handheld, Manpack, and Small Form Fit (HMS) Overarching Integrated Product Team (OIPT) decided to postpone the program's Milestone C. The OIPT took this action to allow the program time to resolve program issues and prepare a strategy to address poor reliability and performance problems demonstrated during the Rifleman Radio LUT.

System
- JTRS is a family of software-programmable and hardware configurable digital radios designed to provide increased interoperability, flexibility, and adaptability to support numerous 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 Small Form Fit (SFF) radio configurations, which produce the stand-alone 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 National Security Agency (NSA) Type 2 encryption of unclassified information. Phase 2 will produce manpack radios requiring NSA Type 1 encryption of classified information.

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, C4 Systems, Scottsdale, Arizona

Activity
- The Army conducted the Rifleman Radio LUT at Fort Bliss, Texas, in April 2009 to support the program's Milestone C decision scheduled for November 2009. The LUT assessed the operational use of the Rifleman Radio under numerous mission scenarios executed by an Infantry platoon within the Army Evaluation Task Force.

- The JTRS HMS OIPT met on October 20, 2009, and decided to postpone the program's Milestone C. The OIPT took this action to allow the program time to resolve unit cost issues, a commercial GPS waiver, and prepare a strategy to address reliability and performance issues demonstrated during the Rifleman Radio LUT.

Assessment

- DOT&E assessed the performance of the Rifleman Radio during its LUT as useful during mission preparation, movement, and reconnaissance activities. During combat engagements, the radio demonstrated poor performance and squad employment of the radio. The following LUT deficiencies require improvement to succeed during IOT&E, scheduled for 4QFY10:
  - Operational reliability was less than half of the radio's intermediate requirement of 840 hours.
  - Transmission range fell well short of the radio's requirement of 2,000 meters, demonstrating connectivity to 1,000 meters.
  - Batteries proved to have a short lifespan and generated excessive heat.
  - Concept of operations for employing the radio proved vague and at times, hindered operations.
- The JTRS HMS program needs to continue development on Position Location Information, Information Assurance, Electronic Warfare, and Nuclear, Biological, and Chemical operations, which were not assessed during the LUT.
- The JTRS program is refining roles and responsibilities between the Ground Mobile Radio product line and the JTRS Network Enterprise Domain product line to ensure full testing of an integrated HMS product.

Recommendations

- Status of Previous Recommendations. The HMS program is addressing all previous recommendations.
- FY09 Recommendation.
  1. JTRS HMS should develop a strategy to address poor reliability, poor performance, and an immature intra-platoon concept of operations demonstrated during the Rifleman Radio LUT. These improvements are critical for success during the scheduled FY10 IOT&E.

Mine Resistant Ambush Protected All Terrain Vehicle (MRAP-ATV)

Executive Summary

- The Mine Resistant Ambush Protected (MRAP) Vehicle program intends to procure 6,644 MRAP-All Terrain Vehicles (M-ATV) to support Operation Enduring Freedom (OEF).
- The scheduled delivery of M-ATV variants to the First Unit Equipped is October 2009. Prior to fielding the first quantities of MRAPs, the M-ATV Test and Evaluation will provide limited information concerning safety, survivability, automotive performance, and reliability.
- Prior to fielding, the M-ATV will have accumulated 2,000 reliability miles during developmental testing.
- The M-ATV developmental testing will accumulate an additional 24,000 miles of operations over terrain analogous to OEF.
- The M-ATV IOT&E is planned for December 2009.
- M-ATV Live Fire testing and vulnerability analysis is ongoing.

System

- The M-ATV is the smallest of the MRAP family of vehicles. The M-ATV is designed to have mobility similar to the High Mobility Multi-purpose Wheeled Vehicle (HMMWV) with the current MRAP level of protection. The vehicle will support combat and stability operations in highly restricted rural, mountainous, and urban terrain with off-road movement conducted 50 percent of the time.
- The M-ATV vehicle is designed to transport five persons with a 25,000-pound curb weight, a width of 96 inches, and a turning diameter of 54 feet curb to curb.
- The M-ATV is designed to improve vehicle and crew survivability over the up-armored HMMWV. M-ATV has the capability to add protection against attacks by Explosively Formed Penetrators (EFP) and Rocket-Propelled Grenades (RPG) to support mounted patrols, reconnaissance, security, and convoy protection.
- M-ATV incorporates current Service command and control and counter-IED systems. M-ATV includes gun mounts with gunner protection kits capable of mounting a variety of weapons systems such as the M240B medium machine gun, the M2 .50 caliber heavy machine gun, and the MK-19 grenade launcher.
- Oshkosh Defense has been awarded a production delivery order for M-ATV.

Mission

- Units equipped with the M-ATV vehicle will conduct mounted patrols, convoy patrols, convoy protection, reconnaissance, and communications as well as command and control missions to support combat and stability operations in highly restricted rural, mountainous, and urban terrain. The M-ATV is reconfigurable to meet mission requirements.
- M-ATV vehicles support multi-Service missions and are fielded to units based upon priorities established by the operational commander.

Prime Contractor

- Oshkosh Defense, Oshkosh, Wisconsin

Activity

- As a result of a Joint Universal Operational Need Statement CC-0326, the Office of the Secretary of Defense requested the Navy procure a new MRAP combat vehicle with the same level of protection of existing MRAP vehicles and incorporating an all-terrain mobility capability, improved vehicle capability at high altitude, and EFP and RPG protection capability to support OEF.
- In June 2009, after source selection testing, the Navy awarded Oshkosh Defense a production delivery order for 2,244 vehicles with approval to provide up to 5,244.
- Due to changes in threat, mission, and other factors, the Joint Requirements Oversight Council approved an adjustment in the M-ATV requirement to 6,644 in September 2009.

- The M-ATV developmental testing is ongoing at Aberdeen Proving Ground, Maryland, and Yuma Proving Ground, Arizona.
- M-ATV High Altitude testing at Flagstaff, Arizona, is scheduled for 2QFY10.
- The M-ATV First Unit Equipped is scheduled for October 2009.
- The M-ATV IOT&E was executed in December 2009 at Yuma Proving Ground, Arizona.
- DOT&E assisted with the development of the M-ATV vulnerability test and evaluation program to support the development of the M-ATV source selection test plan. This involvement assured testing was conducted adequately and allowed maximum use of data collected in subsequent M-ATV vulnerability evaluations.
- M-ATV LFT&E is planned to begin in early FY10.

Assessment

- The M-ATV test and evaluation events will provide limited information concerning safety, survivability, and automotive performance prior to initial fielding of the M-ATV to OEF in October 2009.
- The M-ATV endurance testing is ongoing at Yuma Proving Ground, Arizona. The M-ATV has accumulated 2,000 miles of operations relevant to reliability testing.
- The reliability, availability, and maintainability testing of the M-ATV during development testing will accumulate 24,000 miles of operations analogous to OEF terrain.
- DOT&E will evaluate the effectiveness, suitability, and survivability of the M-ATV based on the M-ATV IOT&E scheduled for December 2009. This evaluation will examine the capability of the M-ATV to provide all terrain mobility while providing the same level of protection to crew as provided by the current MRAP vehicles.
- M-ATV vulnerability analysis is ongoing.

Recommendations

- Status of Previous Recommendations. This is the first annual report for this program.
- FY09 Recommendations.
  1. The MRAP program should implement fixes and upgrades to the M-ATV as a result of operational deficiencies found during the M-ATV IOT&E and address any operational issues of integrating the M-ATV into Army and Marine Corps units.
  2. The Army should conduct the Test and Evaluation Master Plan-required MRAP Family of Vehicle FOT&E and LFT&E to validate M-ATV Engineering Change Proposals and upgrades intended to provide improved operational capabilities and crew protection.

Mine Resistant Ambush Protected (MRAP) Family of Vehicles

FPI Cougar Category I

FPI Cougar Category II

IMG MaxxPro Category I

BAE RG-33L Category II

GDLS RG-31A2 Category I

BAE TVS Caiman Category I

NAVISTAR Ambulance Cat. I

BAE Ambulance Category II

Executive Summary

- DOT&E evaluated the Maxx Pro and RG-33L Mine Resistant Ambush Protected (MRAP) Ambulance variants as operationally effective, suitable, and survivable.
- The DOT&E will evaluate the Cougar Independent Suspension System (ISS) vehicle during the MRAP-All Terrain Vehicle IOT&E in December 2009.
- The MRAP program should continue to ensure that adequate test and evaluation plans are developed, executed, and sufficient resources are allocated to support future upgrades to MRAP vehicles such as armor improvements or other Engineering Change Proposal (ECPs) applied to existing MRAPs.

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 and the MRAP-Ambulance variant. The MRAP Category I (CAT I) vehicle is designed to transport six persons and the MRAP Category II (CAT II) vehicle is designed to transport 10 persons. The MRAP Ambulance variant vehicle is designed to transport up to three litter casualties and from three to six ambulatory casualties. MRAP vehicles incorporate current Service command and control systems and counter-IED systems. MRAP vehicles contain gun mounts with gunner protection kits capable of mounting a variety of weapons systems such as the M240B medium machine gun, 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, Inc. (FPI), General Dynamics Land Systems Canada (GDLS-C), NAVISTAR Defense, 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
  - NAVISTAR Defense MaxxPro CAT I vehicle and Ambulance variant
  - BAE RG-33L CAT II and Ambulance variant
  - GDLS-C RG-31A2 CAT I
  - BAE TVS Caiman CAT I

Mission

- Units equipped with the MRAP CAT I vehicles will 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 vehicles

conduct ground logistics operations including convoy security, troop and cargo transportation, and medical evacuation. The MRAP Ambulance variant supports the conduct of medical treatment and evacuation.
- MRAP vehicles support multi-Service missions and are fielded to units based upon priorities established by the operational commander.

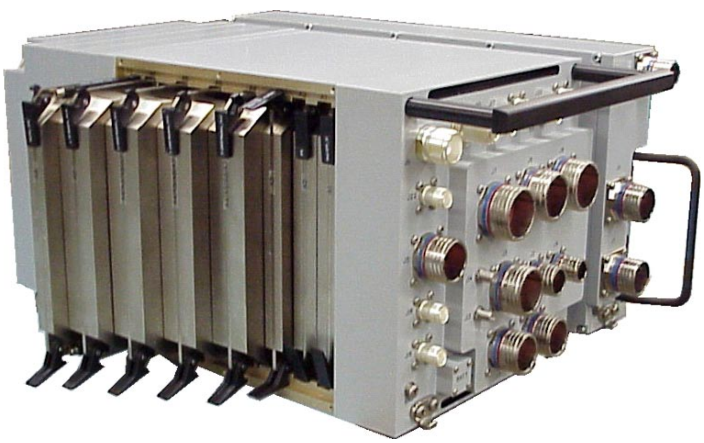
Prime Contractors
- Force Protection Industries, Inc., Ladson, South Carolina
- General Dynamics Land Systems Canada, Ontario, Canada
- NAVISTAR Defense, Warrenville, Illinois
- BAE-TVS, Rockville, Maryland
- BAE Systems, Santa Clara, California

Activity
- The MRAP program has procured the total Service and Special Operations Command (SOCOM) requirement for 21,482 MRAP vehicles. The majority of this procurement has been fielded to operating forces in Iraq and Afghanistan.
- The Army Test and Evaluation Command (ATEC) completed the operational test of two MRAP Ambulance variants, the MaxxPro and RG-33L. Test data and the operational test report were delivered January 2009.
- In June 2009, the Marine Corp Operational Test Activity conducted a Cougar ISS Comparative Evaluation Report to evaluate Marine driver's opinions regarding the mobility of the Cougar CAT I and II with the ISS compared to the Medium Tactical Vehicle Replacement (MTVR) Program and the Baseline Cougar CAT I and II with solid suspension. The evaluation was conducted at two sites: Aberdeen Proving Ground, Maryland, and Twentynine Palms, California.
- As of September 2009, the MRAP program purchased 1,283 ISS kits to integrate on Marine Corps Cougar and SOCOM RG-33 MRAP vehicles as a major ECP to provide improved off-road mobility capability over current MRAP vehicles in Afghanistan.
- The MRAP program initiated a capabilities insertion program in FY09 to acquire, test, and assess enhanced capabilities and solutions to be integrated across MRAP Family of Vehicles. The major capability insertions are: Command, Control, and Communication Suite; Common Remote Weapon Station; and Gunner Protective Kit Overhead Protective Cover. The MRAP Joint Program Officer is managing the capability insertions efforts through ECPs. These capabilities insertions are undergoing developmental, live fire, and operational testing to assess their contribution to MRAP vehicle effectiveness, suitability, and survivability.
- LFT&E vulnerability of block upgrades and engineering changes to MRAP I vehicles continued throughout FY09. This testing focused on EFP armor, fire suppression technologies, and major structural modifications.
- ATEC completed LFT&E of MaxxPro and Caiman MRAP CAT I block upgrades.
- ATEC completed integrated developmental and Live Fire testing of the Cougar CAT I and CAT II ISS vehicles.
- Operational and Live Fire testing of MRAP vehicles was conducted in accordance with the DOT&E-approved Test and Evaluation Master Plan and test plans.

Assessment
- Based upon analyses of the operational tests conducted for the two MRAP Ambulance variants, DOT&E's assessment of the operational effectiveness, suitability, and survivability of these vehicles is the following:
  - MaxxPro MRAP Ambulance is operationally effective and suitable. It is survivable against the requirement threats.
  - RG-33L MRAP Ambulance is operationally effective and suitable. It is survivable against the requirement threats.
  - An ambulance-equipped unit with the MRAP Ambulance variants can accomplish the mission of protected transport of casualties and medical attendant personnel, load and treat wounded troops, and support advanced life-support transfer.
- MCOTEA concluded the demands on the driver and ride quality of the Cougar ISS are similar to the MTVR and is considerably improved over the baseline Cougar vehicles across all road types (primary, secondary, and cross-country). DOT&E will evaluate the effectiveness, suitability, and survivability of the Cougar ISS and MaxxPro Dash after completion of operational testing in December 2009.
- LFT&E demonstrated the effective performance of the passive fire suppression technology added to some MRAP vehicles during the block upgrade/engineering change process.
- Integrated developmental testing and Live Fire testing of the Cougar ISS were successful in supporting the vulnerability reduction design effort including modifications to the suspension and vehicle interior. LFT&E of the final design is planned for FY10.

Recommendations
- Status of Previous Recommendations. The MRAP program continues to address all previous recommendations.
- FY09 Recommendation.
  1. The Services should continue to ensure that adequate test and evaluation plans are developed, executed, and sufficient resources are allocated to support future upgrades to MRAP vehicles such as armor improvements or other ECPs applied to existing MRAPs.

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 still being integrated into host platforms such as the B-1B bomber aircraft. Tests have indicated host platform integration complexities and schedule impacts are often underestimated.
- The MIDS-Joint Tactical Radio System (MIDS-JTRS) is in development and Commander, Operational Test and Evaluation Force (COTF) completed an operational assessment. The Tactical Air Navigation (TACAN) and Link 16 voice and data capability appears improved; however, Link 16 message exchange anomalies remain. Sufficient teating on the final software version to confidently calculate reliability will be required prior to entry into IOT&E.

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)) are intended to allow collaboration despite geographical and organizational boundaries.
- MIDS-JTRS-equipped units should be able to exchange information including air and surface tracks, identification, host platform fuel, weapons, mission status, engagement orders, and engagement results.

Prime Contractors

- ViaSat, Carlsbad, California
- Data Link Solutions, Wayne, New Jersey, and Cedar Rapids, Iowa

Activity

MIDS-LVT (MIDS on Ship)

- COTF completed the operational test of the MIDS-LVT on Ship (MOS) integration for guided missile cruisers and destroyers during 2009 onboard the USS *Stockdale*. COTF issued their Operational Test Report on November 23, 2009.

MIDS-LVT (AC-130 Integration)

- The 18th Flight Test Squadron (an Air Force Special Operations Command) completed the Operational Test Report for the integration of MIDS-LVT into the AC-130U aircraft.
- The 18th Flight Test Squadron conducted the operational test of the MIDS-LVT version 6 into the AC-130H aircraft during 2009 flying from Hurlburt Field AFB, Florida.

MIDS-JTRS

- COTF completed the operational assessment of the MIDS-JTRS during 2009 with ground and flight tests from Naval Air Station (NAS) Patuxent River, Maryland, and NAS China Lake, California.
- All testing was conducted in accordance with DOT&E-approved Test and Evaluation Master Plans and operational test plans.

Assessment

MIDS-LVT (MIDS on Ship)

- DOT&E assessed the integration of MIDS-LVT into Model 5 Aegis-equipped ships as operationally effective and suitable. All performance thresholds were met, and the system demonstrated improved capability over currently fielded systems. The MOS system operated correctly and was stable while operating with up to 26 units in the USS *Nimitz* Carrier Strike Group. The major deficiency observed was the MOS Interference Protection Feature (IPF) generated false misleading indications which affected the reliability of the system. On several occasions during the test, the IPF status box turned red indicating a failure, and at other times the IPF status box remained unlit, indicating no failure. The true operational status of Link 16 operations was not accurately represented by these fault indications. Other IPF faults could not be cleared by the Link 16 console operators and required MOS maintenance personnel to clear the faults at the electronic cabinet assembly.

MIDS-LVT (AC-130 Integration)

- AC-130U Model: DOT&E assessed the integration of MIDS-LVT into the AC-130U as operationally effective, but not operationally suitable. Although operationally effective, one primary deficiency was the reported ground target positional variance between Link 16 and truth data; the AC-130U displayed targets with up to 200 yards positional error while the acceptable range of error is 30 yards. The integration was evaluated as not operationally suitable due to unmet criteria for operational availability, mean time between operational mission failure, and inadequate training and technical documentation.
- AC-130H Model: DOT&E assessed the integration of MIDS-LVT into the AC-130H as operationally effective and suitable. The test successfully demonstrated the interoperability and operational utility of MIDS-LVT Link 16 to support the AC-130 Close Air Support mission. Position accuracy issues identified during AC-130U MIDS-LVT integration testing have been resolved and improved training and technical documentation were provided. The test revealed compatibility problems with other onboard information systems as well as the need to update AC-130 Link 16 tactics, techniques, and procedures. The test attempted but was unable to verify the ability to exchange imagery via Link 16 between the AC-130 and the Air Operations Center. Finally, mean time between operational mission failure was 13 hours. The reliability threshold is 25 hours. This however, represents a point estimate since the insufficient test hours did not provide adequate data to predict reliability with statistical confidence.

MIDS-JTRS

- DOT&E observed the MIDS-JTRS Operational Assessment and assessed that risk to successful completion of IOT&E is low to moderate. The test data indicate that the initial phase of discovery uncovered problems with the MIDS-JTRS Tactical Air Navigation (TACAN) and Link 16 digital voice functions. These problems included primarily TACAN bearing needle deviations and unintelligible Link 16 voice communications. During the course of the operational assessment, the program developed modifications to firmware and software that fixed these two problems. Testing conducted after making these modifications demonstrated that the MIDS-JTRS provided adequate navigation bearing information and understandable voice communications. The Link 16 data link function is fairly mature with some residual message anomalies such as always indicating that the F/A-18E/F is conducting aerial refueling. There were also issues related to automatic cryptographic code rollover and terminal initialization and startup before flight. These, along with the Link 16 message anomalies, require additional test data and analysis to resolve prior to IOT&E. The high tempo of MIDS-JTRS software releases to resolve problems discovered during testing prevented the collection of sufficient data to support reporting of reliability with any statistical confidence. DOT&E expects to collect enough performance and reliability test data during integrated testing and IOT&E to report results with statistical confidence.

Recommendations

- Status of Previous Recommendations. The Navy made satisfactory progress on the previous recommendations.
- FY09 Recommendations.
  1. To preserve some of the anti-jamming broadcast capabilities of Link 16, the Navy should develop and test a solution to support the interface of MIDS terminals with the 1,000 watt High Power Amplifier.
  2. The Navy should investigate and determine the cause of the MOS Interference Protection Feature alerts experienced during operational testing as well as the unexpected terminal reactions to the alerts. The solution should be tested in the guided missile cruiser and destroyer operational environment.
  3. The Air Force Special Operations Command should resolve the AC-130 MIDS-LVT and other information system onboard compatibility deficiencies, and verify that the AC-130 and Air Operations Center are able to exchange imagery via Link 16.

4. The Navy should assure that developmental and operational testing of MIDS-JTRS is completed as planned so that sufficient data are collected to assess system effectiveness and suitability with confidence. Additional MIDS-JTRS testing opportunities should be exploited as available to increase the number of hours of operational system employment.

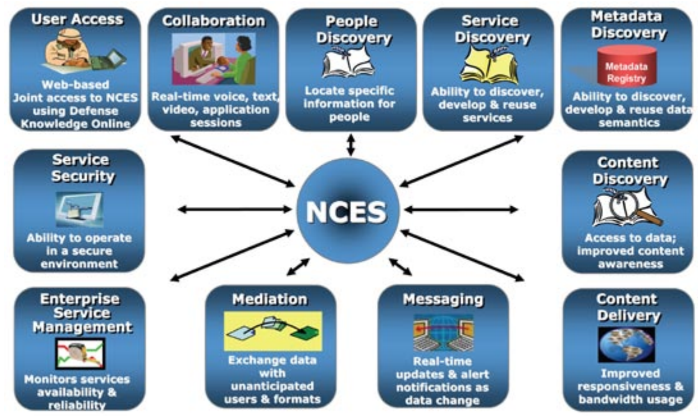
Network Centric Enterprise Services (NCES)

Executive Summary

- The Operational Test Team conducted a series of IOT&E events on a subset of Network Centric Enterprise Services (NCES) Increment 1 services from January 2008 through January 2009. The IOT&E events were conducted in accordance with the DOT&E-approved test plan. Testing was adequate to assess the operational effectiveness and suitability of the subset of NCES. However, the limited user base that exists at this point in time precludes an assessment of scalability to the levels expected in the future by the Capability Production Document (CPD).
- The Milestone Decision Authority granted Full Deployment Decisions on May 15, 2009, for the following services: collaboration (Defense Connect Online (DCO) and E-collab), content delivery (Enterprise File Delivery and Global Information Grid Content Delivery Service (GCDS)), Metadata Registry, and the Defense Knowledge Online (DKO) user access portal.
- The test team conducted an FOT&E from March through April 2009 on Service Discovery, which included the use of the Net-Centric Publisher service from the Metadata Registry, part of the Service Oriented Architecture Foundation product line.
- DOT&E found the test of Service Discovery was not adequate to make a determination of operational effectiveness and suitability in the areas of reuse of services and software, improved interoperability, or reduced costs to the DoD through service reuse. In order to make this determination, Service Discovery requires an expanded repository of services and a larger user base. A concerted effort to mature governance policies, promote benefits, and encourage use across the DoD enterprise is needed to realize the envisioned benefits of Service Discovery.

System

- NCES is a suite of individual capabilities that support automated information exchange across the 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:



  - Enterprise Service Management capabilities providing performance, operational status, and usage of web services that enhance network situational awareness to the Global Infrastructure Services Management Center
  - Information assurance/computer network defense
- 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.
- 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.
- NCES services are available to all operational and tactical users who connect to a Defense Information System Network point-of-presence.
- NCES is a collection of services from which a user can select those that best fit their needs. Users can be system or software developers, system or network administrators, communities of interest, programs of record, or warfighter, business, and intelligence personnel.
- Each service is unique and has its own IOT&E and acquisition fielding decision.

Mission

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

Prime Contractor

- Government Integrator (Defense Information Systems Agency (DISA))

Activity

- The Joint Interoperability Test Command (JITC) led a multi-Service operational test team that conducted a series of IOT&E events on a subset of NCES Increment 1 services from January 2008 through January 2009. The IOT&E's were conducted in accordance with the DOT&E-approved Test and Evaluation Master Plan and operational test plans. The test team continuously monitored product use by the using communities to support data collection and testing. Services tested include:
  - DCO and E-Collab collaboration tools
  - DKO portal
  - Enterprise File Delivery
  - GCDS
  - Metadata Registry
  - People Discovery
  - Enterprise Search (a combined set of services - Centralized Search, Federated Search, and Enterprise Catalog)
- The Milestone Decision Authority granted a Full Deployment Decision on May 15, 2009, for the following services: collaboration (DCO and E-collab), content delivery (Enterprise File Delivery and GCDS), Metadata Registry, and the DKO user access portal.
- The test team did a Verification of Corrections for NCES services evaluated as not-survivable as it relates to information assurance during the IOT&E. The test and evaluation activity included documentation reviews and interviews with program office and hosting site personnel for the following products: unclassified Centralized Search, Federated Search, and Enterprise Catalog; People Discovery; Metadata Registry; E-collab; and GCDS.
- The test team conducted an FOT&E from March through April 2009 on Service Discovery, which included the use of the Net-Centric Publisher service from the Metadata Registry, a part of the Service Oriented Architecture Foundation product line. Data collection included surveys, interviews, and observations of users representing DoD Programs of Record and Communities of Interest engaged in development and exposure of web-based services.
- The test team is currently planning a second FOT&E for January 2010 to assess the People Discovery, Service Security, Enterprise Service Management, and Messaging services.

Assessment

- The IOT&E events were adequate to assess the operational effectiveness and suitability of a subset of NCES services. During the IOT&E events, testers encountered significant limitations: there are extremely limited user bases for many services at this point in time which precluded an assessment of scalability to the levels envisioned in the CPD for the DoD enterprise and an inconsistent quality of suitability data provided by the various Managed Service Providers. The following is a synopsis of the results for each service evaluated during the IOT&E events.
- DOT&E concurs with the JITC assessment that both collaboration services are operationally effective and suitable with limitations. Issues with latency and audio performance still persist, especially for large meetings.
  - Usage levels have not reached those identified in the Key Performance Parameters, making additional scalability analyses necessary to identify needs for infrastructure growth. Based upon low adoption rates, DISA subsequently terminated the unclassified E-collab service in June 2009.
  - To improve suitability, users need improved tools and practices for managing sessions and governing growing content. To evaluate suitability improvements, test agencies will need access to the data that Managed Service Providers use in determining service availability and reliability.
  - JITC plans to assess a continuity of operations plan during the second FOT&E.
- The DKO portal is operationally effective and suitable with limitations. DOT&E recommended improvements include a better search capability and overall user interface. Users report they prefer their existing Service, command, or agency portals to access needed information.
- The Content Delivery services, Enterprise File Delivery, and GCDS are operationally effective and suitable with limitations. The Enterprise File Delivery service requires procedures to govern subscriptions and customer use to minimize duplication of files and demand on the network. GCDS requires clear guidance and procedures so content providers can manage, select, and prioritize content exposure to the appropriate server.
- The Content Discovery and People Discovery services are not operationally effective or suitable and will be upgraded and reassessed during the second FOT&E.
- The Metadata Registry service is operationally effective and suitable with limitations. In order to realize the benefits of a centralized DoD metadata repository better methods for reporting errors, sorting search results, and ensuring consistency. In addition, an authoritative body is needed to exercise oversight and enable reuse of content.
- The survivability assessments conducted during the IOT&E events for each service identified several significant deficiencies in information assurance practices at the sites that host NCES capabilities. Problems existed across the information assurance elements of detection, reaction, and restoration of service.
- As a result of the IOT&E survivability assessment, Managed Service Providers made adjustments to security practices. JITC conducted a Verification of Corrections assessment and published an updated survivability evaluation in April 2009. Based upon documentation reviews and interviews, JITC now assesses Unclassified Centralized Search, Federated Search, and Enterprise Catalog as operationally survivable; and Metadata Registry, GCDS, and the classified E-collab tool as operationally survivable with limitations. DOT&E anticipates confirmation of JITC's assessment during FOT&E 2 survivability testing. The recently upgraded People Discovery tool will be re-assessed at a later date.

- DOT&E found the FOT&E 1 for Service Discovery was not adequate to make a determination of operational effectiveness and suitability in the areas of reuse of services and software, improved interoperability, or reduced costs to the Department through service reuse. In order to make this determination, Service Discovery requires an expanded repository of services and a larger user base. A concerted effort to mature governance policies, promote benefits, and encourage use across the DoD enterprise is needed to realize the envisioned benefits of Service Discovery.
  - The Service Discovery product successfully demonstrated the functionality needed to register or search for a service. There are deficiencies with workflow and navigation that result in delays in service publishing and require substantial help desk support to correct.
  - The ability to reuse existing services registered in the Service Discovery data base, its primary intent, was not assessed due to a lack of experienced users and registered services.
- Testing continues to be hampered by:
  - The slow adoption rate of NCES services by existing programs of record and communities of interest
  - The level of effort needed for programs to expose their data or services using NCES
  - The lack of established governance standards for exposing information on the Global Information Grid

Recommendations

- Status of Previous Recommendations. The Milestone Decision Authority and JITC took effective action on previous recommendations.
- FY09 Recommendations.
  1. DISA should conduct a thorough review of the Defense Enterprise Computing Center facilities to ensure they provide the levels of survivability and information assurance commensurate with the operational importance of the hosted systems.
  2. The Assistant Secretary of Defense (Networks and Information Integration)/DoD Chief Information Officer, DISA, and the U.S. Strategic Command, as appropriate, should publish guidance/procedures/policies and designate responsible agents to affect the necessary governance and development of incentives to encourage developers to register and re-use services in the NCES Service Discovery and Metadata Registry tools.
  3. JITC should conduct periodic independent assessments to evaluate scalability of services to DoD Enterprise levels.

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

Executive Summary

- The Suite of Integrated Radio Frequency Countermeasures (SIRFC) system integration is approximately 90 percent common between the U.S. Army Special Operations Command (USASOC) and Air Force Special Operations Command (AFSOC) aircraft. However, some unique aircraft integration challenges have resulted in different system effectiveness and suitability results with each Service.

Army Special Operations Command

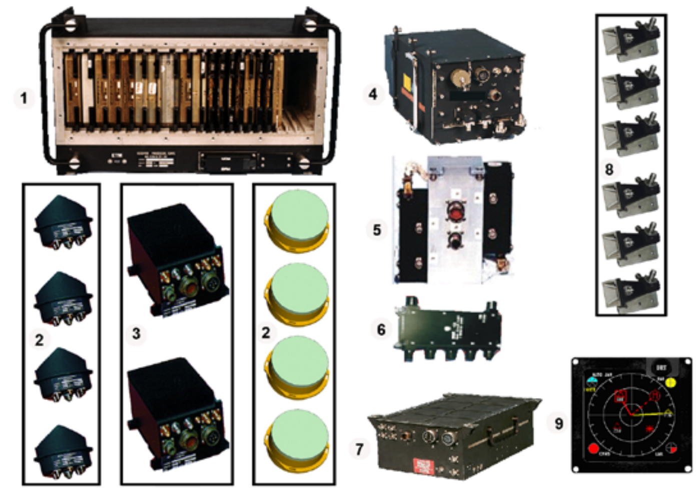
- USASOC continued reliability testing of the SIRFC radio frequency switch assembly in order to determine the root cause of hardware failures observed during 4QFY08 IOT&E and post IOT&E correction of deficiencies testing.
- As a result of analysis completed in 4QFY09, USASOC requested a complete switch redesign and additional qualification testing to be completed no later than November 2010.
- SIRFC jamming on CV-22 was less effective than that observed on the USASOC aircraft, but the system experienced no failures of the radio frequency switch. The less effective jamming and lack of radio frequency switch failures are likely related to the lower power transmitter installed on the CV-22. Operational flight testing with a new higher power transmitter will be required to confirm this assessment.

Air Force Special Operations Command and Navy

- The AFSOC, in coordination with the Navy V-22 Joint Program Office, completed operational testing of SIRFC on the CV-22 aircraft during the 3QFY08 IOT&E.
- DOT&E assessed the SIRFC integration on the CV-22 as not operationally effective due to limited threat efficacy and not operationally suitable due to reliability problems.

System

- SIRFC is an advanced radio frequency self-protection system designed for installation on aircraft.
- Major SIRFC subsystems are the following:
  - Advanced threat Radar Warning Receivers (Numbers 1, 2, 3, 6, and 9 in picture)
  - Advanced threat radar jammer/Electronic Countermeasures (Numbers 4, 5, 7, and 8 in picture)
- SIRFC is integrated onto USASOC MH-47 and MH-60 helicopters and AFSOC CV-22 tilt rotor aircraft. The AFSOC CV-22 aircraft is supported by the Navy V-22 Joint Program Office (PMA 275).



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

- The SIRFC system integration is 90 percent common between the Service platforms, though the Army MH-47 and MH-60 aircraft have a higher power transmitter installed. Early integration challenges on the AFSOC CV-22 aircraft dictated the installation of a lower power transmitter. Future CV-22 block upgrades are scheduled to incorporate the higher power transmitter.

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 Electronics Systems, Clifton, New Jersey

Activity

Army Special Operations Command

- USASOC completed destructive testing and analysis of the high-power radio frequency switch during FY09 in an effort to determine the root cause of the repeated in-flight switch

failures on the MH-47 and MH-60. These failures were first confirmed during DOT&E-directed tests at Eglin AFB, Florida, in 1QFY09.
- Analysis results yielded deficiencies in the current switch design thought to be responsible for the observed failures. As a result of these findings, USASOC requested a complete switch redesign and additional qualification testing to be completed no later than November 2010.
- DOT&E completed the effectiveness and suitability analysis of SIRFC IOT&E flight data during FY09.

Air Force Special Operations Command and Navy
- AFSOC, in coordination with the Navy and the Air Force Operational Test and Evaluation Center, completed operational testing of SIRFC on the CV-22 aircraft during the 3QFY08 CV-22 IOT&E.
- AFSOC is conducting ongoing system software block upgrades to address the problems identified in IOT&E.
- DOT&E released the CV-22 Operational Test and Evaluation Report in early 2010.

Assessment
- Despite the common SIRFC hardware among all the platforms, unique aircraft system integration challenges have resulted in different aircraft effectiveness and suitability results with each Service.
- Although the Services conducted SIRFC development and testing under two separate Test and Evaluation Master Plans, inter-program communication and coordination is good and allows the CV-22 program to benefit from the USASOC SIRFC program.

Army Special Operations Command
- DOT&E's post-IOT&E assessment is that SIRFC is effective, but not suitable due to the reliability problems associated with the radio frequency switch hardware failures.

Air Force Special Operations Command and Navy
- DOT&E's assessment of the results of the FY08 CV-22 IOT&E and all SIRFC-related test events showed that:
  - The SIRFC Radar Warning Receiver software load flown during the CV-22 IOT&E caused some unintentional and undesirable effects on aircrew Situational Awareness. An improved algorithm that is designed to correct these deficiencies has been planned into a future SIRFC software block.
  - SIRFC jamming on CV-22 was less effective than that observed on the USASOC aircraft, but the system experienced no failures of the radio frequency switch. The less effective jamming and lack of radio frequency switch failures are likely related to the lower power transmitter installed on the CV-22. Operational flight testing with a new higher power transmitter will be required to confirm this assessment.

Recommendations
- Status of Previous Recommendations. The Services are satisfactorily addressing the two FY08 recommendations.
- FY09 Recommendations.
  1. USASOC should conduct additional SIRFC flight testing to confirm that the radio frequency switch redesign effort has corrected the deficiencies observed in previous flight testing.
  2. The Air Force and Navy should conduct CV-22 flight testing to confirm that the problems related to aircrew Situational Awareness that were observed during IOT&E have been resolved when the new software becomes available.

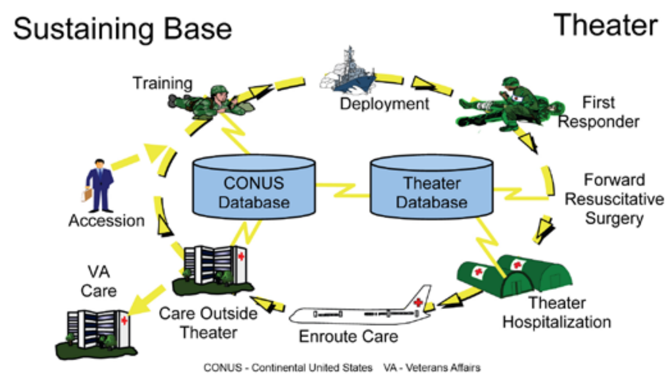
Theater Medical Information Program – Joint (TMIP-J)

Executive Summary

- The Army Test and Evaluation Command (ATEC) conducted an FOT&E to validate the Theater Medical Information Program - Joint (TMIP-J) Block 2 Release 1 and Clinical Data Repository (CDR) interface from December 18, 2008, to January 15, 2009, primarily at the Defense Health Information Management System (DHIMS) offices located in Falls Church, Virginia.
- The CDR successfully processed all randomly selected medical encounter records from TMIP-J Block 2 Release 1 in accordance with the business rules established by the Military Health System. However, some of these records did not process on the first attempt. The CDR successfully processed the retransmitted records. It appears that the TMIP-J Block 2 configuration encountered the same capacity limitation associated with the CDR that has occurred with the previously fielded configuration.

System

- TMIP-J 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-J provides the following medical capabilities required in the theater:
  - Electronic health record
  - Medical command and control
  - Medical logistics
  - Patient movement and tracking
- The Services provide their own infrastructure (networks and communications) and fund the computer hardware to host the TMIP-J software.



- TMIP-J consists of two blocks. Block 1 received a limited fielding approval in early 2003 to meet urgent and compelling wartime requirements and is currently deployed. Block 2 is being developed in multiple incremental releases, the first of which began limited fielding in early 2009.

Mission

- Combatant Commanders, Joint Task Force Commanders, and their medical support staff equipped with TMIP-J 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-J 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

- Science Applications International Corporation (SAIC), Falls Church, Virginia
- Northrop Grumman, Chantilly, Virginia
- Akimeka LLC, Kihei, Maui, Hawaii

Activity

ATEC conducted an FOT&E to validate the TMIP-J Block 2 Release 1 and CDR interface from December 18, 2008, to January 15, 2009, primarily at the DHIMS offices located in Falls Church, Virginia.

Assessment

- The CDR successfully processed 100 randomly selected medical encounter records from TMIP-J Block 2 Release 1 in accordance with the business rules established by the Military Health System. However, 13 of these records did not process on the first attempt. They required retransmission, possibly due to a capacity limitation associated with the CDR, which was also present in TMIP-J Block 1, the previous release.
- Because TMIP-J Block 2 Release 1 demonstrated many improvements over the previous release, this pre-existing limitation was not sufficient to preclude fielding the new release. However, if extensive retransmissions occur, it will affect operational efficiency.

Recommendations

- Status of Previous Recommendations. All previous recommendations have been satisfactorily addressed.
- FY09 Recommendation.
  1. The DHIMS Program Management Office should develop a Plan of Actions and Milestones (POA&M) to reduce the number of retransmissions required with the goal of improving operational efficiency and minimizing the risk that a record update will be missing from the CDR when needed. ATEC should monitor the implementation of the POA&M.

Army Programs

Army Programs

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

Executive Summary

- The Under Secretary of Defense for Acquisition, Technology and Logistics (USD(AT&L)) designated the Advanced Threat Infrared Countermeasures (ATIRCM)/Common Missile Warning System (CMWS) program as an Acquisition Category (ACAT) 1D program on April 15, 2009.
- The USD(AT&L) also limited the ATIRCM Quick Reaction Capability (QRC) effort to 83 CH-47D/F Chinook helicopters in support of Operation Iraqi Freedom (OIF) and Operation Enduring Freedom (OEF) and authorized a new next generation ATIRCM program titled the Common Infrared Countermeasures (CIRCM) system.

CMWS

- The Army is currently upgrading the CMWS to the Generation 3 (GEN 3) version that includes new processing hardware to support advanced threat detection algorithms allowing worldwide operations. The Army plans to conduct operational tests on the system in FY11.

ATIRCM QRC

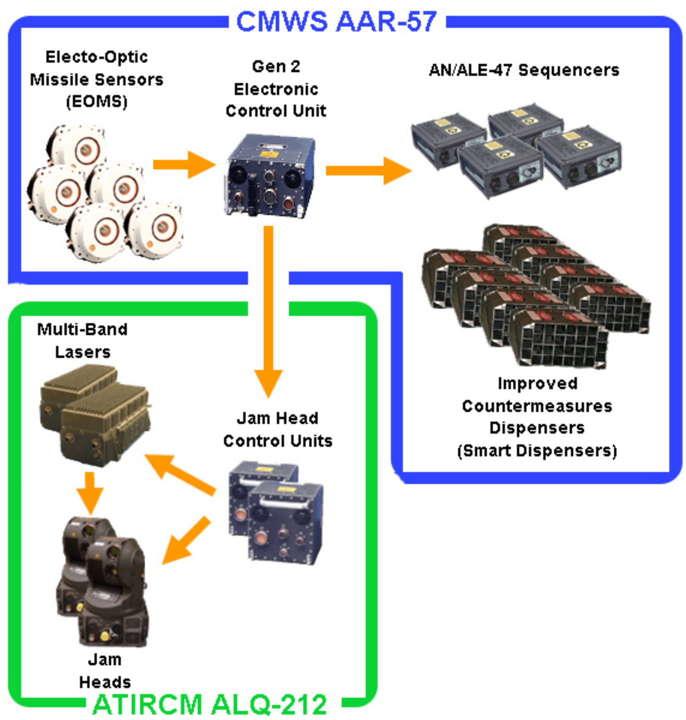
- The Army tested the ATIRCM QRC system throughout FY09 to support a First Unit Equipped date planned for December 2010.

CIRCM

- The CIRCM program is intended to develop a lightweight, low-cost jammer subsystem for installation on DoD rotary-wing and slow moving fixed-wing aircraft.
- The CIRCM program began Broad Agency Announcement demonstration testing involving five competitor systems in June 2009 to support a Milestone B decision planned for 3QFY10. Following completion of the system IOT&E, full-rate production of CIRCM is planned for 2QFY15.

System

- ATIRCM/CMWS is the Army's newest aircraft missile countermeasure system designed to detect incoming surface-to-air infrared missiles, warn pilots of the threat, and command automatic employment of laser and flare infrared countermeasures.
- The CMWS consists of electro-optical missile sensors that detect an oncoming missile threat, and an electronic control unit that informs the crew of the threat and activates countermeasures.
- The production CMWS coupled with flare dispensers is currently fielded on approximately 1,000 Army CH-47, UH-60, AH-64, C-12 series, RC-12, UC 35, and C-23 aircraft. The Army Procurement Objective is currently 2,002 systems.
- ATIRCM adds an infrared laser jammer to the CMWS to provide improved infrared defensive countermeasures. The



Army began a QRC program to field ATIRCM on 83 OIF/OEF CH-47D/F in 2QFY09. ATIRCM will not be fielded on any other aircraft and at the end of the QRC effort, ATIRCM will be terminated.
- The ATIRCM program will be replaced by the new ACAT 1D program called CIRCM. The CIRCM system incorporates Tri-Service Army, Navy, and Air Force requirements. This new program began in April 2009. The DoD strategy is to competitively develop a lightweight, low-cost jammer subsystem for installation on all DoD rotary-wing and slow moving fixed-wing aircraft starting in 4QFY14.

Mission

- Combatant Commanders will use the integrated ATIRCM/CMWS/CIRCM suite to enhance threat warning and improve defensive countermeasures for helicopters and fixed-wing aircraft. The systems will protect aircraft and crews from shoulder-fired, vehicle-launched, and other advanced infrared guided missile threats during vulnerable low-altitude operations.
- Combatant Commanders currently use the fielded version of CMWS and flares to warn pilots and provide limited infrared countermeasures within the design parameters of the system.

Prime Contractors
- CMWS and ATIRCM QRC: BAE Systems, Electronics & Integrated Solutions, Electronic Warfare Division, Nashua, New Hampshire
- CIRCM: Selection anticipated 3QFY10

Activity

CMWS
- The Army is currently conducting full qualification testing of the CMWS to support an Army full material release decision. This testing is required because the CMWS hardware had not completed full qualification testing prior to fielding in FY06.
- The Army tested the threat detection algorithm update, which provides capability enhancements against various threats, at the Tonopah Test Range (TTR), Nevada, in November 2008. The update was fielded in December 2008.
- The Army has continued to field the production CMWS to support immediate warfighter needs while deferring development of a full-threat-capable CMWS. The Army plans to conduct operational testing on the full-threat-capable CMWS supporting worldwide operations in FY11.
- The Army has funded a processor hardware upgrade (CMWS GEN 3) in order to increase the capability of the legacy processor so that it will support the full-threat-capable CMWS. The program began developmental test activities in September 2009 and plans to conclude in early 2010. Contractor and Army reliability demonstration testing will be accomplished as part of the GEN 3 T&E strategy.
- Due to the urgent CMWS threat detection algorithm update and the ATIRCM QRC efforts, Army testing in FY09 differed significantly from the plan approved in the DOT&E-approved Test and Evaluation Master Plan (TEMP). The Army is currently updating the November 2005 TEMP with current test plans and resources.

ATIRCM QRC
- The Army began installing production kits on the Chinooks for the new ATIRCM QRC and CMWS in May 2009 and plans to fully equip the first unit in December 2009. All 83 CH-47D/F Chinooks deploying to Southwest Asia are planned to be equipped with ATIRCM QRC systems by 2QFY10.
- The Army conducted ATIRCM QRC risk reduction missile testing at TTR in November 2008 and jam code evaluation testing at the Guided Weapons Evaluation Facility at Eglin AFB, Florida, in November 2008. Integrated developmental flight testing culminated in the Field System Assessment at Fort Rucker, Alabama, in July 2009. The Army conducted sled testing at the high-speed test track at Holloman AFB, New Mexico, in June 2009 and production hardware missile testing at the White Sands Missile Range Aerial Cable Range, New Mexico, in August through September 2009. The Army Test and Evaluation Center is reviewing all ATIRCM QRC data and will issue a Capabilities and Limitations Report based on test results.

CIRCM
- The USD(AT&L) authorized the CIRCM program in April 2009.
- The CIRCM program began Broad Agency Announcement demonstration testing involving five competitor systems in June 2009 to support a Milestone B decision planned for 3QFY10.
- Milestone C is planned for 3QFY12 and full-rate production is planned for 2QFY15.

Assessment

CMWS
- The Army has not accredited their end-to-end CMWS simulation model. If accredited, the CMWS simulation model could potentially reduce flight test requirements of follow-on testing.

ATIRCM QRC
- Preliminary results based on testing accomplished to date show satisfactory system performance. Additional reliability data from the field will need to be collected to assess system reliability performance.

Recommendations

- Status of Previous Recommendations. The Army has adequately addressed two of the three FY08 recommendations.
- FY09 Recommendations. The Army should:
  1. Accomplish an updated TEMP supporting the development and testing activities required for CMWS GEN 3 hardware upgrade.
  2. Accomplish a new TEMP supporting the development and testing activities required for CIRCM.
  3. Accomplish accreditation of their end-to-end model for CMWS.

Apache Block III (AH-64D)

Executive Summary

- During 2009, DOT&E has been monitoring Army developmental test activities. The Army is scheduled to conduct a Limited User Test (LUT) in November 2009. The LUT and development testing data will inform a low-rate initial production decision review scheduled for April 2010.
- Not all aircraft functionality will be integrated for the LUT. System evaluation will rely on developmental testing of subsystems not available for testing in the LUT: improved drive system, composite main rotor blade, integrated aircraft survivability equipment, 701D engine with enhanced electronic controls and weapons accuracy, performance, and integration.
- The Apache Block III is a covered program for LFT&E. The Program Office is preparing an Alternate LFT&E Strategy and plans to apply for a waiver to full-up system-level testing.
- OT&E is not scheduled to commence until October 2011. DOT&E continues to monitor developmental testing as part of an integrated test program.
- The Apache Program Office continues the reliability improvement program for fielded aircraft by replacing key dynamic components. AH-64D Block II fleet reliability and availability has improved.
- The late start of LFT&E, partly due to availability of production representative test articles, will limit opportunities to influence the design.

System

- The Apache Block III is a modernized version of the AH-64D Attack Helicopter. The Army intends to organize the Apache Block III into 24 aircraft Attack/Reconnaissance Battalions assigned to the Combat Aviation Brigades.
- The Army's acquisition objective is for 634 Apache Block III aircraft.
- The Apache Block III aircraft include the following:
  - Level 4 Unmanned Aircraft System (UAS) capability to provide control of the UAS flight, payload, and UAS video feeds
  - Improved Radar Electronic Unit to provide Radio Frequency Interferometer passive ranging, extended Fire Control Radar range, and maritime targeting

  - Improved performance with 701D engines, composite main rotor blades, weight reduction through processor and avionic upgrades, and an improved drive system
  - Enhanced survivability with integrated aircraft survivability equipment and additional crew and avionic armoring
  - Enhanced communication capability with an integrated communication suite to meet global air traffic management requirements and includes satellite communication and Link 16 (data link)
  - Improved reliability and maintainability using embedded system-level diagnostics, improved electronic technical manuals, and reduced obsolescence

Mission

The Attack/Reconnaissance Battalions assigned to the Combat Aviation Brigade will employ the Apache Block III (AH-64D) to conduct the following missions:

- Attack
- Movement to contact
- Reconnaissance
- Security

Prime Contractors

- The Boeing Company Integrated Defense Systems, Mesa, Arizona (Aircraft)
- Longbow Limited, Orlando, Florida, and Baltimore, Maryland (Sensors and UAS datalink)

Activity

- The Army is scheduled to conduct a LUT in November 2009. The LUT and developmental testing data will inform a low-rate initial production decision review scheduled for April 2010.
- OT&E is not scheduled to commence until October 2011. DOT&E continues to monitor developmental testing as part of an integrated test program.

- Avionics flight testing continues on two aircraft to demonstrate functionality of Level 4 UAS control, Radar Electronic Unit, and Integrated Helmet and Display Sight System capabilities.
- The Army is testing the improved drive system. They began endurance testing on a test stand and will complete 200 hours of integration testing on the ground test vehicle.
- The Composite Main Rotor Blade has completed qualification for flight testing and continues fatigue testing in a structural test lab.
- The Army completed developmental and customer testing of the integrated aircraft survivability equipment in an Apache Block II aircraft.
- The Apache Program Office continues the reliability improvement program for fielded aircraft by replacing key dynamic components. Key components include main transmission, main rotor head, tail rotor gearbox, tail rotor swashplate, engine nose gearbox, main rotor swashplate, actuators, pumps, and servos.
- The LFT&E Integrated Product Team has met on several occasions to discuss tasks, assets, and schedules for the Alternate LFT&E Strategy to support a request for a waiver from full-up system-level testing. Live Fire testing is scheduled to start 1QFY11 and be complete by 4QFY11 to support a full-rate production decision in 3QFY12.

Assessment

- Avionics aircraft have demonstrated the capability to exercise Level 2-4 control of surrogate UAS in developmental flight testing.
- The Radar Electronic Unit generates false targets in some operating modes, but generally performs as well as legacy radar avionics.
- Early Integrated Helmet and Display Sight System testing has identified problems with cockpit registration, site picture stability, and operator comfort.
- Structural weakness around fastener holes in the top cover of the new transmission has resulted in oil leakage and a redesign of the cover, adding strength and weight to the transmission.
- The integrated aircraft survivability suite improves pilot understanding of threat locations and provides new capability to locate and target threat systems.
- AH-64D Block II fleet reliability and availability has improved.
- The late start of LFT&E, partly due to availability of production representative test articles, will limit opportunities to influence the design.

Recommendations

- Status of Previous Recommendations. There was no annual report for Apache Block III in 2008.
- FY09 Recommendations. The program should:
  1. Develop and implement reliability improvements on baseline and Apache Block III components.
  2. Look for opportunities for test articles to support earlier Live Fire test events.

Armored Tactical Vehicles – Army

Executive Summary

- The Army is adding armored cabs to tactical wheeled vehicles. In the urban and non-linear battlefields of Iraq and Afghanistan crews of tactical wheeled vehicles are susceptible to small arms fire, mines, IEDs, and rocket-propelled grenades.
- Many tactical wheeled vehicles are undergoing armor upgrade development, live fire, and operational testing. Development includes redesigned crew cab structures and heavier duty axles, transmissions, and other components that increase weight-bearing capability to accept attachable armor that can be installed as the tactical situation demands.
- The M915A5 Line Haul Tractor completed an FOT&E in FY09.

ECV2 / HMMMV

M915A5

System

- The following tactical wheeled vehicle programs designed armor protection kits and were tested in FY09:
  - 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 general purpose light, highly mobile, diesel-powered, four-wheeled-drive that is configured as a troop carrier, armament carrier, shelter carrier, ambulance, anti-tank guided-missile carrier, and scout vehicle.
  - The Expanded Capacity Vehicle (ECV2) is a HMMWV variant designed to restore lost payload, performance, and crew protection. The ECV2 is a light, highly mobile, diesel-powered, four-wheel-drive utility vehicle that is configured as a troop carrier, shelter carrier, and scout vehicle.
- The following tactical wheeled vehicle programs are in the planning and development stages of up-armoring their cabs:
  - The Heavy Equipment Transport System (HETS) is composed of the M1070 tractor and M1000 semitrailer. This system is used to transport, recover, and evacuate a combat loaded M1 series main battle tank or equivalent loads up to 75 tons.
  - The Joint Light Tactical Vehicle (JLTV) will consist of three payload categories:
    - Category A (3,500 pounds)
    - Category B (4,000 pounds for the Marine Corps and 4,500 pounds for the Army)
    - Category C (5,100 pounds)
  - Each Variant is equipped with a companion trailer. Both Services will employ 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 personnel and tactical wheeled vehicles has created a need for augmented and flexible mission-based ballistic protection.
- The M915A5 is a line haul tractor truck used 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.
- The HMMWV is a light tactical wheeled vehicle for command and control, troop transport, light cargo transport, shelter carrier, ambulance, towed prime mover, and weapons platform throughout all areas of the battlefield or mission area.

Prime Contractors

- M915A5: Daimler Truck North America, Charlotte, North Carolina
- HMMWV and ECV2: AM General, South Bend, Indiana
- HETS – M1070 Truck: Oshkosh Corporation, Oshkosh, Wisconsin
- HETS – M1000 Trailer: Systems & Electronics, St. Louis, Missouri
- JLTV: BAE Ground Systems, Santa Clara, California; Lockheed Martin Systems, Owego, New York; General Dynamics Land Systems, Sterling Heights, Michigan

Activity

- M915A5
  - The Army completed the FOT&E of the M915A5 in September 2009. Testing was done in accordance with the DOT&E-approved Test and Evaluation Master Plan and test plan.
  - The Army completed M915A5 live fire testing in September 2009.
- HMMWV
  - The Army completed HMMWV live fire testing in June 2009.
- ECV2
  - The Army conducted ECV2 developmental testing and completed the live fire test program. Army Test and Evaluation Command (ATEC) executed the ECV2 Customer Test at Fort Bragg, North Carolina, and Fort Polk, Louisiana, from March to May 2009.
  - The Army decided to not initiate the ECV2 program in June 2009.
- LFT&E
  - The Army is 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 (to include explosively formed penetrators), and rocket-propelled grenades.

Assessment

- M915A5
  - Analyses of M915A5 FOT&E results are not complete. DOT&E observed that all FOT&E missions were successful. The M915A5 tractor truck demonstrated the capability to conduct short- and long-haul transport of various combat loads specified in the Operational Requirements Document.
  - The Army's emerging evaluation of M915A5 FOT&E results along with developmental and live fire test data will inform a production cut-in decision scheduled for November 2009.
  - Based upon live fire testing, the M915A5 provides armor protection to the crews against the likely threats while still maintaining mission capability.
- HMMWV
  - Live fire system-level testing of the HMMWV confirmed an improvement in protection provided by various rapidly fielded armor kits, but vulnerabilities to the crew still exist.
- ECV2
  - During the ECV2 Customer Test and Developmental Test, the ECV2 demonstrated a higher payload capacity and more interior volume compared to an up-armored HMMWV. The ECV2's improved suspension, power-train, and ground clearance increased off-road mobility. The lack of a mount for weapons on the ECV2 command and control variant decreased survivability for that variant.
  - The ECV2 demonstrated 1,628 Mean Miles Between Operational Mission Failure-Hardware (MMBOMF-H) prior to the Customer Test compared to the requirement of 2,250 MMBOMF-H. ECV2 failures experienced during developmental test were with its semi-active suspension, oil leaks, and production quality assurance problems.
  - Soldiers had difficulty diagnosing ECV2 malfunctions during the Customer Test because of the ECV2's increased automotive complexity over the existing HMMWV.
  - Live fire system-level testing of the ECV2 demonstrated crew protection against the required mines and IEDs but crew survivability vulnerabilities similar to those of the HMMWV exist against larger and more realistic threats.

Recommendations

- Status of Previous Recommendations. The Army accepted all previous recommendations.
- FY09 Recommendations.
  1. The Army should update the M915A5 Test and Evaluation Master Plan to include details of developmental and live fire testing, and FOT&E results.
  2. Additional live fire testing will be required if armor upgrades or design changes are developed for any of the currently tested vehicles.
  3. The Army should continue to address the vulnerabilities identified during the HMMWV live fire testing.

Black Hawk UH-60M Baseline and UH-60M Upgrade

Executive Summary

- As of September 2009, 140 UH-60M Baseline aircraft are fielded. Early reports from units receiving the UH-60M Baseline are encouraging and confirm DOT&E's assessment based on operational test results that the UH-60M Baseline is effective, suitable, and survivable.
- The UH-60M Upgrade Common Avionics Architecture System (CAAS) provided enhanced navigation and situational awareness while reducing crew workload during a Limited User Test (LUT). The CAAS provides additional features over the legacy UH-60A/L cockpit. UH-60M Upgrade CAAS capabilities and workload are similar to the UH-60M Baseline digital cockpit.
- The full UH-60M Upgrade fly-by-wire flight control system is still in development and has not yet been flown in operational testing.
- The composite tailcone redesign efforts did not meet weight, cost, or survivability goals of the program. The Army decided to stop redesign efforts and revert to the proven metal tailcone design.
- In August 2009, the Army proposed to continue UH-60M Baseline production and not pursue production of the UH-60M Upgrade configuration. The Army will complete developmental testing of UH-60M Upgrade technology. The Army also proposed to integrate selected capabilities onto the UH-60M Baseline aircraft.
- A revised Acquisition Strategy and Test and Evaluation Master Plan are required due to program changes.

System

- The UH-60M Baseline and UH-60M Upgrade are modernized versions of the UH-60A or UH-60L Black Hawk medium-lift helicopters.
- An Assault Helicopter Battalion is organized as three companies of 10 aircraft each.
- The acquisition objective is for 1,931 UH-60 Black Hawks (1,227 UH-60M variants and 704 UH-60L variants). Until recently, the program projected that 361 aircraft would be UH-60M Baseline aircraft, and the remaining 866 would be UH-60M Upgrade aircraft.
- The UH-60M Baseline aircraft include the following capabilities:
  - Digital cockpit with Blue Force Tracker (Friendly force tracking)
  - Power and airframe improvements with the 701D engine, wide chord blades for enhanced performance, and

monolithic machined parts that provide structural improvement over the UH-60A and UH-60L
  - Improved survivability with enhanced laser and missile warning systems and infrared signature suppression for anti-aircraft missile defense
- The UH-60M Upgrade design adds the following:
  - Fly-by-wire advanced flight controls
  - A 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 visual environments
  - Full Authority Digital Engine Control (FADEC) for the 701E engine

Mission

Assault Aviation and General Support Aviation Battalions will employ the Black Hawk helicopter to conduct the following missions:

- Air Assault lift for 11 combat Soldiers or 9,000 pounds of equipment 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 Helicopter, West Palm Beach, Florida, and Stratford, Connecticut

Activity

- As of September 2009, 140 UH-60M Baseline aircraft were fielded.
- The Army conducted a LUT of the UH-60M Upgrade CAAS in October 2008 using a cockpit simulator in the System Integration Laboratory at Redstone Arsenal, Alabama.
- In December 2008, the Army proposed delaying the UH-60M Upgrade low-rate initial production cut-in decision one year. The delay was intended to facilitate the production of 22 additional HH-60M MEDEVAC helicopters and six additional UH-60M helicopters and to allow time to complete planned flight testing prior to a low-rate initial production decision. The delay occurred as a result of a nine month slip in the delivery of test aircraft.
- Initial LFT&E on the new main rotor and tail rotor actuators indicated ballistic vulnerability and necessitated additional design changes and ballistic qualification.
- Initial LFT&E on the new composite tailcone indicated significant ballistic vulnerability and necessitated a redesign. The composite tailcone redesign efforts did not meet weight, cost, or survivability goals of the program. The Army chose to revert to the proven metal tailcone design.
- A combined contractor and government test team continued developmental flight testing on two prototype UH-60M Upgrade aircraft. Testing focused on the fly-by-wire advanced flight controls, CAAS cockpit integration, and FADEC engine development. As of September 2009, 190 of the planned 407 developmental flight hours had been completed.
- In August 2009, the Army proposed to continue UH-60M Baseline production and not pursue production of the UH-60M Upgrade configuration. The Army intends to complete developmental testing of UH-60M Upgrade technology. The Army also proposed to integrate selected capabilities onto the UH-60M Baseline aircraft.

Assessment

- Early reports from units receiving the UH-60M Baseline are positive and confirm DOT&E's evaluation based on operational test results that the UH-60M Baseline is effective, suitable, and survivable.
- Army pilots successfully completed 16 of 21 missions during the UH-60M Upgrade LUT in the simulator.
  - The CAAS provided enhanced navigation and situational awareness while reducing crew workload and was an improvement over the UH-60A/L cockpit. UH-60M Upgrade CAAS capabilities and workload were similar to those of the UH-60M Baseline digital cockpit.
  - Fly-by-wire software is not mature. Software anomalies during take-off, landing, flight close to the terrain, and aggressive maneuvers negatively impacted, to varying degrees, 14 of the 16 successful missions.
  - Fly-by-wire technology, as implemented in the LUT, reduced pilot workload and fatigue during flight at altitude, but increased aircrew workload during low altitude/low airspeed maneuvers.
- Full UH-60M Upgrade fly-by-wire functionality has not yet been proven in developmental flight testing. Prototype aircraft are not yet ready to participate in integrated operational testing.
- Redesign and qualification of the main rotor and tail rotor actuators is required as a result of ballistic testing.
- The UH-60M Baseline effort to assess vulnerability of the new monolithic frames and the laboratory simulation testing to evaluate ballistic damage effects on the fly-by-wire computer system have not been completed.

Recommendations

- Status of Previous Recommendations. The Army has addressed eight of the 14 recommendations included in the May 2007 DOT&E combined OT&E and LFT&E Report for the UH-60M Baseline aircraft.
- FY09 Recommendations.
  1. The Program Office should define the scope of future development and test activities in a revised Acquisition Strategy and Test and Evaluation Master Plan.
  2. The Army should conduct adequate integrated operational flight testing prior to migrating any UH-60M Upgrade capabilities onto the UH-60M Baseline aircraft.
  3. The Army should continue activities for those items to be migrated from the UH-60M Baseline under the approved LFT&E Strategy. The Army should complete the vulnerability analysis planned for the monolithic airframe and Ballistic Armor Protection System incorporated, but not tested, under UH-60M Baseline. The laboratory evaluation of the fly-by-wire computer system needs to be performed.

Cartridge 5.56 mm M855A1

Executive Summary
- The Army initiated testing of the M855A1 projectile in FY08. That testing, in addition to LFT&E lethality testing, continued into FY09.
- During high temperature operational testing in FY09, the Army observed an anomaly with the trajectory of the projectile. As a result, the Army initiated an investigation to fully understand the problem and implement a resolution.
- The Army subsequently developed a modified projectile, incorporating a copper slug, and will conduct additional validation testing in FY10.

System
- The M855 A1 program evolved from an Army Research, Development, and Engineering Center, Picatinny, New Jersey, program titled "Green Ammunition."
- The objectives of the Green Ammunition program are to reduce lead contamination on training ranges and reduce the lead hazard from the manufacturing environment while maintaining performance and trajectory match with the current M855 cartridge. While the Green Ammunition program will produce other calibers of ammunition, the 5.56 mm projectile was the first to be spun-out due to its extensive use.
- The M855A1 cartridge is intended to be compatible with the M4 and M16 family of weapons, as well as the M249 Squad Automatic Weapon. This new cartridge is intended to be a direct replacement for the currently fielded M855 cartridge.
- The M855A1 is a three-part projectile consisting of a steel penetrator, a copper slug, and a reverse drawn copper jacket.

Mission
Infantry and security forces equipped with the M855A1 will close with and engage enemy combatants following traditional tactics, techniques, and procedures.

Prime Contractor
- Alliant-Techsystems, Small Caliber Systems, Independence, Missouri

Activity
- During high temperature operational testing in FY09, the Army observed flight stability problems with the M855A1 projectile. The Army attributed the anomaly to the material composition of the slug (material used to fill the rear portion of the projectile).
- Subsequently, the Army Program Manager for Maneuver Ammunition Systems; the Army Research Laboratory's Weapons and Materials Research Directorate; the Army Research, Development, and Engineering Center's Munitions Systems and Technical Directorate; and the prime manufacturer developed a material change to the projectile to address the anomaly.
- The Army will conduct additional validation testing in FY10 to verify that the material change adequately addresses the trajectory anomaly and to assure the lethality of the cartridge was maintained.

Assessment
During Qualification and LFT&E lethality testing, the M855A1 demonstrated adequate performance and lethality.

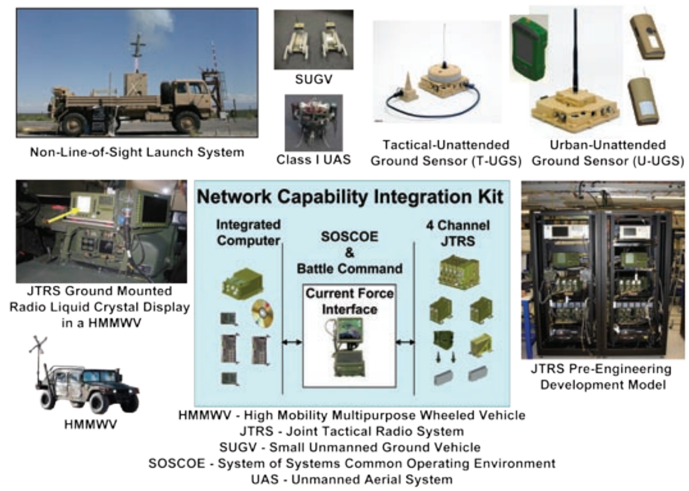
Recommendations
- Status of Previous Recommendations. This is the first annual report for this program.

- FY09 Recommendation.
  1. The Army Test and Evaluation Command should convene the lethality integrated product team following completion of validation testing to assess whether the material change affected the projectile's lethality.

Early Infantry Brigade Combat Team (E-IBCT)

Executive Summary
- The systems to be acquired as part of the Early Infantry Brigade Combat Team (E-IBCT) program were originally components of the Future Combat Systems (FCS) program. In June 2009, the DoD cancelled the FCS program and directed the Army to establish the E-IBCT Increment One as a separate acquisition program with a Milestone C decision scheduled for December 2009.
- The Army Test and Evaluation Command (ATEC) executed a Limited User Test (LUT), the first operational test of E-IBCT systems, at Fort Bliss, Texas, in August and September 2009.
- Based upon analyses of the results from the LUT and developmental testing, DOT&E's current assessment of the E-IBCT systems is that none have demonstrated an adequate level of performance to be fielded to units and employed in combat. All of the systems require further development in order to meet threshold user requirements.

System
- The Army intends to modernize IBCTs in two increments. The Army plans to field the first E-IBCT Increment One in FY11 with a total procurement objective of seven Increment One E-IBCTs. The Army has not yet determined the procurement objective for Increment Two E-IBCTs.
- Planned E-IBCT Increment One capabilities include the following:
  - Network Integration Kit (NIK) mounted on a High Mobility Multi-purpose Wheeled Vehicle (HMMWV), consisting of:
    - Integrated Computer System with battle command software
    - Force XXI Battle Command, Brigade and Below (FBCB2) Joint Capability Requirement software
    - 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 (CLU), which holds 15 missiles (maximum range out to 40 km), and a Computer and Communications System
    - In the E-IBCT, the Battle Command for the NLOS-LS is the Advanced Field Artillery Tactical Data System



  - Class I Unmanned Aerial System (UAS), Block 0
  - Small Unmanned Ground Vehicle (SUGV), Block 1
- The Army currently plans to equip the E-IBCT Increment Two with additional systems starting in FY13. The Army has not yet determined which systems will comprise Increment Two. Candidate systems include a number of systems from the FCS program such as:
  - Class IV UAS
  - Multi-functional Utility/Logistics and Equipment (MULE) unmanned ground vehicle
  - Common Controller AN/PSW-2
- Detailed reports on Class I UAS Block 0, NLOS-LS, and UGS are provided following this overview.

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

Prime Contractors
- Prime: The Boeing Company, Integrated Defense Systems, St. Louis, Missouri
- Class I UAS: Honeywell, Aerospace Division, Albuquerque, New Mexico
- NLOS-LS: Raytheon Missile Systems, Tucson, Arizona
- UGS: Textron Defense Systems, Wilmington, Massachusetts
- SUGV: iRobot, Burlington, Massachusetts

Activity

- The systems to be acquired as part of the E-IBCT program were originally components of the FCS program. In June 2009, the DoD cancelled the FCS program and directed the Army to establish E-IBCT Increment One as a separate acquisition program with a Milestone C decision scheduled for December 2009.
- During the summer of 2009, the contractor conducted a series of three Technical Field Tests (TFT) at White Sands Missile Range, New Mexico. The TFTs were developmental tests executed under field conditions and were designed to assess the level of technical maturity for all E-IBCT systems. Additionally, the Army's Training and Doctrine Command (TRADOC) conducted an E-IBCT Force Development Test and Experimentation (FDT&E) in July and August 2009 at Fort Bliss, Texas. The intent of the FDT&E was to further develop tactics, techniques, and procedures for employment of E-IBCT systems.
- ATEC executed a Limited User Test (LUT), the first operational test of E-IBCT systems, at Fort Bliss, Texas, in August and September 2009. During the LUT, a company-size unit equipped with E-IBCT systems executed a series of offensive, defensive, and stability missions during four 96-hour scenarios. The results of the LUT will be used to inform the E-IBCT Milestone C decision.
- As an outcome of previous testing, the T-UGS was redesigned during the past year. A new form-factor T-UGS (NFF T-UGS) was introduced into the TFT in late July. A limited number of NFF T-UGS were also available for employment during the LUT. Other additional modifications to E-IBCT systems resulting from previous testing include the addition of a Leader Display and Control (LDAC) device – a handheld device to display U-UGS images – and a Range Extension Relay, a radio relay device to extend the communications range from the T-UGS field to the HMMWV-mounted NIK.
- The NLOS-LS Flight LUT was rescheduled for January - February 2010 as a result of deficiencies discovered in the developmental test flights.

Assessment

- Based upon analyses of the results from the LUT and developmental testing, DOT&E's current assessment of the E-IBCT systems is that none have demonstrated an adequate level of performance to be fielded to units and employed in combat. Individual system assessments are as follows:
  - NLOS-LS cannot be fully assessed until completion of the Flight LUT. The NLOS-LS CLU is currently on track to achieve its reliability requirement.
  - T-UGS and U-UGS as tested were not effective. These systems demonstrated poor communications connectivity, inadequate transmission ranges, poor image quality, and frequent system failures.
  - Class I UAS performed well, but is not reliable. The air vehicle flight and sensor performance met most user requirements. Its demonstrated reliability (1.5 hours Mean Time Between System Abort (MTBSA)) is falling well short of user threshold requirements (23 hours MTBSA).
  - The SUGV demonstrated a capability for remote investigation of potential threat locations, such as buildings or suspected IEDs. However, SUGV tactical utility is limited by poor line-of-sight communications range between the operator and the robotic vehicle. The SUGV is falling well short of user threshold reliability requirements.
  - The NIK performed its basic functions of controlling the UGS, receiving and passing still images from the UGS and Class I UAS, and interoperating with the current brigade battle command network. NIK reliability fell well below user threshold requirements.
- As noted above, the demonstrated reliability for the NIK, U-UGS, T-UGS, Class I UAS, and SUGV is poor and falls short of the level normally expected of an acquisition system at this stage of development. Shortfalls in meeting reliability requirements may adversely affect the E-IBCTs overall operational effectiveness and suitability and increase life-cycle costs.
- The program plans to implement a number of configuration changes in all E-IBCT systems prior to LUT 2, scheduled for the summer of 2010. In particular, operational testing to date has been primarily conducted with prototype JTRS or surrogate radios. This has precluded the ability to conduct an evaluation of the E-IBCT systems operating in a secure tactical network against potential threat information operations, such as electronic warfare. This will be a necessary condition for LUT 2 and employment in combat.
- The effectiveness of the E-IBCT systems is dependent upon the availability of production-representative JTRS radios and corresponding waveforms. This is a risk area for the program as the JTRS development and test and evaluation schedule currently lags the E-IBCT program by several months.
- Adequate operational testing of the E-IBCT requires a high fidelity Real Time Casualty Assessment (RTCA) system. The ability to adequately evaluate the force-level effectiveness and survivability of an IBCT equipped with E-IBCT systems is directly dependent upon such an RTCA.

Recommendations

- Status of Previous Recommendations. There are no previous recommendations.
- FY09 Recommendations.
  1. Recommendations specific to Class I UAS Block 0, NLOS-LS, and UGS are contained in detailed reports following this overview.
  2. The E-IBCT program should develop and implement a revised reliability growth plan for all E-IBCT systems which will ensure systems achieve reliability requirements by the start of the IOT&E scheduled for 4QFY11.
  3. The E-IBCT program should improve the line-of-sight communications range between the SUGV operator and the robotic vehicle. The SUGV communications range

requirement of 1,000 meters, if met, would be satisfactory for effective SUGV employment.

4. The Army should not execute the E-IBCT IOT&E until all radios in E-IBCT systems have received an Interim Authority to Operate (IATO), which verifies that these radios are ready for operation in combat.
5. The Army should review its test instrumentation development and procurement strategy to ensure than an adequate high fidelity RTCA system is available to support E-IBCT operational testing.

Early Infantry Brigade Combat Team (E-IBCT) Increment 1 Class I Block 0 Unmanned Aircraft System

Executive Summary

- The Army plans to acquire systems within the Early Infantry Brigade Combat Team (E-IBCT) program that were originally components of the Future Combat System (FCS) program. In June 2009, the Defense Acquisition Executive cancelled the FCS program and directed the Army to establish the E-IBCT Increment One as a separate acquisition program with a Milestone C decision scheduled for December 2009.
- Class I Block 0 Unmanned Aircraft System (UAS) is one of the planned E-IBCT Increment One capabilities and is the predecessor to the Class 1 UAS threshold capability currently under development.
- Results of FY09 testing will contribute to the DOT&E Operational Assessment of the Class I Block 0 UAS informing the E-IBCT Milestone C decision.

System

- The Class I Block 0 UAS design comes from the Defense Advanced Research Projects Agency developed gas Micro Air Vehicle.
- The Army intends to employ the E-IBCT Class I Block 0 UAS at the company/platoon level.
  - The system is intended to be man-portable in two custom Modular Lightweight Load-carrying Equipment packs weighing no more than 56 pounds each.
  - The flight time endurance is 40 minutes with a forward airspeed up to 40 knots.
  - The aircraft can be launched in winds up to 15 knots and once airborne, operates in winds up to 20 knots at an altitude of 500 feet above ground level with a range out to 4 km.
- The Class I Block 0 UAS consists of an aircraft with a five horsepower engine, a ground data terminal, an operator control unit, gimbaled payloads (electro-optical or infrared), avionics pod, and support equipment.
- The electro-optical pod and infrared pod payloads are interchangeable sensors. The Class I Block 0 Aircraft can carry one sensor at a time.

- The Class I Block 0 UAS takes off and lands vertically and once airborne uses both autonomous and manual flight mode navigation.

Mission

Companies and platoons employ the Class I Block 0 UAS to conduct reconnaissance, surveillance, target acquisition, and force protection missions in support of operations in open, rolling, and under canopy terrain, and in urban environments.

Prime Contractor

- Honeywell Aerospace Division, Albuquerque, New Mexico

Activity

- The Army plans to acquire systems within the E-IBCT program that were originally components of the FCS program. In June 2009, the Defense Acquisition Executive cancelled the FCS program and directed the Army to establish the E-IBCT Increment One as a separate acquisition program with a Milestone C decision scheduled for December 2009.
- The government and contractor jointly conducted developmental flight testing consisting of tethered and off tether reliability tests, software regressions tests, and Electromagnetic Environmental Effects (E3) test. The test team conducted confirmation testing, partial environmental

qualification testing, E3 radiated susceptibility tests, and payload and aircraft performance testing.
- The Army conducted three Technical Field Tests to assess performance of the Class I Block 0 systems integration by the test unit in a field environment.
- The Training and Doctrine Command conducted a Force Development Test and Evaluation to validate doctrine, organization, training, and leader development products.
- The Army conducted a Limited User Test (LUT) from August 25 through September 12, 2009. During the test a company, augmented by battalion elements, conducted offensive and defensive operations.
- In October 2009, the E-IBCT conducted additional reliability testing for the Class 1 Block 0 UAS in order to provide an additional assessment of system reliability.
- Results of the LUT and the additional reliability testing will provide the basis for the DOT&E Operational Assessment of the Class I Block 0 UAS informing the E-IBCT Milestone C decision. The Army conducted the testing in accordance with the DOT&E-approved Test and Evaluation Master Plan and test plan.

Assessment
- Class I Block 0 UAS performed well, but is not reliable. The air vehicle flight and sensor performance met most user requirements. Class I Block 0 UAS reliability demonstrated during the LUT is well short of user threshold requirements.
- The incorporation of gimbaled sensors has improved the effectiveness of the system.
- During the LUT, the Class 1 Block 0 UAS provided reconnaissance and surveillance support. The unit did not employ the system as a man-portable, "use on the move" system, as the Army requirements document intends. The battalion, to make better use of available resources and better support subordinate company operations, effectively consolidated all UAS resources under battalion control and employed them from "team airport," a centralized launch and recovery site.
- During the LUT, there were two occasions when the aircraft fuel bladders burst during refuel operations. This is a known suitability issue of the current manual syringe pump refueling system. To address this issue, the Army has developed an electric fueling system, is competing qualification testing of that system, and intends to deliver this capability to the field as part of the system in FY10.
- Images taken by the Class I Block 0 are truncated to facilitate passage through the "network" via the Network Integration Kit (NIK) and are not usable when received at the battalion tactical operations center. Transmission times for images passing through the NIK are sometimes significant – up to 24 hours – depending on the saturation of the network. Even though this network issue is not a Class I Block 0 system shortcoming, it does hamper the effectiveness of the unit equipped with this UAS capability.
- The Army has not reduced the acoustic signature of the aircraft. The Class 1 Block 0 UAS can be heard and seen from 2 and 4 km away respectively.
- Reliability and durability of the aircraft continues to be poor.

Recommendations
- Status of Previous Recommendations. The Army addressed two of the four FY08 recommendations.
- FY09 Recommendations. The Army should:
  1. Review manpower, training, resource requirements, and commensurate air vehicle capabilities to ascertain if assigning the Class 1 Block 0 systems as a battalion asset, as demonstrated in the LUT, rather than a company/platoon level asset would be more effective and suitable.
  2. Consider including the One System Remote Video Terminal as part of the system for use by maneuver leaders to receive "real time" and quality images until network passing of the images is satisfactory.
  3. Reduce the acoustic and visual signature of the aircraft to improve aircraft and unit survivability and system effectiveness.
  4. Improve the reliability and durability of the aircraft.
  5. Consider including an expansion valve for the fuel bladder.
  6. Consider reducing the weight of the electric fueling system, currently weighing 20 pounds, so that it may be included in the backpack configuration and replace the syringe refuel system.

Early Infantry Brigade Combat Team (E-IBCT) Increment 1 Non-Line-of-Sight Launch System (NLOS-LS)

Executive Summary

- The program shifted their low-rate initial production (LRIP) decision from December 2009 to April 2010 in order to correct deficiencies identified in early flight tests and due to hardware production delays.
- The program has conducted nine of 18 Army government developmental Precision Attack Missile flight tests. Five flights revealed failures that the program manager is addressing.
- The Container Launch Unit (CLU) is meeting its Early Infantry Brigade Combat Team (E-IBCT) Increment 1 reliability requirements. The Precision Attack Missile (PAM) is below its E-IBCT Increment 1 reliability requirements.
- The E-IBCT Increment 1 Limited User Test (LUT) demonstrated that the Non-Line-of-Sight Launch System (NLOS-LS) requires further testing in order to meet Army requirements before fielding to units employed in combat. NLOS-LS cannot be fully assessed until completion of the Flight LUT in 2QFY10.
- The program is making progress, but continues to be schedule driven leading up the NLOS-LS Flight LUT in 2QFY10 and the LRIP decision in 3QFY10.

System

- The XM501 NLOS-LS is an E-IBCT, Increment 1 program the Army intends to field to Infantry Brigade Combat Teams.
- The NLOS-LS consists of a 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 PAMs.
- 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, moving, or stationary targets 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 its 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 E-IBCT Increment 1, Soldiers communicate with the missile, through the CLU, using the Advanced Field Artillery Tactical Data System. When the full network is complete for the IOT&E, Soldiers will communicate directly with the missile from a variety of nodes.

Mission

The E-IBCTs will use NLOS-LS sections, composed of six CLUs, transported on three Family of Medium Tactical Vehicles, and a Control Cell located within the E-IBCT 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 NetFires LLC, Dallas, Texas
- Raytheon Missile Systems, Tucson, Arizona

Activity

- In May 2009, the program shifted their LRIP decision from December 2009 to April 2010 in order to correct deficiencies identified in early flight tests and due to hardware production delays.
- The program manager has conducted nine of 18 Army government developmental PAM flight tests and one Navy government developmental PAM flight test at White Sands Missile Range (WSMR), New Mexico, between November 2008 and November 2009. The flights demonstrated the PAM's capability to launch, fly a pre-designated route, track moving and stationary targets with its seeker, receive In-Flight Target Updates, and impact a target. The flights revealed a number of deficiencies. All deficiencies have been addressed, except for a launch failure during the Navy test, caused by a short in a cable coupling. The project office has a short-term fix to allow flight testing to continue, but has not developed a long-term solution.
- The program intends to complete the remaining government developmental PAM flight tests by December 2009. The program will fire six PAMs at WSMR and three PAMs at the Cold Region Test Center, Fort Greely, Alaska. These remaining flight tests will include PAMs with warheads, moving targets, and an engagement close to the maximum range of 40 km.
- Soldiers from the Army Evaluation Task Force tested the NLOS-LS during the E-IBCT Increment 1 LUT in September 2009 at WSMR. NLOS-LS tactics, techniques, and procedures and CLU reliability were the focus of the test.
- The program will execute a Flight LUT at WSMR, beginning in January 2010, to examine a unit's ability to employ the NLOS-LS and execute their doctrinal mission under realistic operational conditions. Six fully tactical rounds will be fired against threat targets. The test results will be used to support the LRIP decision scheduled for April 2010.

Assessment

- The program is making progress, but continues to be schedule driven leading up the NLOS-LS Flight LUT in 2QFY10 and LRIP decision in 3QFY10. The recent successes indicate the program manager appears to have fixed the deficiencies discovered early, but more complicated flight tests with sensors and warheads as well as environmental conditioning remain. The schedule driven flight tests leave little chance for reliability growth should the program discover additional deficiencies in the remaining developmental flight tests.
- The E-IBCT Increment 1 LUT demonstrated that the NLOS-LS requires further testing in order to meet Army requirements before fielding to units employed in combat. NLOS-LS cannot be fully assessed until completion of the Flight LUT in 2QFY10.
- The CLU is currently meeting its E-IBCT Increment 1 reliability requirements. As of September 2009, the CLU has demonstrated it can operate 259 hours before a system abort exceeding the Increment 1 requirement of 125 hours.
- The PAM is below its planned reliability growth curve that is designed to meet its requirement after the IOT&E. As of September 2009, there have been eight successes in 13 flights (62 percent success). The Increment 1 requirement following the IOT&E is 85 percent.
- Based on demonstrated performance in developmental testing, completion of the planned Flight LUT and the ongoing developmental test flight series and modeling is needed to evaluate the operational performance of the PAM infrared seeker.
- Developmental testing and modeling conducted to date indicates PAM is meeting its lethality requirements against armored targets. More testing is needed to determine PAM effectiveness against non-armored targets.
- The Army incorporated Soldier feedback in the design of the CLU and is applying their input to the production representative NLOS-LS systems for easier use in a combat environment.

Recommendations

- Status of Previous Recommendations. The Army addressed DOT&E's FY08 recommendation to increase the developmental test flight test window by delaying tests when known problems were not fixed. The Army also included countermeasured targets in two additional flight tests.
- FY09 Recommendations. The Army should:
  1. Implement the Lessons Learned from the E-IBCT LUT and NLOS-LS Flight LUT. Apply the corrective actions before fielding the NLOS-LS to combat.
  2. Continue the test-analyze-fix strategy to the PAM flight test program.

Early Infantry Brigade Combat Team (E-IBCT) Increment 1 Unattended Ground Sensors (UGS)

Tactical-Unattended Ground Sensor (T-UGS)

Urban-Unattended Ground Sensor (U-UGS)

Executive Summary

- In 2009, the contractor conducted three Technical Field Tests (TFTs), an Early Infantry Brigade Combat Team (E-IBCT) Force Development Test and Evaluation (FDT&E), and a Limited User Test (LUT) for the Tactical-Unattended Ground Sensor (T-UGS) and the Urban-UGS (U-UGS).
- Based on lessons from 2008 tests, 2009 improvements included a new form factor (NFF) as well as a Range Extension Repeater for the T-UGS, and a Leader Display and Control Device (LDAC) for the U-UGS.

System

- E-IBCT Increment 1 has two unattended ground sensors, T-UGS and 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 tactical 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 tactical network via a hand-held gateway.
- The program modified the T-UGS and U-UGS based upon performance in 2008 testing by the addition of a LDAC device – a handheld device to display U-UGS images – and a Range Extension Repeater – a radio relay device to extend the communications range from the T-UGS field to the High Mobility Multi-Wheeled Vehicle (HMMWV)-mounted Network Integration Kit.
- A new form-factor T-UGS (NFF T-UGS) was introduced into the last TFT in late July. A limited number of NFF T-UGS were also available for employment during the LUT.

Mission

Infantry companies and platoons use UGS to provide remote perimeter defense, surveillance, target acquisition, situational awareness, and detection of radiological and nuclear contamination.

Prime Contractor

- Textron Defense Systems, Wilmington, Massachusetts

Activity

- During the summer of 2009, the contractor conducted a series of three TFTs at White Sands Missile Range, New Mexico. The TFTs were developmental tests executed under field conditions and were designed to assess the level of technical maturity for all E-IBCT systems, including T-UGS and U-UGS. The Army's Training and Doctrine Command conducted an E-IBCT FDT&E in August 2009 at Fort Bliss, Texas. The purpose of the FDT&E was to develop tactics, techniques, and procedures for employment of E-IBCT systems, including T-UGS and U-UGS.
- The Army Test and Evaluation Command executed a LUT, the first operational test of T-UGS and U-UGS, at Fort Bliss, Texas, in August and September 2009. During the LUT, a company-size unit equipped with both current form factor and NFF T-UGS and the U-UGS executed a series of offensive, defensive, and stability missions during four 96-hour scenarios. The results of the LUT will be used to inform the T-UGS and U-UGS Milestone C decision.

- In October 2009, after the LUT, the program conducted additional reliability testing for the NFF T-UGS and the U-UGS with LDAC.

Assessment

- During TFTs, the demonstrated reliability for U-UGS and T-UGS was poor. The Army Test and Evaluation Command-calculated maximum growth potential for T-UGS and U-UGS is below the current threshold reliability requirements. Shortfalls in meeting reliability requirements may adversely affect the U-UGS' and T-UGS' overall operational effectiveness and suitability and increase life-cycle costs.
- Based upon the analyses of the results from the LUT, the T-UGS and U-UGS require further development before IOT&E or fielding. Both systems demonstrated poor communications connectivity, inadequate transmission ranges, poor image quality, and frequent system failures.
- The program plans to implement a number of configuration changes prior to LUT 2, scheduled for the summer of 2010. In particular, operational testing to date has been conducted with early prototype Joint Tactical Radio System (JTRS) or surrogate radios. This has precluded the ability to conduct an evaluation of the T-UGS and U-UGS operating in a secure tactical network against potential threat information operations, such as electronic warfare. This will be a necessary condition for LUT 2.
- The effectiveness of the T-UGS and U-UGS is dependent upon the availability of production-representative JTRS radios and corresponding waveforms. This is a risk area for the program as the JTRS development and Test and Evaluation schedule currently lags the E-IBCT program by several months.

Recommendations

- Status of Previous Recommendations. The Army addressed the previous recommendations.
- FY09 Recommendations. The Army should:
  1. Execute the planned reliability growth programs for T-UGS and U-UGS.
  2. Continue development and testing to improve UGS reliability and effectiveness.

Excalibur XM982 Precision Engagement Projectiles

Executive Summary

- Paladin-equipped units in Operation Iraqi Freedom (OIF) have been using Excalibur since May 2007 to engage targets. As of October 2009, Field Artillery units have fired more than 76 rounds with reported accuracy better than 10 meters and 88 percent reliability.
- M777A2 Lightweight 155 mm Howitzer-equipped artillery units have been using Excalibur in Operation Enduring Freedom (OEF) since February 2008. As of October 2009, they have fired 38 projectiles with 82 percent reliability.
- Increment Ia-2 has demonstrated its effectiveness in GPS jamming and unjammed environments. It exhibits lower reliability at extreme cold and maximum propellant charges.
- The Army expects Excalibur to meet its reliability requirement before achieving Initial Operational Capability in September 2010.

System

- Excalibur is a family of precision-guided, 155 mm artillery projectiles.
- The Army is developing the High Explosive, Unitary Projectile (Increment I) in three spirals of increasing capability (Ia-1, Ia-2, and Ib).
- 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 and Ib projectiles add base bleed technology to further increase range to beyond 30 km.
- All variants use GPS and an Inertial Measurement Unit (IMU) to attack point targets with accuracy of less than 20 meters from the desired aim point.

Mission

- Field 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 to minimize collateral damage.

Prime Contractor

- Raytheon Missile Systems, Tucson, Arizona

Activity

Increment Ia-1

- The Army halted fielding of the FY07 production projectiles to OIF and OEF after a projectile flew back toward the firing position during a November 2008 Lot Acceptance Test.
- Units in OIF and OEF continued to use Increment Ia-1 rounds from the FY06 production lots, which were not affected by the safety problem in the FY07 lots.
- The Army isolated the FY07 lot deficiency to the IMU. The project manager selected a new IMU vendor and conducted a Design Verification Test in May 2008 and a Production Verification Test 2 in July 2009 to qualify the new IMU vendor and test corrective actions for additional failure modes.
- The Army resumed shipment of Increment Ia-1 projectiles to OIF and OEF in September 2009 following replacement of IMUs in all FY07 production lots.
- Paladin-equipped units in OIF have been using Excalibur since May 2007 to engage targets. As of October 2009, Field Artillery units have fired more than 76 rounds with reported accuracy better than 10 meters and 88 percent reliability.
- M777A2 Lightweight 155 mm Howitzer-equipped artillery units have been using Excalibur in OEF since February 2008. As of October 2009, they have fired 38 projectiles with 82 percent reliability.

Increment Ia-2

- In April 2009, the Army fired two Excalibur Increment Ia-2 projectiles at White Sands Missile Range, New Mexico, in the Guided-Gunfire 5 test. Both projectiles failed.
- Between April and July 2009, the Army fired 28 Increment Ia-2 projectiles in the second Sequential Environmental Test for Performance series at ranges from 9 to 35 km. GPS jamming was present for 26 of the 28 projectiles and the average miss distance from the aim point was less than 10 meters. Twenty-one projectiles performed properly resulting in 70 percent reliability in the test. Representative light material and plywood roof targets were used to provide additional data for the lethality evaluation.
- The Army has assessed Increment Ia-2 reliability at 81 percent following partial demonstration of the corrective actions for the failure modes common with Increment Ia-1 in the Design Verification Test and Production Verification Test 2 tests.
- The Army has scheduled additional testing for November and December 2009 to demonstrate additional corrective actions and build confidence in the corrective actions applied to Increment Ia-1.
- The Army postponed the Initial Operational Test until February 2010 due to a change in test unit and to ensure 85 percent reliability.

Increment Ib

- In September 2008, the Army awarded design and maturation contracts for full and open competition for Excalibur Increment Ib to reduce unit cost and improve reliability. The companies will evolve their proposed concepts then demonstrate them in a side-by-side live firing event in 2QFY10. The Army will then select a single contractor to move forward with the qualification and initial production of the Increment 1b projectile.

Assessment

- Fielding Excalibur to artillery units in OIF in 2007 and OEF units in February 2008 has enhanced their ability to strike targets precisely while minimizing collateral damage. Increment Ia-1 has proven effective in combat even with limitations on its operational employment and less than required reliability. The new IMU resolved the safety issues with the FY07 lot.
- In developmental testing, the Excalibur Increment Ia-2 projectile demonstrated effectiveness against personnel, light material, and structure targets in jammed and unjammed environments.
- The program has identified reliability problems with Excalibur Increment Ia-2 in extreme cold (-45 degrees Fahrenheit) and when using the highest propellant charge (Modular Artillery Charge System zone 5). The Army expects the projectile to meet the reliability requirement before achieving its Initial Operational Capability in September 2010.

Recommendations

- Status of Previous Recommendations. The Army is making progress on DOT&E's previous recommendations.
- FY09 Recommendations. The Army should:
  1. Assess the operational impacts of Excalibur Increment Ia-2 if it does not achieve the reliability threshold requirements.
  2. Continue efforts to improve Excalibur reliability with Increment Ib.
  3. Articulate a credible lethality evaluation.

Extended Range Multi-Purpose (ERMP) Unmanned Aircraft System (UAS) Quick Reaction Capability

Executive Summary

- In response to the Secretary of Defense's directive to increase intelligence, surveillance, and reconnaissance support in Iraq and Afghanistan, the Army is deploying two early versions of the Extended Range Multi-Purpose (ERMP) Unmanned Aircraft System (UAS) for operational use.
- Deployment of the ERMP Quick Reaction Capability 1 and 2 (QRC 1 and 2) is taking place prior to completion of IOT&E and the full-rate production decision. The QRC 1 unit completed deployment in August 2009. The Army plans to test the QRC 2 capability in May and June of 2010 and deploy the QRC 2 unit in August 2010.
- The Army conducted testing of QRC 1 capability in conjunction with training for unit deployment to Iraq.
- DOT&E completed an Early Fielding Report in September 2009, assessing the QRC 1 unit's ability to accomplish its wartime mission and its performance demonstrated in testing.

System

- The QRC UAS is an early version of the ERMP UAS program of record system.
- The QRC unit has 17 military personnel and 24 Contractor Field Service Representatives.
- The ERMP QRC 1 system consists of the following major components:
  - Four unmanned aircraft each with an electro-optical/infrared, with a Laser Range Finder/Laser Designator, sensor payload
  - Two Ground Control Stations designated as the One System Ground Control Station
  - Two Tactical Common Data Links/Ground Data Terminals
  - One Satellite Communications Ground Data Terminal
  - One General Atomics "Legacy" Ground Control Station with two C-Band Ground Data Terminals
- The QRC 1 system uses the legacy MQ-1 Predator Ground Control Station for all ground and maintenance operations and in case of emergency, loss of data link, or malfunction of the Automated Take-off and Landing System.
- The QRC 1 platoon did not deploy to Iraq with a Synthetic Aperture Radar/Ground Moving Target Indicator capability. The Army intends to add this capability as an in-theater upgrade.

Mission

- The QRC 1 unit is to provide reconnaissance, surveillance, target acquisition, and communications relay 22 hours per day to the supported Army Division, based on the Division commander's priorities and scheme of maneuver.
- The QRC 1 unit can participate in cooperative attack missions using the laser designator.

Prime Contractor

- General Atomics Aeronautical Systems, Inc., Aircraft Systems Group, Poway, California

Activity

- In response to the Secretary of Defense's directive to increase intelligence, surveillance, and reconnaissance support in Iraq and Afghanistan, the Army is deploying two early versions of the ERMP UAS for operational use.
- Deployment of the ERMP Quick Reaction Capability 1 and 2 (QRC 1 and 2) is taking place prior to completion of IOT&E and the full-rate production decision. The QRC 1 unit completed testing in FY09 and completed deployment in August 2009. The Army plans to test the QRC 2 capability in May and June of 2010 and deploy QRC 2 unit in August 2010.

- The Army conducted testing of QRC 1 in accordance with the DOT&E-approved Test and Evaluation Master Plan and test plan.
- The Army conducted a Product Manager for Medium Altitude Endurance UAS sponsored Customer Test, which included 106 flight hours and 30 missions. The Army Operational Test Command conducted the test at the contractor's facility in El Mirage, California, with reconnaissance, surveillance, and target acquisition missions flown over nearby Edwards AFB, California.
- The Army performed system-level Climatic and limited Air Vehicle Electromagnetic Environmental Effects testing on the QRC and the ERMP program of record system.
- Ongoing Engineering Development Testing of the program of record system includes contractor subsystem and system-level testing and interoperability testing.
- DOT&E completed an Early Fielding Report in September 2009 assessing the QRC 1 unit's ability to accomplish its war time mission and its performance as demonstrated in testing. The report was used as the basis for DOT&E input into the upcoming ERMP program of record Milestone C decision scheduled for February 2010.

Assessment

- The Customer Test was an excellent example of combining training and testing to support a rapid fielding initiative.
- The unit effectively employed the system during the Customer Test. Based on test results, the unit will provide an increased reconnaissance, surveillance, target acquisition capability.
- During the Customer Test, the aircraft and sensor payload met reliability requirements. Use of the redundant Legacy Ground Control Station offset poor Ground Control Station reliability. Overall QRC 1 system availability observed during testing met requirements.
- The QRC 1 unit was able to successfully complete missions using line-of-sight Tactical Common Data Links in spite of incomplete development and integration of the ERMP system. The ability to encrypt the Tactical Common Data Link to support secure communications is in development.
- Development of the Satellite Communications data link between the Ground Control Station and the aircraft is not complete. The unit was not able to demonstrate beyond line-of-sight connectivity during test.
- The Communications Relay Package was capable of providing non-secure and secure radio communications between two ground-based radio systems with limited range. The QRC unit was not able to use the Communications Relay Package to establish secure communications between the Ground Control Station and any other station.
- The QRC 1 unit demonstrated effective target detection and recognition capability using the electro-optical/infrared sensor with Laser Range Finder/Designator payload. The measured mean target location error of 31 meters (taken from 53 target reports) did not meet the 25 meter requirement. This could decrease the effectiveness of precision munitions engagements.
- During testing, the unit conducted a total of 15 notional Hellfire or artillery engagements. The crews did not employ live ordnance during the Customer Test or in the training preceding the test. The QRC 1 unit conducted the notional cooperative engagements correctly, except for three occasions where procedural mistakes might have resulted in errant Hellfire or artillery fire.
- The design of the Ground Control Station shelter has a number of conditions that reduce operator efficiency and increases operator stress and fatigue.
  1. The payload video is presented to the payload operator on a small 6 x 7 inch window that cannot be adjusted/enlarged without removing all other data elements from the computer screen. This small field of view makes it difficult to conduct reconnaissance tasks and identify targets.
  2. The air conditioning vents located above and behind the operators blast cold air on the heads and necks of the operators. Because the air conditioner must be operated at all times to keep the avionics (which are in front of the operators) cool, the operators wear skull caps, gloves, and jackets to stay warm, even when the outside temperatures exceed 95 degrees Fahrenheit.
  3. The workspace allotted to each operator is limited. Operators reported inadequate space for manuals, checklists, mission orders, personal equipment, and legroom.
  4. All operators share the three headsets that come as subcomponents of the Ground Control Station. The headset microphone is directly in front of the operator's mouth collecting germs. Several of the operators got sick during the Customer Test, perhaps as a result of sharing these headsets and/or the blowing cold air described above.

Recommendations

- Status of Previous Recommendations. This is the first annual report for this program.
- FY09 Recommendations. The Army should:
  1. Complete system qualification and QRC unit training for cooperative engagements with helicopters with Hellfire missiles, and artillery "call for fire" missions with an artillery unit with live rounds before use in combat.
  2. Complete development and integration of more reliable secure Tactical Common Data Links and Satellite Communications links for Ground Control Station operations.
  3. Improve the Ground Control Station reliability and implement the Ground Control Station reliability growth program. Improve the Ground Control Station shelter design.
  4. Fix the Communications Relay Package system so that it works in both secure and non-secure modes at the required operational ranges.

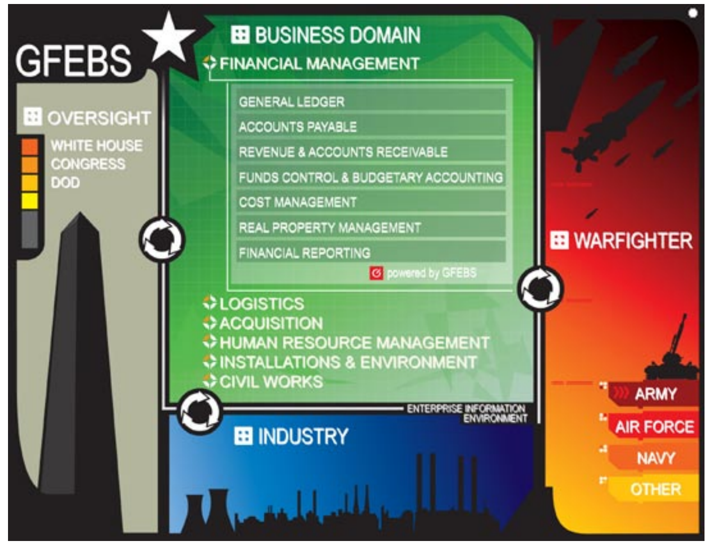
General Fund Enterprise Business System (GFEBS)

Executive Summary

- The Army Test and Evaluation Command (ATEC) completed a Limited User Test (LUT) of Release 1.2 in November and December of 2008. The primary objective of the LUT was to assess system maturity to support a Milestone C review and to identify areas requiring improvement prior to the IOT&E of Release 1.3.
- The LUT results showed that six of nine critical business process areas met the 95 percent success rate requirement. Accounts Payable at 80 percent, Cost Management at 82 percent, and Revenue and Accounts Receivable at 75 percent did not meet the requirement and needed improvement.
- The system met all availability, reliability, and maintainability requirements.
- The LUT demonstrated that training improvements were needed. A majority of users were not confident of their skills to operate the system after receiving the training. Inadequate supervisor training resulted in improper user role assignment and subsequent training for the users.
- The Threat Computer Network Operations team conducted penetration, exploitation, and attack activities against the system and identified significant Information Assurance vulnerabilities.
- ATEC also conducted an IOT&E of Release 1.3 in June through August 2009 to support a full-fielding decision of Release 1.3. The IOT&E data analysis is ongoing. The assessment will not be completed until after the completion of additional testing activities scheduled for November 2009.

System

- The General Fund Enterprise Business System (GFEBS) is a Major Automated Information System for administering and managing the Army's general funds.
- GFEBS is designed to provide web-based real-time transactions and information accessible by all Army organizations worldwide, including the Army National Guard and the Army Reserve.
- GFEBS is intended to allow the Army to meet the requirements of the Federal Financial Management Improvement Act of 1996 and the Defense Finance and Accounting Service Guide to Federal Requirements for Financial Management Systems (the Blue Book).
- GFEBS will be developed in four software releases:
  - Release 1.1, which provides Real Property Inventory functionality, was developed for a technology demonstration only and will not be fielded.



  - Release 1.2, the first fieldable release, was developed for a limited deployment at Fort Jackson, South Carolina, to replace the legacy Standard Finance System (STANFINS).
  - Release 1.3 will provide full STANFINS capability, including the Army National Guard and Army Reserve requirements.
  - Release 1.4 will provide the full capability of the legacy Standard Operations and Maintenance Army Research and Development System.

Mission

- Army financial managers will use GFEBS to compile and share accurate, up-to-the-minute financial management data across the Army.
- The Army and DoD leadership will use GFEBS to access vital, standardized, real-time financial data and information to make sound strategic business decisions that have a direct and positive impact on the warfighter.
- The Army will use GFEBS' capabilities to satisfy congressional and DoD requirements for auditing of funds, standardization of financial ledgers, timely reporting, and reduction in costly rework.

Prime Contractor

- Accenture, Reston, Virginia

Activity

- ATEC completed a LUT of Release 1.2 from November 3 through December 12, 2008, in accordance with the DOT&E-approved Test and Evaluation Master Plan (TEMP) and Operational Test Plan, at Fort Jackson, South Carolina; Indianapolis, Indiana; Fort McPherson, Georgia; Redstone Arsenal, Alabama; and Washington, D.C.
- ATEC also completed an IOT&E of Release 1.3 from June 29 through August 7, 2009, in accordance with the DOT&E-approved TEMP and Operational Test Plan at Fort Stewart, Georgia; Fort Benning, Georgia; Fort Jackson, South Carolina; Fort Monroe, Virginia; Indianapolis, Indiana; Rome, New York; Fort McPherson, Georgia; and Washington, D.C.

Assessment

- The primary objective of the Release 1.2 LUT was to assess system maturity to support a Milestone C review and to identify areas requiring improvement prior to the IOT&E of Release 1.3.
- Test results showed that six of nine critical business process areas met the 95 percent success rate requirement. Accounts Payable at 80 percent, Cost Management at 82 percent, and Revenue and Accounts Receivable at 75 percent did not meet the requirement and needed improvement.
- During the LUT, the system achieved 99.5 percent availability, which met the 97 percent requirement. The system also met the reliability and maintainability requirements by achieving a Mean Time Between Failures of three weeks against a two-week requirement and a Mean Time To Repair of 2.46 hours against a three-hour requirement.
- The LUT demonstrated that training improvements were needed. A majority of users were not confident of their skills to operate the system after receiving the training. Inadequate supervisor training resulted in improper user role assignment and subsequent training for the users.
- The integrated logistics support policies and procedures were adequate for the system administrators and users.
- The Threat Computer Network Operations team conducted penetration, exploitation, and attack activities against the system and identified significant information assurance vulnerabilities.
- The IOT&E data analysis is ongoing. The assessment will not be completed until after the completion of additional testing activities scheduled for November 2009.

Recommendations

- Status of Previous Recommendations. The program has made satisfactory progress on four of five previous recommendations. The remaining previous recommendation on training improvement is still valid and requires additional attention.
- FY09 Recommendations. None.

Joint Cargo Aircraft (JCA)

Executive Summary

- The Joint Cargo Aircraft (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 to L-3 Communications (prime contractor).
- Resource Management Decision 802 transferred the JCA program to the Air Force. A new acquisition strategy is in progress, and the Test and Evaluation Master Plan has been revised and is in the approval cycle.
- The Army will remain as the lead Service during the remainder of the work until full-rate production.
- 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 JCA should occur in 2QFY11.
- The JCA LFT&E program has an aggressive schedule, but is executing well and results are expected to be included in the Beyond Low-Rate Initial Production report.

System

- 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 is to be capable of self-deployment to theater.
- 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

- Air Force 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 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 Contractor

- L-3 Communications Integrated Systems, L.P, Greenville, Texas

Activity

- The prime contractor delivered the first C-27J to the Army for testing in September 2008, followed by the second aircraft in November 2008. Both deliveries were on time.
- JCA LFT&E began in September 2008, with the armor system being the first to test. Oxygen systems, flight controls, propeller, and wing hydrodynamic ram tests are complete. Wing iron bird dry bay fire testing is underway. All Live Fire testing is scheduled to be completed in March 2010.
- The JCA LFT&E sub-system test series began in September 2008. Sub-system tests completed during FY09 include armor, oxygen systems, flight controls, propeller, Wing Hydrodynamic Ram, Wing Iron Bird, Wing Dry Bay Fire, and man-portable air defense system. Engine nacelle tests will be completed in December 2009. The flare dispenser vulnerability analysis is complete and the overarching Ballistic Vulnerability Analysis will be completed in July 2010. Remaining final test reports will be completed by 2QFY10.
- Government Production Qualification testing began in October 2008 with an infrared signature measurement test, followed by electromagnetic environmental effects, airdrop, and interoperability testing. Aircraft survivability equipment testing is scheduled to start in September 2009.
- Production Qualification airdrop testing identified shortcomings in the hung jumper retrieval system and door jump platform. This has delayed full qualification of static line jumps.

- 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 schedule to finish the remaining Production Qualification testing and enter MOT&E has been very aggressive.
- Any additional items that delay testing or force additional testing will likely result in a slip in MOT&E, putting pressure on the full-rate production decision date.
- The program is operating under a post-Milestone C Test and Evaluation Master Plan, which does not reflect the current acquisition status of the program, wherein the Air Force will possess all C-27J aircraft.
- The threat models used to evaluate survivability equipment have not been validated, verified, or accredited.
- The Class 2 pilot training scheduled to commence in 1QFY10 is the program manager's stated critical path to starting MOT&E.
- The MOT&E consists of operationally-realistic missions, aircrews, and support. Operational test missions will include time-sensitive combat delivery to austere airfields, aerial delivery of cargo and personnel, medical evacuation, and troop resupply. The MOT&E is scheduled to begin in April 2010.
- Contracting issues slowed the start of LFT&E, but the team recovered well and is close to completing all ballistic testing.
- Ballistic testing demonstrated that the JCA wing is vulnerable to dry bay fire in the wing leading and trailing edges.
- The Live Fire program is on schedule for completion in 2QFY10.

Recommendations

- Status of Previous Recommendations. The program is addressing the two FY08 recommendations.
- FY09 Recommendation.
  1. The program must accredit all threat models for use of results in the evaluation of aircraft survivability.

Land Warrior

Executive Summary

- The Army approved an Operational Needs Statement to support the fielding of Land Warrior to the 5th Brigade 2nd Infantry Stryker Brigade Combat Team (5/2 SBCT).
- The program manager added a commercial GPS to Land Warrior.
- The Army Test and Evaluation Command (ATEC) conducted developmental testing of Land Warrior.

System

- Land Warrior is an integrated combat fighting system used by dismounted combat Soldiers on the networked battlefield. It includes a laser rangefinder; visual displays; integrated load carrying equipment with ballistic protection; protective clothing; a display; a headset consisting of a speaker and a microphone; a radio; an enhanced computer; navigation tools; computer software that integrates mission data support products; and a Stryker vehicle installation kit. It has two variants: the original version, Land Warrior-Manchu, was fielded to and deployed with the 4th Battalion, 9th Infantry in 2007; the current version, Land Warrior-Strike, was fielded to and deployed with 5/2 SBCT in 2009.
- There are two configurations of the Land Warrior-Strike: Squad Leader and above, and Team Leader. The Squad Leaders' configuration has the Navigation Sub System (NSS) Selective Availability Anti-Spoofing Module (SAASM) in addition to a commercial GPS, while the Team Leaders' configuration has the commercial GPS.
- The new Land Warrior-Strike Team Leader configuration weighs 7.28 pounds due to the removal of the NSS SAASM. The Squad Leader's configuration is 9.9 pounds, similar to the weight of the earlier Land Warrior-Manchu configuration.
- The Army continues to field Land Warrior to Stryker units, from Infantry Company to fire team level, of the 5th Brigade, 2nd Infantry in preparation for their deployment to Afghanistan.

Mission

- Infantry units will use Land Warrior to provide increased situational awareness and enhanced communications to increase their ability to close with and engage the enemy to defeat or capture him, or to repel his assault by fire, close combat, and counter-attack.
- Infantry units will use Land Warrior to:
  - Enhance small unit leaders' situational awareness through leader icon emplacement into the Force XXI Battle Command Brigade-and-Below (FBCB2) network
  - Provide voice communications between companies, platoons, and squads
  - Enhance collaborative mission planning

Prime Contractor

- General Dynamics C4 Systems, Scottsdale, Arizona

Activity

- The Army approved an Operational Needs Statement to field the Land Warrior system to the 5/2 SBCT.
- The Army deployed the Land Warrior system with the 5/2 SBCT to Operation Enduring Freedom in July 2009.
- The Land Warrior system has undergone several modifications since the previous deployment. The current configuration is known as Land Warrior-Strike. Key system changes include adding a commercial GPS in addition to the NSS SAASM GPS.
- ATEC conducted developmental testing on the Land Warrior-Strike configuration to include land navigation and reliability testing.
- The program manager conducted a week-long New Equipment Training exercise with each of the Stryker companies equipped with Land Warrior-Strike with the 5/2 SBCT at Fort Lewis, Washington.

Assessment

- The Land Warrior has improved its reliability during the deployment of the 4th Battalion, 9th Infantry. Upgrades to the software corrected the high number of system failures identified early in the unit's deployment. Failures included lock-ups and freezes that required system reboots.

- The commercial GPS is the primary navigational mode for team leaders and the de-facto primary means for the squad leader due to the commercial GPS demonstrating better accuracy (10 meter average error) than the NSS SAASM GPS (15 meter average error). The impact of this has not been determined because no operational testing of Land Warrior-Strike has been conducted.
- The Enhanced Soldier Control Unit (eSCU) is not watertight. Testing indicates that exposing the eSCU to significant amounts of water (i.e., heavy rain, submersion) can result in failures in the eSCU.

Recommendations

- Status of Previous Recommendations. With the termination of the program in January 2007, and the supplemental funding used to purchase additional sets of Land Warrior, the Army was able to take action on the previous recommendation of increasing the life while decreasing the size of the battery.
- FY09 Recommendations.
  1. Before fielding to additional units, the Army should conduct an operational assessment with an electronic warfare threat to adequately access the effectiveness of Land Warrior-Strike.
  2. Units need to be trained on how to recognize GPS jamming and spoofing. Tactics, techniques, and procedures need to be developed on how to recover and resume operating in one of the other navigation modes.
  3. Soldiers must take steps to protect their eSCU in rain or near water to avoid water induced problems with their systems.

M1128 Stryker Mobile Gun System (MGS)

Executive Summary
- The Army Test and Evaluation Command (ATEC) began conducting Engineering Change Order validation testing in May 2009 to verify material fixes and mitigations to address deficiencies identified both in the 2008 Secretary of Defense Report to Congress and by the Vice Chief of Staff of the Army (VCSA).
- The Army is working to correct additional deficiencies identified during the operational and live fire tests.
- DOT&E assesses that nine of the 23 deficiencies identified in the 2008 Secretary of Defense Report to Congress are mitigated or fixed either by material fixes or by tactics, techniques, and procedures (TTPs). Ten deficiencies still require validation and four deficiencies were not corrected.
- The 2008 Secretary of Defense Report to Congress directed that full-rate production of the Stryker Mobile Gun System (MGS) will not be approved until the identified deficiencies are corrected. The Army delayed the FY09 MGS procurement decision until not earlier than 2Q-3QFY10.
- The C-130 Transportability Key Performance Parameter is a design constraint that limits the MGS capabilities.

System
- The Stryker Family of Vehicles consists of two variants on a common vehicle platform: Infantry Carrier Vehicle (ICV) and the MGS. There are eight configurations of the ICV variant.
- The MGS was a separate acquisition decision because the system needed additional development.
- The MGS mission equipment includes the following:
  - M68A2 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 (RPGs). RPG protection is provided by add-on slat armor (high hard steel arranged in a spaced array).

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 Land Systems, Sterling Heights, Michigan

Activity
- The Army delayed the FY09 MGS procurement decision because an integrated configuration for RPG protection and reliability corrections will not be available for verification before 2Q-3QFY10. In 2008, the Secretary of Defense Report to Congress directed that full-rate production of the MGS will not be approved until the deficiencies identified in the report are corrected.
- In March 2009 the VCSA prioritized three additional deficiencies (trigger delay, reboot time, and gun tube stabilization) that had been identified by the Army Training and Doctrine Command and the Armor School (system proponent) as the users' top three MGS deficiencies that must

be mitigated. This raised the total number of deficiencies that must be corrected or mitigated to 23.
- ATEC conducted Engineering Change Order validation testing from January to October 2009 to verify material fixes and mitigations to address the three deficiencies identified as priorities by the VCSA.
- ATEC conducted a developmental test/operational test in July 2009. This event evaluated five fixes and seven TTPs that correct or mitigate 12 of the 23 identified deficiencies.
- The Army, in consultation with DOT&E, submitted reports to Congress in December 2008 and July 2009 updating the status of actions taken by the Army to mitigate all Stryker MGS deficiencies as directed in Section 115 of the Duncan Hunter National Defense Authorization Act for FY09.

Assessment
- The program has mitigated, by either material fixes or TTPs, nine of the 23 deficiencies identified in the 2008 Secretary of Defense Report to Congress or by the VCSA. Of the remaining 14 deficiencies, solutions for 10 deficiencies have been identified by the program, but the corrective actions have not yet been applied and evaluated. Four deficiencies – gun pod protection, low ammo sensor, hydraulic circuit separation for redundancy, inadequate ready load for 7.62 coaxial machine gun - have not been satisfactorily corrected.
- Integration of software version 2.3 reduced the incidence of trigger delay to a level accepted by the user. Integration of software 2.5 provided increased gun stabilization and reduced the number of gun tube strikes on the back deck of the vehicle. The MGS retained its boresight on the occasions that the gun tube did strike the back deck of the vehicle.
- The Abrams Commanders Display Unit is not susceptible to electromagnetic interference and provided better resolution to the vehicle commander than the original Amber Monochromatic Display Unit.
- Redundancy in the hydraulic circuit will potentially be accomplished through a redesign of the circuitry and will only be accomplished with the Stryker Modernization Program.
- In the 2007 Beyond Low-Rate Initial Production (BLRIP) Report, DOT&E assessed the MGS as not operationally effective in the degraded mode. The current protection of the gun pod meets the Operational Requirements Document Change One approved requirement, and is not anticipated to be upgraded by the program. DOT&E assesses that not upgrading gun pod protection increases MGS vulnerability and increases the likelihood of the MGS operating in a degraded mode.
- The C-130 Transportability Key Performance Parameter is a design constraint that limits the MGS capabilities. Because of size and weight constraints for transporting equipment on the C-130, there is a limitation on the size and weight of the MGS. This limit impacts several survivability deficiencies including the Commander's Weapon Station, protection of 105 mm ammunition, gun pod protection, and hydraulic circuit separation. These deficiencies will potentially be addressed as part of the Stryker Modernization Program with Milestone B planned for in FY11.

Recommendations
- Status of Previous Recommendations. The Army satisfactorily addressed five of the eight previous recommendations through either material fixes or the use of TTPs. The remaining recommendations merit additional emphasis.
- FY09 Recommendations. As part of our coordination with the Army as directed in Section 115 of the FY09 National Defense Authorization Act, DOT&E recommended:
  1. Continue to improve Mission Equipment Package Reliability and verify corrective actions during an operational gunnery event.
  2. Finalize configuration for Stryker Reactive Armor Tile (SRAT) and schedule live fire testing in order to validate the SRAT design and configuration.
  3. Increase gun pod protection.
  4. Develop an audio or visual cue to indicate low ammo to the gunner for the 7.62 mm coaxial machine gun.
  5. Continue to replace the Amber Monochromatic Display Unit with the Abrams Commanders Display Unit.
  6. Proceed with the Stryker Modernization Program to completely fix deficiencies identified in the 2007 BLRIP that require an integrated solution.

M1135 Stryker Nuclear, Biological, and Chemical Reconnaissance Vehicle (NBCRV)

Executive Summary

- The Army is conducting Reliability Growth Testing on the Stryker chassis to demonstrate improvement in reliability since IOT&E Phase I. Additional live fire testing is planned for FY10 to address threats and increased vulnerabilities, associated with the Army decision to issue Nuclear, Biological, and Chemical Reconnaissance Vehicles (NBCRVs) to support Heavy Brigade Combat Teams (BCTs) and develop a reactive armor kit for the system.
- The program manager has made progress in resolving failure modes that led to poor base vehicle reliability in IOT&E Phase I. Changes to the NBCRV configuration will continue to be made during the course of Reliability Growth Testing.
- The chemical, biological, radiological, and nuclear (CBRN) sensor suite and communication system are still experiencing failures. The sensor failure modes observed will impact operational effectiveness and should be resolved prior to IOT&E Phase II.
- IOT&E Phase II is planned for 4QFY10.

System

- The NBCRV is one of nine configurations of the Infantry Carrier Vehicle variant of the Stryker family of vehicles. Chemical, biological, and radiological sensors and communications are integrated with the Stryker vehicle to perform CBRN detection, identification, marking, sampling, and reporting of these hazards.
- The NBCRV's scalable armor provides ballistic protection against small arms, mines, and artillery fragments. The NBCRV has slat armor to protect against rocket-propelled grenade threats. The Army is developing a reactive armor kit for the NBCRV to increase survivability. The NBCRV is equipped with a filtering and over-pressure system that provides protection from CBRN threats.
- The CBRN mission equipment package includes the following:
  - Joint Biological Point Detection System
  - Joint Service Lightweight Standoff Chemical Agent Detector
  - Chemical and Biological Mass Spectrometer
  - Chemical Vapor Sampling and Storage System
  - NATO standard markers and deployment system
  - Automatic Chemical Agent Detector Alarm
  - Radiological detectors
- A NBCRV team consists of a Stryker NBCRV and a four person crew.
  - Stryker BCT has one platoon of three NBCRV teams
  - Heavy BCT has one squad of two NBCRV teams
  - Division or Corps Chemical Company has six NBCRV teams

Mission

CBRN reconnaissance units conduct route, zone, and area reconnaissance to determine the presence and extent of CBRN contamination using the CBRN reconnaissance techniques of search, survey, surveillance, and sampling. A CBRN reconnaissance unit, as part of an early entry combat force, is capable of limited independent operations.

Prime Contractor

- General Dynamics Land Systems, Sterling Heights, Michigan

Activity

- The Army conducted Reliability Growth Testing in FY09 to demonstrate improvement in reliability since IOT&E Phase I. Reliability testing will continue into FY10.
- Additional live fire testing is being planned for FY10 to address threats and increased vulnerabilities driven by the planned addition of a reactive armor kit and the Army decision to issue NBCRVs to support Heavy BCTs.
- IOT&E Phase II is planned for 4QFY10.

Assessment

- Data from Phase I of the Reliability Growth Testing indicates that the major base vehicle failure modes observed during IOT&E Phase I have been mitigated. The system contractor is working to address several new base vehicle failure modes that occurred during Phase I of the Reliability Growth Testing.
- The CBRN sensor suite and communication system are still experiencing failures. The sensor failure modes observed will impact operational effectiveness if they are not resolved prior to IOT&E Phase II.

Recommendations

- Status of Previous Recommendations. There are no outstanding previous recommendations.
- FY09 Recommendations.
  1. The program manager should ensure failure modes identified during Reliability Growth Testing are resolved to improve system reliability and to reduce risk prior to the initiation of IOT&E Phase II. Due to configuration changes planned after the first two phases of Reliability Growth Testing, all three planned phases of Reliability Growth Testing should be conducted.
  2. The Army should include sufficient miles in IOT&E Phase II to evaluate operational reliability of the final configuration proposed for full-rate production.
  3. The program manager must submit an updated Test and Evaluation Master Plan for approval that addresses additional testing to be conducted.

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

Executive Summary

The Army conducted four major developmental Patriot flight tests and a Force Development Experiment (FDE) in 2009. The first guided test flight of the Patriot Advanced Capability-3 (PAC-3) Missile Segment Enhancement (MSE) interceptor failed to intercept when the second pulse of the rocket motor failed to fire. Post Deployment Build (PDB)-6.5 flight tests conducted in April and June 2009 were successful, while a July 2009 flight test was partially successful when two of the three interceptors failed to launch, but the third missile achieved a successful intercept.

System

- The Patriot system includes the following:
  - C-band phased-array radars for detecting, tracking, classifying, identifying, and discriminating targets
  - Battalion and battery battle management elements
  - 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 aircraft and missile threats
    - The newest version of the PAC-3 interceptor is the Cost-Reduction Initiative missile. In addition, the Army is developing the PAC-3 MSE missile with increased battlespace defense capabilities and an improved lethality enhancer.
    - Earlier versions of Patriot interceptors include the Patriot standard missile, the PAC-2 Anti-Tactical Missile (ATM), and the Guidance Enhanced Missile (GEM) family.
- Planned Medium Extended Air Defense System (MEADS) developments include the following:
  - 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 Missile and Fire Control, Dallas, Texas
- MEADS International, Inc., Orlando, Florida
- Raytheon Integrated Defense Systems, Tewksbury, Massachusetts

Activity

- The Army conducted the PDB-6.5 Developmental Test and Evaluation at White Sands Missile Range (WSMR), New Mexico, and at the Software Engineering Directorate, Redstone Arsenal, Huntsville, Alabama, in November and December 2008.
- The Army conducted the PDB-6.5 FDE at Fort Bliss, Texas, in May 2009. This test consisted of only a static phase of operations.

- During the first intercept attempt for the MSE missile (Flight Test 7-2) at WSMR in March 2009, Patriot fired one MSE interceptor at a ballistic missile target, but failed to intercept it.
- During PDB-6.5 flight test P6.5-4 at WSMR in April 2009, Patriot fired two PAC-3 missiles and successfully intercepted a short-range ballistic missile target with the first interceptor.
- During PDB-6.5 flight test P6.5-1 at WSMR in June 2009, Patriot fired a GEM missile that successfully intercepted a low-altitude cruise missile target in clutter.
- During PDB-6.5 flight test P6.5-3 at WSMR in July 2009, Patriot attempted to fire three interceptors against a subscale aircraft target. The first two Standard Patriot (MIM-104A) interceptors failed to launch. The third interceptor, a PAC-2 ATM, successfully intercepted the target. A flight test to retest the primary test objective using Standard Patriot interceptor missiles has been scheduled for December 2009 at McGregor Range, New Mexico.
- The next Patriot operational testing – the PDB-6.5 Limited User Test – is scheduled to occur during 1-2QFY10.

Assessment

- The Patriot system met most of the objectives during the PDB-6.5 Developmental Test and Evaluation; however, there were some incidents during the ground testing portion where Patriot misclassified targets, engaged targets that should not have been engaged, failed to engage targets that should have been engaged, or engaged targets with more interceptors than it should have. Also, during this testing, the Army could not test Mode 5 Identification, Friend or Foe (IFF) due to Federal Aviation Administration concerns regarding the Mode 5 IFF interrogators' ability to transmit Mode S waveforms. These air safety concerns were addressed by disabling this capability.
- The PDB-6.5 FDE deviated from the DOT&E-approved Patriot Test and Evaluation Master Plan due to funding and time constraints. Specifically, there were no maneuver or sustainment phases, which significantly limited the number of evaluation measures addressed. Out of 102 Patriot critical tasks, the Army validated 19, updated 19 with minor changes, rewrote 46, and was unable to test 18. These limitations precluded an adequate test of the changes to maintainability and a determination of any changes to the system's ability to meet its manpower and personnel integration requirements.
- During Flight Test 7-2, the MSE interceptor launched successfully, but the ignition safety device for the solid rocket motor second pulse failed to arm so it did not fire. The Army is investigating the cause of this failure, and plans to conduct a follow-on Flight Test 7-2A in January 2010. Doctrine dictates that Patriot fire two interceptors at ballistic missiles, but the Army had only one interceptor available for the 7-2 flight test.
- The Army collected all required data during flight tests P6.5-4 and P6.5-1 and the system met the objectives in these tests.
- The Army is investigating the causes of the launch failures of the two standard Patriot missiles during flight test P6.5-3. A retest is scheduled for December 2009 in conjunction with a Foreign Military Sales partner Field Surveillance Program flight test mission.

Recommendations

- Status of Previous Recommendations. The Army addressed one of the eight recommendations from FY08. The remaining seven recommendations merit additional emphasis.
- FY09 Recommendations. The Army should:
  1. Review the risks associated with not conducting all flight tests against ballistic missiles in accordance with published doctrine that requires the launch of two interceptors for each target.
  2. Plan to conduct an IOT&E prior to the MSE full-rate production decision.
  3. Prior to PDB-7 operational testing, conduct a robust FDE with static, maneuver, and sustainment phases to test 100 percent of the Patriot critical tasks.

Precision Guidance Kit (PGK)

Executive Summary

- DOT&E approved the Precision Guidance Kit (PGK) Milestone C Test and Evaluation Master Plan in August 2009.
- Throughout FY09, the program conducted a series of contractor tests on PGK Increment 1 focusing on PGK's reliability, mission processing, and accuracy.
- In October, the program updated the PGK Acquisition Program Baseline allowing more time prior to Milestone C to correct deficiencies identified during contractor testing. The program's Government Developmental Testing was rescheduled to 2QFY10 through 4QFY10. Milestone C will follow successful completion of developmental testing in 4QFY10.
- Should the program discover additional deficiencies in developmental testing, the program schedule may again be challenged.

System

- The PGK is a fuze that attaches to 155 mm artillery projectiles to improve the ballistic accuracy of the current stockpile of Field Artillery projectiles.
- The Army plans to develop PGK in three increments:
  - Increment 1: 155 mm High Explosive projectiles
  - Increment 2: 105 mm High Explosive projectiles
  - Increment 3: All 105 mm and 155 mm High Explosive and cargo projectiles
- All increments use GPS data to correct the projectiles range and azimuth when attacking targets. Increment 1 provides an accuracy of 50 meters or less from the desired aim point. The planned accuracy for Increments 2 and 3 is 30 meters or less.
- The PGK will operate with existing and developmental artillery systems that have digital fire control systems and inductive fuze setters such as the M777A2 Light Weight Towed Howitzer, and the M109A6 Paladin Self-Propelled Howitzer.

Mission

Field Artillery units will use PGK to provide near-precision (50 meters) indirect fire support to combat maneuver units in all weather and terrain. Artillery units will use PGK to achieve comparable effects of conventionally fuzed projectiles using fewer rounds and reducing collateral damage.

Prime Contractor

- Alliant-Techsystems Advanced Weapons Division, Plymouth, Minnesota

Activity

- In FY09, the program conducted a series of contractor tests on PGK Increment 1. The testing evaluated PGK's reliability, mission processing, and accuracy against the requirements identified in the Capability Production Document.
- In March 2009, as part of a Government Confidence Demonstration (GCD) for the Advanced Field Artillery Tactical Data System, PGK demonstrated interoperability with existing artillery fire control and delivery systems.
- The GCD demonstrated PGK missions could be successfully processed from an observer to an M109A6 Paladin and M777A2 Howitzer. An M109A6 Howitzer crew was able to properly handle PGK-equipped projectiles and process PGK missions.
- DOT&E approved the PGK Test and Evaluation Master Plan in August 2009. The program's Milestone C is in 2QFY10.
- The program plans to conduct an IOT&E in January 2011 at Yuma Proving Ground, Arizona. The IOT&E will examine a unit's ability to employ PGK under realistic operational conditions.

- In October, the program updated the PGK Acquisition Program Baseline allowing more time prior to Milestone C to correct deficiencies identified during contractor testing. The program's Government Developmental Testing was rescheduled to 2QFY10 through 4QFY10. Milestone C will follow successful completion of developmental testing in 4QFY10.

Assessment

- The program is conducting several failure reviews as a result of recent testing. Most observed failures are GPS related.
- Rebaselining of the program provides time to address system deficiencies and achieve reliability growth prior to Milestone C. Should the program discover additional deficiencies in the remaining developmental test firings, finding sufficient time to analyze the failures, identify, implement, and demonstrate fixes prior to Milestone C will challenge the program.

Recommendations

- Status of Previous Recommendations. This is the first annual report for this program.
- FY09 Recommendation.
  1. The Army should consider closely monitoring developmental testing and identifying, implementing, and demonstrating corrective actions for system deficiencies prior to Milestone C.

Spider XM7 Network Command Munition

Executive Summary
- During FY09, the Spider program continued in the low-rate initial production phase of its acquisition program and completed an FOT&E of its "man-in-the-loop" only system.
- Based on an Operational Needs Statement approved by the Army in August 2008, 66 partial Spider systems were deployed between February and May 2009 to three Brigade Combat Teams for combat operations in Operation Enduring Freedom (OEF).
- Identification and development of methods to mitigate the loss of Spider's capability to autonomously attack targets continued under a two-year Standoff Capabilities Enhancement (SCE) program initiated in FY08.
- Prior to incorporating SCE capabilities into the Spider system, the Army will test these enhancements during a second FOT&E scheduled for April – May 2010.

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 persistent landmines after 2010
  - Incorporate self-destructing and self-deactivating technologies into alternatives to current persistent landmines
- The Army intends to achieve an Initial Operational Capability with Spider by 2011.
- The Army removed the capability for Spider to engage targets autonomously. "Man-in-the-loop" control is the only method the system uses to engage targets.
- A Spider munition field includes:
  - Up to 63 Munition Control Units, each housing six miniature grenade launchers
  - A remote control station, used by the operator 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.

Mission
Maneuver or engineer units will employ Spider, by itself or in conjunction with other networked munition systems and obstacles, to accomplish the following missions:
- Force protection
- Battlefield shaping
- Early warning
- Delay enemy forces
- Attrite enemy forces

Prime Contractors
- C2 hardware and software: Textron Defense Systems, Wilmington, Massachusetts
- Munition Control Unit and Miniature Grenade Launcher: Alliant-Techsystems Advanced Weapons Division, Plymouth, Minnesota

Activity
- The Army conducted the "man-in-the-loop" Spider FOT&E at Fort Bragg, North Carolina, in February – March 2009.
- Based on an Operational Needs Statement approved by the Army in August 2008, the Army deployed 66 partial Spider systems, between February – May 2009, to three Brigade Combat Teams for use in OEF. The 66 partial systems had full command and control capabilities, but reduced numbers of Munition Control Units and munitions.
- The Army continues to investigate and develop methods to mitigate the loss of Spider's capability to autonomously attack targets. The Army is focusing these new developments under a two-year SCE research development test and evaluation contract initiated in FY08.
- The program will conduct a second FOT&E beginning in April 2010, to operationally test the baseline Spider system and SCE capabilities.

- The Army is preparing an updated Test and Evaluation Master Plan to support a planned full-rate production and fielding decision in 2010. The updated TEMP will address how the Army will integrate the SCEs into the Spider system.

Assessment

- Based upon analysis of the FOT&E conducted for the Spider system, DOT&E's assessment is:
  - The Spider system remains complex and is difficult to employ and sustain in an operational environment.
  - The loss of Spider's capability to engage targets autonomously and the complexity of the system's hardware and software reduce a unit's ability to control and fight a munition field.
  - A unit's logistic requirements to support the fielded system will increase due to Spider's Munition Control Units not meeting the reuse requirement. The Army expects a unit to reuse a Spider Munition Control Unit seven times before it fails. Failures before seven times will require increased repair or replacement.
- The program has limited 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.

Recommendations

- Status of Previous Recommendations. The program has addressed all previous recommendations.
- FY09 Recommendations. The Army should:
  1. Capitalize on lessons learned from the Spider systems deployed to OEF units for optimizing tactics, techniques, and procedures and addressing system deficiencies.
  2. Concentrate on system complexity issues and reevaluate the Spider system in the second FOT&E.

Warfighter Information Network – Tactical

Executive Summary

- DOT&E-approved the Warfighter Information Network – Tactical (WIN-T) Increment 2 Test and Evaluation Master Plan (TEMP) on July 28, 2009.
- The Army completed a combined WIN-T Increment 2 and Increment 1b Limited User Test (LUT) in March 2009.
- DOT&E assessed WIN-T Increment 2 performance during the LUT as supportive of voice, video, and data communications, yet the network needs improvement in reliability, ability to support on-the-move communications, Soldier training, communications speed, and network operations.
- The WIN-T Increment 2 Overarching Integrated Process Team (OIPT) decided to delay the program's Milestone C until January 2010. The OIPT took this action to allow the program time to resolve program issues and to prepare a strategy to address performance and reliability issues demonstrated during the WIN-T Increment 2 LUT.

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.
- The WIN-T program consists of four Increments:
  - Increment 1: "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 an improved network security architecture.
  - Increment 3: "Full Networking on the Move" provides full mobility command and control for all Army field commanders, from theater to company level, through enhanced mobility and satellite connectivity. Network reliability and robustness are enhanced with the addition of the air tier transport layer.
  - 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 will 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 all maneuver commanders with mobile communications capabilities to support full command and control on the move, including the air tier and protected satellite communications (Increment 3 and 4)

Prime Contractor

- General Dynamics, C4 Systems, Taunton, Massachusetts

Activity

- The Joint Requirements Oversight Council approved the WIN-T Increment 2 Capability Production Document and DOT&E approved the WIN-T Increment 2 TEMP. The Army continues development of the Increment 1b requirements document to support future operational testing.

- The Army conducted a combined WIN-T Increment 2 and Increment 1b LUT at Fort Stewart, Georgia; Fort Lewis, Washington; and Fort Gordon, Georgia, in March 2009.
- The WIN-T Increment 2 OIPT met on October 28, 2009, and decided to delay the program's Milestone C until January 2010. The OIPT took this action to allow the program time to resolve funding and interoperability issues with future WIN-T radio systems, and to prepare a strategy to address performance and reliability issues demonstrated during the WIN-T Increment 2 LUT.

Assessment

- DOT&E assessed WIN-T Increment 2 performance during the LUT as supportive of voice, video, and data communications, yet the network needs improvement in the following areas:
  - Operational Reliability
  - Ability to support on-the-move communications
  - Soldier training due to complexity of the system
  - Speed of communications due to network routing
  - Network Operations Management
- An approved requirements document for the Increment 1b is needed to support planning for operational tests in 2QFY11.
- An approved requirements document and an Increment 3 TEMP are needed to support planning for operational tests in 1QFY12.

Recommendations

- Status of Previous Recommendations. The Army is addressing all previous recommendations.
- FY09 Recommendations. The Army should:
  1. Prepare a comprehensive strategy to address all issues demonstrated during the WIN-T Increment 2 LUT. This plan should include improvements in material, concept of operations, and a reliability development growth plan.
  2. Continue to ensure that sufficient resources including test units, configuration items, and training areas for full spectrum, on-the-move operations are allocated for future operational test events to satisfy WIN-T's theater and below network requirements.
  3. Complete an approved capabilities document for Increment 1b and Increment 3, and a TEMP for Increment 3.

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 completed operational testing of the A-RCI APB-06 system and found it to be not effective and not suitable.
- DOT&E issued a classified consolidated A-RCI report on all operational test results of A-RCI for the APB-06 and prior systems in October 2009.

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 the following:
  - 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.
- Although technically separate acquisition programs the TB-16 series tactical towed array, the TB-29 series long-range search towed array, and the new acquisition programs TB-34 tactical towed array (TB-16 replacement) and the TB-33 long-range search towed array (TB-29 replacement) are primary passive sensors for A-RCI. These arrays along with the spherical array, hull array, wide aperture array, and high frequency array, which are installed during submarine construction, are the sensors required by A-RCI.

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 Maritime Systems and Sensors, Washington, District of Columbia

Activity

- The Navy completed operational testing of the A-RCI TI-06/APB-06 system following an Arctic Ocean under-ice event to test the High Frequency sonar in March 2009. Previous APB-06 testing of the passive sonar capability included Anti-Submarine Warfare (ASW) search testing against an Italian diesel-electric submarine (SSK) in September 2008 and High-Density Surface Contact Management in April 2008 and in October 2008. Testing was conducted in accordance with a DOT&E-approved test plan. The Navy's Commander, Operational Test and Evaluation Force (COTF) issued their report in August 2009.
- DOT&E approved the A-RCI TI-06/APB-07 Test and Evaluation Master Plan (TEMP) on June 18, 2009. The TEMP allows for combined testing with the AN/BYG-1 Combat Control System and the new towed array acquisition programs for the TB-33 and the TB-34 arrays. A-RCI APB-07 testing is planned to begin in October 2009 and is scheduled to complete

before the first APB-07 submarine deploys with the upgrade in 2010.

- The Navy finished the development of A-RCI APB-09 and began installing the system on operational submarines (initial installation on USS *North Carolina* – a *Virginia* class submarine). The Navy has not completed a TEMP for A-RCI APB-09. The new draft Capabilities Development Document deleted previously required operational metrics for assessing the ASW performance of submarine sonar.
- DOT&E issued a classified consolidated A-RCI report on all operational test results of A-RCI for the APB-06 and prior systems in October 2009.

Assessment

- The Navy's independent test agency, COTF, found A-RCI APB-06 to be not effective against threat diesel-electric submarines (SSKs) and not suitable for most operations. The Navy also found APB-06 to demonstrate poor situational awareness in high traffic areas. However, the Navy believes A-RCI to be an improvement over previous APB versions based on developmental test data and a qualitative assessment. Additionally, COTF found that A-RCI sonar training was improved. DOT&E agrees with the effectiveness and suitability assessment. However, while some laboratory data indicates minor performance improvement, this has not been evident with operators at sea. Additional comparative testing is required to assess these changes.
- The Navy has not completed operational testing of the A-RCI APB-07 system; however, development of APB-09 is complete. The Navy's schedule-driven process prevents operational test results from supporting development of the follow-on APBs.
- The DOT&E classified report on A-RCI performance for all testing conducted with TI-06/APB-06 and the preceding systems concludes the following:
  - A-RCI passive sonar capability is effective against older classes of submarines in most benign to moderate acoustic environments, but is 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 improved and meets thresholds, but is not effective for transiting a minefield.
  - Overall, A-RCI is not suitable due to problems with reliability, training, documentation, and poor performance of supporting sub-systems.
- The program is not following the requirements of the Acquisition Process (Department of Defense Instruction 5000.02 of December 2008) for an evolutionary development. Requirements documents and TEMPs are developed and approved in parallel with APB development and installation. As a result, while some operational testing occurred, most was not complete before the system was deployed.

Recommendations

- Status of Previous Recommendations. The Navy has made progress in addressing seven of the 10 previous recommendations.
- FY09 Recommendations. The Navy should:.
  1. Implement the recommendations in DOT&E's A-RCI report.
  2. Since testing is interdependent, consolidate the A-RCI, TB-33, and TB-34 TEMPs into a capstone document and continue to conduct combined testing with the AN/BYG-1. This will increase testing efficiency and enable a full end-to-end evaluation of submarine capability in the applicable mission areas.
  3. Develop operationally relevant metrics to evaluate A-RCI performance. These metrics should allow for comparison testing between APBs and assessment of the system's planned improvements as well as overall performance.
  4. Institute a reliability growth program for A-RCI software.

Aegis Modernization Program

Executive Summary

- DDG 51 with Aegis Weapon System (AWS) Baseline 7.1.2.1 has limited effectiveness in littoral waters where it may encounter asymmetric, high-speed surface threats.
- Several key tests of DDG 51 with AWS Baseline 7.1.2.1 were not completed in accordance with the DOT&E-approved Test and Evaluation Master Plan (TEMP) and test plan.

System

- The Navy's Aegis Modernization program provides updated technology and systems for existing Aegis Guided Missile Cruisers (CG 47) and Destroyers (DDG 51). This planned, phased program also provides similar technology and systems for Destroyers under new construction.
- The AWS, carried on DDG 51 Guided Missile Destroyer and CG 47 Guided Missile Cruisers, integrates the following components:
  - 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 (DDG 51-78, CG 52-73), 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)
  - Close-In Weapon System (CIWS)
  - Five-inch diameter gun
  - Harpoon anti-ship cruise missiles (DDG 51-78, CG 52-73)
  - 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
- AWS Baseline 7.1.2.1 modified the AWS computer programs to correct deficiencies from Baseline 7.1.1.1, improve AN/SPY-1D(V) performance, and integrate CIWS Block 1B with the AWS to provide surface warfare capability.

Mission

The Maritime Component commander can employ DDG 51 and CG 47 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

- General Dynamics Marine Systems Bath Iron Works, Bath, Maine
- Northrop Grumman Shipbuilding, Pascagoula, Mississippi
- Lockheed Martin Maritime Systems and Sensors, Moorestown, New Jersey

Activity

- Commander, Operational Test and Evaluation Force (COTF) issued the final test report for operational testing of AWS Baseline 7.1.2.1 (OT-IIIJ), conducted from February to August 2008.
- The Navy plans to conduct operational testing in FY11 of the newest DDG 51 Guided Missile Destroyer with AWS Baseline 7.1.R and the first of the modernized CG 47 Guided

Missile Cruisers with Advanced Capability Build 08 (ACB08) Baseline in FY10.

Assessment

- COTF testers were unable to complete several key tests of AWS Baseline 7.1.2.1 in accordance with the DOT&E-approved TEMP and test plan. Tests not completed during OT-IIIJ included the following:
  - Testing of the air/surface logic of the CIWS due to non-availability of CIWS caused by a failed power modulator. The power modulator is a normally reliable part with an extremely low rate of failure that is not normally stocked onboard the ship
  - Testing of fratricide issues between CIWS and the Vertical Launching System due to non-availability of CIWS
  - Surface tracking capability of the SPY-1D(V) Radar due to inadequate initial crew training
  - Testing against high-speed surface threats due to unsatisfactory CIWS performance caused by optical sight misalignment and inadequate initial crew training
- The AWS Baseline 7.1.2.1 continues to have limited effectiveness in littoral waters against asymmetric high-speed surface threats.

Recommendations

- Status of Previous Recommendations. The Navy has completed three of the four FY05 recommendations, one of the four FY06 recommendations, and none of the FY08 recommendations. The remaining recommendations merit additional emphasis.
- FY09 Recommendation.
  1. The Navy should complete all planned key operational tests of AWS Baseline 7.1.2.1 in accordance with the DOT&E-approved TEMP and test plan.

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

Executive Summary

- The AGM-88E Advanced Anti-Radiation Guided Missile (AARGM) completed the second developmental test (DT) phase in 2009 with four successful combined developmental and operational test (OT) missile firings.
- Missile development continues to be delayed by hardware and software technical challenges.
- The Navy is continuing a surrogate target program with a focus on developing operationally-realistic targets. The Resource Enhancement Program is funding this target development effort.

System

- The AARGM is the follow-on to the AGM-88A/B High-Speed Anti-Radiation Missile using a modified AGM-88A/B missile body and fins. AARGM is carried on F/A-18 C/D/E/F/G platforms.
- The AARGM changes will incorporate Millimeter Wave (MMW), GPS, digital Anti-Radiation Homing (ARH), Weapon Impact Assessment 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.
  - The IBS-R allows reception of national broadcast data.

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, Strike Weapons, Woodland Hills, California

Activity

- The Navy concluded the second phase of AARGM developmental testing in 2009 with captive carriage flights to evaluate missile ARH and MMW sensor capabilities in various threat target scenarios. Testing included four missile firings from F/A-18C/D aircraft. The last missile was fired by a combined DT/OT aircrew in an operational scenario and consisted of operationally representative missile hardware and software. Data collected from this event may be used for an upcoming operational evaluation.
- The program continued developmental testing for ARH and MMW seeker characterization using a contracted twin engine Beech aircraft with an AARGM seeker assembly attached to the nose of the aircraft as well as a captive missile on the wing of an F-18.
- Representative targets do not exist for this type of weapons system. DOT&E provided Resource Enhancement Project funding in past fiscal years for target development to support operational testing. The verification, validation, and accreditation of these surrogate targets have continued with Commander, Operational Test Force representatives at China Lake, California, but were not completed in 2009.
- With the conclusion of developmental testing, the AARGM program is preparing for OT&E in FY10.

Assessment

- The total of eight live firings in the second phase of developmental testing (one missile in FY07, three missiles in FY08, and four missiles in FY09) have not demonstrated sufficient characterization of the missile system prior to entering operational evaluation.
- The surrogate targets have not been fully characterized. Continued delays in completing this task may result in risk to the program schedule.
- The ARH and MMW radars are better characterized, but there remains a known shortcoming to these sensor systems resulting in the Key Performance Parameter Three target being deferred to FOT&E in FY11.
- Software development challenges continue to pose a risk to the program schedule. Software maturity and the resulting impact to reliability is the key concern. The Program Office has identified the deficiencies and is working toward correction of deficiencies with the DT and OT community.
- Because of the software deficiencies and development delays in the ARH and MMW systems, the program has delayed entry into OT&E for four months until January 2010.

Recommendations

- Status of Previous Recommendations. The Navy did not satisfactorily address the FY08 recommendations.
- FY09 Recommendations.
  1. The Operational Test Agency, after receiving the verification and validation reports, must ensure that the surrogate targets are accredited before formal operational testing is performed on each representative target type. This may be done sequentially as the accreditation progresses from target type to type.
  2. The Navy must fully characterize the MMW and ARH sensors in developmental test prior to formal OT to ensure the OT is a period of confirmation vice discovery.

AIM-9X Air-to-Air Missile Upgrade

Executive Summary

- The AIM-9X program continues OT&E of hardware and software upgrades to the fielded missile. Operational testing during FY09 demonstrated the effectiveness and suitability of the Operational Flight Software (OFS) 8.212 upgrade.
- Hardware and software upgrades now under development are planned to address parts obsolescence problems and provide multiple new capabilities. Operational testing during FY10 is intended to assess hardware upgrades, as well as surface attack capabilities inherent in the OFS 8.212 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 is OFS 8.212.
- 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.
- OFS 8.212 (the latest software version) includes limited lock-on-after-launch, full envelope high off-boresight capability without a helmet-mounted cueing system, and increased flare rejection performance.
- AIM-9X Block II (the latest hardware version) is designed to prevent parts obsolescence and provide processing capability for the upcoming OFS 9.3XX software upgrade. The Block II missile includes a new processor, a new rocket motor battery, ignition safety device, data link, and Active Optical Target Detector fuze. OFS 9.2XX is the current version for the Block II missile and provides similar capabilities as Block I OFS 8.212.
- OFS 9.3XX will be a software only upgrade to the Block II missile, and will add lofting, data link with the launching aircraft, improved lock-on-after-launch, target reacquisition, optimized fuzing, and surface attack.

Mission

Air combat units use the AIM-9X to:

- Conduct short-range offensive and defensive air-to-air combat
- Engage multiple enemy aircraft types with passive infrared guidance in the missile seeker
- Seek and attack enemy aircraft at large angles away from heading of the launch aircraft

Prime Contractor

- Raytheon, Missile Systems, Tucson, Arizona

Activity

- The AIM-9X program completed OT&E of a software upgrade (8.212) 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.
- Commander, Operational Test and Evaluation Force completed the operational test for OFS 8.212 in October 2008 in accordance with a DOT&E-approved test plan. The test program consisted of captive carriage flights using F-15, F-16, and F/A-18 aircraft, and live shots against target drones evaluating end-to-end system performance in various scenarios.
- The Program Office began developmental testing of version 9.2XX in September 2008. Operational testing for OFS 9.2XX is scheduled to begin in early 2010.
- Technical delays in fuze development have led to splitting operational testing into two phases. The first phase will involve captive carry missiles only, and will support a decision to field captive carry training missiles to the fleet. After the fuze is ready, a second phase will involve captive carry

missions, as well as four live shots, to support a decision to field live rounds to the fleet.
- The Air Force intends to conduct operational testing of OFS 8.220's potential surface attack capability during FY10. This testing will consist of captive carry and live fire missions against surface vehicle targets.

Assessment
- OFS 8.212 operational testing indicates slightly better performance than the previously fielded 8.019 missile.
- DOT&E rates the system effective and suitable. Reliability is rated unsatisfactory because the missile's mean time between failures (MTBF), as measured in operational test, is less than the requirement. However, MTBF was substantially improved over 2003 operational test results.
- Technical delays in Block II fuze development may lead to schedule delays in operational testing and fielding of the full-up OFS 9.2XX missile.

Recommendations
- Status of Previous Recommendations. All of the FY06 and FY07 recommendations have been addressed. The two FY08 recommendations remain valid.
- FY09 Recommendation.
  1. Future testing should have sufficient captive carry and live shots to demonstrate the new capabilities.

AN/BYG-1 Combat Control System

Executive Summary
- The Navy deployed the AN/BYG-1 Advanced Processor Build (APB)-06 system on an operational submarine during 2008 before completing operational testing.
- The Navy's Commander, Operational Test and Evaluation Force (COTF) ended testing and completed an OT&E report on the AN/BYG-1 APB-06 combat control system. Performance is similar to previous AN/BYG 1 APBs.
- The Navy completed development of the APB-07 version and commenced OT&E in October 2009.

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 computer technology and software. The Navy installs improvements to the system via a spiral development program. It includes the following:
  - 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 (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 (HDCM), 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 Advanced Information Systems, Fairfax, Virginia
- Raytheon Integrated Defense Systems, Tewksbury, Massachusetts

Activity
- The Navy deployed the AN/BYG-1 TI-06/APB-06 Combat Control System on an operational submarine before completing operational testing in 2008.
- The Navy conducted TI-06/APB-06 HDCM test events in March 2008 and October 2008, but, due to poor weather, the test area did not contain the required high density of surface contacts. Despite that limitation, the ship failed to maintain all ships outside the threshold range, indicating it is not able to support operations in difficult high-contact density environments.
- The Navy canceled the TI-06/APB-06 Information Assurance penetration testing scheduled for February 2009. This decision was due to schedule conflicts with the test platform, and the Navy's decision to convert all APB-06 systems to APB-07 systems, which will undergo Information Assurance testing within a year.
- COTF ended operational testing for the TI-06/APB-06 system and issued an OT&E Report in August 2009. COTF reported the AN/BYG-1 APB-06 system was not operationally effective, but the APB-06 system provides enhanced performance over other systems. COTF also reported the AN/BYG-1 APB-06 system was effective in employing Tomahawk missiles and was operationally suitable.
- DOT&E approved the AN/BYG-1 APB-07 TEMP in October 2009. The APB-07 system uses the same requirements document and thresholds as APB-06.
- The Navy conducted AN/BYG-1 APB-07 Anti-Submarine Warfare search rate and HDCM operational test events in

October 2009. The test event was combined with the testing of the Acoustic Rapid Commercial Off-the-Shelf Insertion APB-07 sonar upgrades and the new TB-34 towed array.

Assessment

- While laboratory qualitative information suggests APB-06 could improve operator performance, the Navy has not conducted sufficient comparison testing or at-sea testing to determine that an improvement in performance exists from APB to APB.
- DOT&E agrees with COTF that the AN/BYG-1 APB-06 version does not meet all required performance thresholds and the system is operationally suitable.
- AN/BYG-1 continues to demonstrate above-threshold reliability and availability.

Recommendations

- Status of Previous Recommendations. The Navy has implemented one of the three FY08 recommendations.
- FY09 Recommendations. The Navy should:
  1. Develop requirements and thresholds for future AN/BYG-1 APBs that allow comparison of performance to previous AN/BYG-1 APBs.
  2. Retest correction of HDCM software in conjunction with APB-07 testing.

Armored Tactical Vehicles – Naval

MTVR

LVSR

JAB

Executive Summary

- The Logistics Vehicle System Replacement (LVSR) family of vehicles provides adequate armor protection to the crews against the likely threats while still maintaining mission capability.
- The Marine Corps is continuing development and testing of other armored protection upgrades.

System

- The Marine Corps is adding armored protection to tactical wheeled and tracked vehicles to improve crew survivability in the urban and non-linear battlefields of Iraq and Afghanistan.
- The armor is intended to reduce crew susceptibility to small arms fire, mines, IEDs, and rocket-propelled grenades. Development includes redesigned crew cab structures with the capability to accept attachable armor that can be installed as the tactical situation demands.
- The Marine Corps Armored Tactical Vehicle Programs include the following:
  - The LVSR is a family of heavy trucks capable of transporting 18 tons off-road and 22.5 tons on-road. The Marine Corps designed an armor protection kit and completed testing in FY09.
  - The Medium Tactical Vehicle Replacement (MTVR) is a family of medium trucks capable of transporting 7 tons off-road and 12 tons on-road. The Marine Corps continues to design armor protection kits and began testing in FY09.
  - The Joint Assault Bridge (JAB) is based upon the M1A1 Abrams chassis and will provide an assault crossing capability to counter both natural and man-made gaps up to 18.3 meters (60 feet) long. The Marine Corps is in the planning and development stage of up-armoring the JAB.

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 increased threat to tactical vehicles has created a need for augmented and flexible mission-based ballistic protection.

- The LVSR is the heavy lift transport capability within all elements of the Marine Air Ground Task Force, which includes transporting bulk fuel and water, ammunition, cargo, tactical bridging, containers, combat engineer vehicles, and heavy wrecker capability.
- The MTVR is the prime mover for the howitzer, fuel and water assets, troops, and a wide variety of equipment.
- The JAB is a rapidly employable, short-gap, assault crossing bridge to project combat power ashore and maintain the initiative of the maneuver element.

Prime Contractors

- LVSR and MTVR: Oshkosh, Wisconsin
- JAB: General Dynamics Land Systems, Sterling Heights, Michigan

Activity

- The Marine Corps completed LVSR live fire testing on the cargo variant in October 2008. The LVSR wrecker and tractor variants incorporate the same cargo variant armor design and do not require additional live fire testing.
- DOT&E submitted the LVSR LFT&E Report to Congress in December 2008.
- DOT&E approved the MTVR Live Fire strategy and evaluation plan in July 2009.
- The Marine Corps reviewed MTVR live fire data from FY07 and decided to conduct additional exploitation, full-up and system-level tests on the reducible height armor package, and troop carrier upgrades.
- The Marine Corps completed MTVR exploitation testing in July 2009 and is considering design improvements to increase crew survivability. Two full-up system-level test events were completed in September 2009 and the six remaining system-level test events are planned for September through December 2009.

- The Marine Corps completed JAB ballistic exploitation testing in July 2009 on a prototype JAB armor system mounted to an M1A1 hull.

Assessment

- As stated in the December 2008 LVSR LFT&E Report to Congress, the LVSR family of vehicles provides adequate armor protection to the crews against the likely threats while still maintaining mission capability.
- JAB-unique components performed as expected during exploitation testing and demonstrated the ability to provide adequate protection to the crew compartment as well as the launcher mechanism components.

Recommendations

- Status of Previous Recommendations. The Marine Corps satisfactorily addressed all previous recommendations.
- FY09 Recommendation.
  1. Additional LVSR and MTVR live fire testing will be required if armor upgrades or design changes are developed for any of the currently tested vehicles.

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 air vehicles for Air Force and Marine Corps missions are nearly identical, with common subsystems and military components sustainable by each Service's logistics system.
- DOT&E assesses the CV-22 Block 10/B as operationally effective with significant limitations and operationally suitable with limitations for supporting Special Operations missions. In particular there are significant deficiencies in the performance of electronic warfare and communications equipment that limit mission accomplishment. The IOT&E and Live Fire testing were adequate to reach this conclusion and were executed in accordance with the test plan approved by DOT&E.
- Adequate CV-22 FOT&E must address: installation of a new high-power jammer and the threat systems not tested in IOT&E; deferred cold weather operations tests; strategic refueling capability and self-deployment; mission planning system improvements; and fixes to the ice protection system and engine sub-assemblies.
- The Air Force has not submitted subsequent test planning documents for review and approval.

System

- The CV-22 is the replacement for aging Special Forces MH-53 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 538 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 deficiencies identified during IOT&E.

Mission

Air Force squadrons equipped with the CV-22 will provide high-speed, long-range insertion, and extraction of Special Operations Forces to and from high-threat objectives.

Prime Contractors

- Bell Helicopter, Amarillo, Texas, and The Boeing Company, Ridley Township, Pennsylvania (Joint Venture)

Activity

- The 2008 CV-22 IOT&E testing was adequate to determine operational effectiveness and suitability and was conducted in accordance with the DOT&E-approved Test and Evaluation Master Plan (TEMP) and test plan.
- The Air Force has not submitted subsequent test planning documents for review and approval.

Assessment

- DOT&E assesses the CV-22 Block 10/B as operationally effective with significant limitations and operationally suitable with limitations for supporting Special Operations missions. In particular there are significant deficiencies in the performance of electronic warfare and communications equipment that limit mission accomplishment. The IOT&E and Live Fire testing were adequate and were executed in accordance with the test plan approved by DOT&E.
- Testing revealed deficiencies with the ice protection system, the engine air particle separator assembly, Directional Infrared Countermeasures (DIRCM) performance, Suite of Integrated Radio Frequency Countermeasures (SIRFC) performance, communication reliability, and several small hardware issues. The lack of a strategic refueling capability from KC-10 tankers

necessitates operational support from limited MC-130/KC-130 aircraft limit mission effectiveness.
- Air Force Operational Test and Evaluation Center (AFOTEC) had planned to conduct cold-weather testing in Alaska, as well as a long-range deployment outside the continental United States during IOT&E, but these tests were deferred. No planning or execution of follow-on testing of critical shortfalls identified in IOT&E, deferred capabilities that were not included in previous testing, or new mission enhancements are in active planning by AFOTEC.
- The currently approved TEMP FOT&E strategy assigns AFOTEC primary responsibility for planning and executing FOT&E. Contrary to that TEMP, AFOTEC has deferred FOT&E responsibility to Air Force Special Operations Command (AFSOC). AFSOC has assumed responsibility for follow-on testing, but they have not coordinated any ongoing test activity, resources for future testing, or scheduling of assets to adequately resolve the outstanding issues.

Recommendations
- Status of Previous Recommendations. The program addressed all but one of the previous recommendations. The recommendation regarding development of battle damage repair procedures and fire suppression systems for the aircraft dry bay remains valid.
- FY09 Recommendations.
  1. The Navy and Air Force should increase emphasis on correcting known deficiencies of the CV-22.
  2. The Air Force should:
     - Ensure that AFOTEC resumes responsibility for FOT&E of the CV-22.
     - Ensure that the CV-22 defensive suite problems are fully corrected and operationally tested before the aircraft reaches Full Operational Capability.
     - Demonstrate cold weather operational capability.
     - Address deficiencies documented in IOT&E with the ice protection system, the multi-mission advanced tactical terminal, and the strategic refueling capability and operational test fixes.

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 is scheduled to complete in October 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 Key Performance Parameter.
- 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.
- Early analyses of OT-B2 findings indicate that integration of the Joint Strike Fighter (JSF) into the CVN 21 will result in damage to the carrier flight deck environment and surfaces and will adversely affect hangar deck operations. Additionally, review of the current design indicates a severe communication limitation due to a planned single channel for common data link (CDL).

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 DBR.
- 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, and will include increased self defense capabilities when compared to current aircraft carriers.
- CVN 21 is designed to increase the sortie generation capability of embarked aircraft to 160 sorties per day and be able to surge to 270 sorties per day (threshold values).

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 Shipbuilding, Newport News, Virginia

Activity

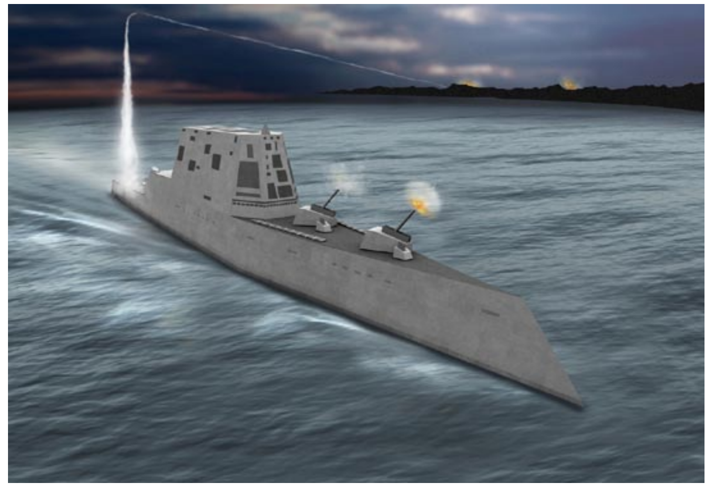
- Commander, Operational Test and Evaluation Force began an operational assessment (OT-B2) in March 2008. It is currently scheduled to be complete in Q1FY10. This assessment should inform the planned program review in FY12, but does not support a specific acquisition decision.
- The Navy is continuing to develop the Virtual Carrier model for analyses of the sortie generation rate capability of the ship. Results of the most recent spiral have been captured in OT-B2.
- The Navy is currently performing high-cycle testing and highly accelerated life testing of the electromagnetic aircraft launch system equipment at various labs.
- The Navy is currently performing extended reliability testing of advanced arresting gear at the General Atomics facility in San Diego, California.
- The Navy is continuing construction of a full-scale, single catapult, land-based EMALS system and advanced arresting

gear system at Naval Air Engineering Station 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 CVN 21 program is developing an advanced modeling and simulation capability that, combined with reduced scope shock testing of CVN 78, will reduce the cost of conducting the CVN 78 shock trial. The Navy has reached agreement through a Memorandum of Agreement on the elements of the process. DOT&E will withhold its decision to sign the Memorandum of Agreement until FY12 when the feasibility of the modeling and simulation should be demonstrated.
- The CVN 21 Program Office is revising the Test and Evaluation Master Plan in an effort to align planned developmental tests with corresponding operational test phases.

Assessment
- Emerging results from the ongoing OT-B2 Operational Assessment highlight significant integration challenges with the F-35 JSF that will adversely impact mission accomplishment. The most significant integration challenges include:
  - Hangar Bay space is limited due to the requirement to place JSF Engine Power Modules and JSF Squadron training spaces in the Hangar Bay.
  - The F-35C thermal footprint from main engine exhaust is larger than legacy aircraft making the Jet Blast Deflectors currently installed on aircraft carriers vulnerable to warping and failure.
  - Flight deck personnel experience excessive noise levels with JSF engines at full power.
  - The Integrated Power Pack exhaust from F-35B Short Take-off Vertical Landing variant of the JSF is deflected downward and poses a hazard to flight deck refueling stations, munitions, personnel, and equipment in the catwalks.
- Current design has a single transmit/receive channel for CDL. This link is required for effective tactical communication with MH-60R helicopters, P-8A Poseidon Multi-Mission Aircraft, Broad Area Maritime Surveillance, Predator, Firescout, Sky Warrior, Global Hawk, Reaper, and Shadow, as well as other small Tactical Unmanned Aerial Systems. This is a critical limitation especially in a satellite-denied environment.
- Stress and environmental testing of advanced arresting gear and EMALS components continues at test sites in both Mississippi and California. These tests have resulted in design changes that are currently under evaluation. The next major electromagnetic aircraft launch system test event scheduled is "dead load" testing (unmanned aircraft size and weight load) in 2QFY10. Testing using manned aircraft is scheduled in FY11.
- The planned IOT&E of CVN 78 is planned in conjunction with post delivery sea trials and pre-deployment training. Any delays in ship delivery will jeopardize the dedicated IOT&E period and complete assessment of the ship's capabilities.

Recommendations
- Status of Previous Recommendations. The Navy satisfactorily addressed all FY08 recommendations.
- FY09 Recommendations. The Navy should:
  1. Resolve integration issues with JSF.
  2. Resolve CDL limitations.
  3. Refine the Test and Evaluation Master Plan to include dedicated IOT&E periods in the ship's schedule.

DDG 1000 *Zumwalt* Class Destroyer



Executive Summary

- The DDG 1000 program continued detailed design, systems integration, and technology risk reduction in FY09. Developmental testing and an operational assessment (OT-B1) examined a range of major warfare mission and ship support areas to identify potential ship design and performance risks.
- The Navy revised the Acquisition Strategy for DDG 1000. The revised acquisition strategy reduces production and delivery of the DDG 1000 ship class from seven to three ships.
- Although no Live Fire testing occurred in FY09, an active LFT&E program is in place to gain survivability insights.

System

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

- Two 155 mm Advanced Gun Systems 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, and 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 the following:
  - Land Attack Warfare - Joint Surface Strike and Joint Surface Fire Support
  - Anti-Surface Warfare
  - Anti-Air Warfare
  - Undersea Warfare
- 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

- General Dynamics Marine Systems Bath Iron Works, Bath, Maine
- BAE Systems, Minneapolis, Minnesota
- Northrop Grumman Ship Systems, Pascagoula, Mississippi
- Raytheon, Waltham, Massachusetts

Activity

- The Navy conducted significant developmental testing of the Dual Band Multi-function Radar, Total Ship Computing Environment/Infrastructure (TSCEI), and hull form in FY09.
- Commander, Operational Test and Evaluation Force conducted an operational assessment (OT-B1) of DDG 1000 from March 2008 to July 2009. OT-B1 test events examined hull mechanical, electrical, damage control, and mission system designs, and shore support and habitability/onboard support areas to identify any significant risks to DDG 1000 completing IOT&E. The Navy conducted testing in accordance with the DOT&E-approved Test and Evaluation Master Plan (TEMP) and test plan.
- The Navy revised the Acquisition Strategy for DDG 1000. Production and delivery of DDG 1000 ship class was reduced from seven to three ships. The revision also includes a commitment by the Navy to construct the three ships at Bath Iron Works, with Northrop Grumman Ship Building retaining work share efforts. The scope of the testing defined by the DOT&E-approved TEMP remains adequate. The TEMP will be revised during FY10 to align the testing schedule with the program execution schedule cited in the Acquisition Strategy.
- The LFT&E program performed an in-depth review of mission essential systems to identify vulnerabilities in the Detail Design.

- The Navy is developing a new shock qualification program based in part on the reduction of DDG 1000 to a three ship class. The options under consideration include no shock qualification, shock qualification for take home capability only, or shock qualification for take home and limited self-defense capability.

Assessment

- Test results from operational assessment (OT-B1) identified the following:
  - When electrical power is disrupted causing a loss of chilled cooling water, affected TSCEI Data Centers will shut down within seconds due to thermal overload, despite being powered by uninterruptible power supplies. Electrical power casualties that cause the loss of both TSCEI Data Centers (Deadship Condition) will require manual restoration of electrical power and cooling. It will take a significant amount of time to recover and restore basic command and control operations placing the ship at risk.
  - The Close-in-Gun System gun mount will accumulate a significant amount of toxic fumes when the gun fires a fully loaded (120-round) magazine at the maximum rate of fire (about 220 rounds per minute). Personnel safety procedures require that the gun mount be purged of the toxic fumes before personnel may reenter the mount. This will preclude immediate reloading of the gun during extended engagements.
  - The Navy has not identified funding to purchase inert rounds for use in the Advanced Gun System. Operational readiness will be adversely impacted if inert rounds are not available to support operator and unit training and system maintenance.
  - The DDG 1000 program intends to defer a significant amount of preventative and corrective maintenance to shore-based contractors. Uncertain funding raises the real possibility that DDG 1000's minimally manned crews will be required to perform these maintenance actions in excess of their planned workload. The current Navy Training Plan and Projected Ship's Manning Document for DDG 1000 do not support this requirement.
- 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 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 Advanced Gun System 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.
- The LFT&E program's mission essential systems review identified survivability features in the Detail Design that will not be included in the first two ships. The first two ships of the class will be less survivable because of the Navy's decision to reduce cost by not implementing certain system redundancy features of the Detailed Design.
- The OT-B1 assessment noted the delay in important software functionality. The LFT&E review of many ship systems suggested there may be a significant disconnect between intended system operation as designed and the software developers' understanding of system dependencies.
- The DDG 1000 has a requirement to maintain all mission essential functions when exposed to underwater explosive shock loading. The Navy is exploring possible changes to the existing DDG 1000 shock qualification program. These changes, if accepted, would reduce the adequacy of the DDG 1000 LFT&E program by eliminating important testing necessary to measure the shock hardness of the ship. This testing is vital to understanding the survivability characteristics of the DDG 1000.

Recommendations

- Status of Previous Recommendations. The Navy has closed three of the four FY05 recommendations, one of the two FY07 recommendations, and one of the three FY08 recommendations.
- FY09 Recommendations. The Navy should:
  1. Develop solutions to eliminate or reduce the impact of loss of electrical power and associated loss of chilled water cooling casualties on TSCEI Data Centers.
  2. Develop procedures for manual electrical plant restoration during total loss of electrical power casualties that secure all TSCEI Data Centers.
  3. Develop tactics and training that optimize employment of the Close-in-Gun System against surface threats.
  4. Identify funding to purchase inert rounds for use in the Advanced Gun System.
  5. Develop contingencies in the Navy Training Plan and Projected Ship's Manning Document that address training and manning issues that may occur in the event of potential fluctuations in shore-based contractor maintenance funding.
  6. Maintain the current shock requirements and complete the shock qualification program prior to deploying DDG 1000.

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

Executive Summary

- The Department of the Navy's Large Aircraft Infrared Countermeasure (DoN LAIRCM) system is a directional, laser-based self-protection system.
- The Navy fielded DoN LAIRCM as an Early Operational Capability in January 2009 on the Marine Corps CH-53E aircraft that had deployed to support Operation Iraqi Freedom/Operation Enduring Freedom (OIF/OEF). The fielding decision was based on developmental testing and a Quick Reaction Assessment conducted by Commander, Operational Test and Evaluation Force (COTF) from April to August 2008.
- The DoN LAIRCM system is a derivative of the latest variant of the Air Force's Large Infrared Countermeasures (LAIRCM) system. The DoN LAIRCM system incorporates new infrared missile warning sensors and an upgraded laser jammer (the Guardian Laser Transmitter Assembly (GLTA)) compared to the ultraviolet warning sensors and the small laser transmitter assembly used in earlier versions of LAIRCM.
- COTF conducted an IOT&E of DoN LAIRCM on the CH-53E aircraft from March to June 2009 to support both a Milestone C and a full-rate production (FRP) decision planned for 2QFY10. The COTF IOT&E report was released in mid-November 2009. The report concluded the DoN LAIRCM system installed on the CH-53E aircraft is operationally effective and suitable. DOT&E concurs with COTF's assessment.
- The Navy has fielded one CH-53E squadron with an EOC deployed to U.S. Central Command. Subsequent to the verification of correction of deficiencies found in the CH-53E IOT&E, the rest of the CH-53E fleet will be fielded. The Marine Corps' CH-46E and CH-53D aircraft will be fielded with DoN LAIRCM after completion of FOT&E, which is scheduled for the 2QFY10.

C.I.U. - Control Interface Unit
GLTA - Guardian Laser Turret Assembly
MWS - Missile Warning System
IR - Infrared

System

- The DoN LAIRCM system, a spin-off of the Air Force LAIRCM system, is a defensive system for Marine Corps' helicopters designed to defend against surface-to-air infrared missile threats. It combines the derivative AAR-54 two-color infrared Missile Warning Sensor (MWS) with the GLTA. The GLTA is equipped with a four-axis, stabilized gimbal system, an AN/AAR-24 Fine Track Sensor, and a Viper™ laser. The MWS detects an oncoming missile threat and sends the information to the system processor which, in turn, notifies the crew through the control interface unit and at the same time directs the GLTA to slew to and begin jamming the threat.
- The Navy plans to procure 156 systems, and installation is scheduled on the CH-53E, CH-46E, and CH53D platforms 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. Commanders will use 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, Electronic Systems, Defensive Systems Division, Rolling Meadows, Illinois

Activity

- COTF conducted IOT&E on the CH-53E aircraft at the Naval Air Warfare Center, China Lake, California, during March and April 2009, including a formal Maintenance Demonstration, with data analysis being completed June 2009. The IOT&E was accomplished to support both Milestone C and FRP decisions scheduled for 2QFY10. The COTF report was released in mid-November 2009. The report concluded the DoN LAIRCM system installed on the CH-53E aircraft is operationally effective and suitable.
- Developmental testing was accomplished on the CH-46E at Edwards AFB, California, during July and August 2009. The FOT&E for the CH-46E aircraft is planned for 2QFY10.
- Developmental testing on the CH-53D is scheduled for 2QFY10. The FOT&E for the CH-53D aircraft is tentatively planned for 2QFY10.

Assessment

- DOT&E concurs with COTF's assessment that the DoN LAIRCM system installed on CH-53E aircraft is operationally effective and suitable.
- Field data from OIF/OEF is being sent to the operational test team in order to obtain a more robust assessment of reliability. These data show that the DoN LAIRCM system on the CH-53E aircraft is approaching its reliability requirement of 130 hours between mission affecting failures.
- The effectiveness and suitability of the DoN LAIRCM on CH-46E and CH-53D aircraft will be evaluated during the integration tests and FOT&E planned for 2QFY10.

Recommendations

- Status of Previous Recommendations. The Navy and Marine Corps are addressing all of the previous recommendations.
- FY09 Recommendations. The Navy/Marine Corps should:
  1. Ensure deficiencies found in IOT&E are corrected and the updated software is tested on the CH 53E, CH-46E, and the CH-53D aircraft.
  2. Continue with the integration of the DoN LAIRCM system on the CH-46E and the CH-53D aircraft and conduct a comprehensive FOT&E prior to fielding.
  3. Continue to obtain operational data from OIF/OEF.
  4. Conduct live fire missile testing to ensure effectiveness of DoN LAIRCM with the latest software upgrades.

Digital Modular Radio (DMR)

Executive Summary

- The Navy AN/USC-61(C) Digital Modular Radio (DMR) with Software Build 6.4.2 is operationally effective for surface ships, submarines, and shore installations.
- DMR with Software Build 6.4.2 is operationally suitable for shore installations.

System

- The DMR system is an open architecture, software definable, modular, multimode, and multi-band communications system for use in U.S. Navy surface ships, submarines, and shore installations. The baseline DMR provides the following:
  - Radio communications in the High Frequency (HF), Very High Frequency, and Ultra High Frequency (UHF) bands, to support both line-of-sight (LOS) communications and Satellite Communications (SATCOM)
  - A standard interface with legacy shipboard and fixed station communication systems, including the capability to be controlled by the simple network management protocol interfaces
  - Simultaneous operation of four independent communications channels
- Surface ship and shore DMR installations use 100-watt and 200-watt UHF power amplifiers for LOS and SATCOM UHF communications, respectively (HF communications not available).
- Submarine DMR installation uses 200-watt UHF power amplifiers for LOS and SATCOM communications and a 500-watt power amplifier for HF communications.

Mission

- U.S. Navy surface and subsurface vessels, and shore installations can employ DMR to:

  - Facilitate efficient and effective communication between operational units
  - Support performance of all assigned unit missions
  - Support the conduct of fleet, joint, and coalition operations

Prime Contractor

- General Dynamics C4 Systems, Scottsdale, Arizona

Activity

- Commander, Operational Test and Evaluation Force (COTF) conducted OT&E (OT-IIB) of DMR with Software Build 6.4.2 on two U.S. Navy surface ships and at a shore installation from October to November 2008; and on a submarine in January 2009. COTF issued the final test report for OT-IIB in April 2009.
- COTF conducted operational testing at a shore installation during July 2009 to verify correction of reliability and logistics supportability deficiencies cited in the OT-IIB test report.
- The Navy conducted all DMR testing in accordance with a DOT&E-approved Test and Evaluation Master Plan and test plan.
- COTF intends to conduct further operational testing in FY10 to verify correction of outstanding reliability and logistics supportability deficiencies on surface ships and submarines cited in the OT-IIB test report.

Assessment

- Test results from operational testing (OT-IIB) identified the following:
  - DMR with Software Build 6.4.2 is operationally effective for surface ships, submarines, and shore installations. DMR is capable of operating within its intended frequency range across all required waveforms.

- DMR with Software Build 6.4.2 is operationally suitable for shore installations.
- The reliability and logistics supportability of DMR with Software Build 6.4.2 for surface ship and submarine applications are unsatisfactory. The impact of reliability deficiencies in submarine applications is exacerbated by the lack of DMR system redundancy in submarines, increasing the potential operational impact of a DMR failure.

Recommendations

- Status of Previous Recommendations. This is the first annual report for this program.
- FY09 Recommendations. None.

Distributed Common Ground System – Navy (DCGS-N)

Executive Summary

- The Commander, Operational Test and Evaluation Force (COTF) conducted an Operational Assessment (OT-B1) of the Distributed Common Ground System – Navy (DCGS-N) in March 2009 to provide information for Milestone C. DOT&E concurred with the COTF OT-B1 Operational Assessment Report and recommended DCGS-N Block 1 proceed to Milestone C and subsequent IOT&E.
- The Assistant Secretary of Defense for Networks Information Integration (ASD (NII)) authorized low-rate initial production on August 17, 2009.
- COTF commenced an embarked IOT&E (OT-C1) of the DCGS-N Increment 1 on August 20, 2009. Anomalies forced a suspension of testing from August 25 – September 8, 2009. COTF completed the embarked phase of IOT&E during the period of September 9-18, 2009. COTF anticipates publication of the OT-C1 Operational Evaluation Report in December 2009.

System

- DCGS-N is the Navy Service component of the DoD DCGS family of systems, providing multi-Service integration of Intelligence, Surveillance, Reconnaissance, and Targeting (ISR&T) capabilities.
- DCGS-N will ultimately be hosted by Consolidated Afloat Networks and Enterprise Services (CANES), but until CANES can be fielded, DCGS-N Increment 1 aligns with the Integrated Shipboard Network System and Sensitive Compartmented Information Networks.
- DCGS-N Increment 1 uses commercial off-the-shelf and mature government off-the-shelf software, tools, and standards. DCGS-N interoperates with the DCGS family of systems via implementation of the DCGS Integration Backbone and Net-Centric Enterprise Services standards.

Mission

- The operational commander will use DCGS-N to participate in the Joint Task Force level joint targeting and joint planning processes and to expose Navy-organic ISR&T data for Joint Forces.
- Operational and force level users equipped with DCGS-N will:
  - Identify, locate, and confirm targets through multi-source intelligence feeds
  - Update enemy track locations and provide situational awareness to the Joint Force Maritime Component Commander based on processing of data from available sensors
  - Support federated Joint Intelligence, Surveillance, and Reconnaissance exploitation/production

Prime Contractors

- BAE Systems, Electronics, Intelligence and Support (EI&S), San Diego, California
- L-3 Communications, Services Group, Chantilly, Virginia
- Science Applications International Corporation (SAIC), Chantilly, Virginia

Activity

- COTF conducted an Operational Assessment (OT-B1) of the DCGS-N in March 2009 in accordance with the DOT&E-approved test plan to provide information in support of a Milestone C decision.
- The ASD (NII) signed the Milestone C Acquisition Decision Memorandum on August 17, 2009.
- COTF conducted IOT&E (OT-C1) onboard USS *Harry S Truman* (CVN 75) while operating at sea. The IOT&E (OT-C1) commenced on August 20, 2009; however, COTF suspended testing six days later when the DCGS-N system server stopped functioning. The Program Office isolated the problem to a procedural problem that allowed the virtual drive to fill with error messages. The Program Office provided revised procedures to the crew. COTF resumed testing on September 9, 2009. COTF completed the embarked phase of the IOT&E on September 18, 2009.

- IOT&E results will provide information for the full deployment decision review for DCGS-N Increment 1, Block 1.

Assessment

- DOT&E concurred with the COTF OT-B1 assessment and recommended that DCGS-N Increment 1 Block 1 proceed to Milestone C and subsequent IOT&E. Although DCGS-N demonstrated sufficient maturity for Milestone C, DOT&E recommended the Program Office develop the capability to shut down DCGS-N within the time supported by the installed uninterruptible power supply prior to shipboard operations. COTF further recommended the Program Office correct performance shortfalls in Intelligence, Surveillance, and Reconnaissance, and complete the assessment of information assurance and interoperability.
- The Program Office demonstrated resolution of the shutdown sequence problem prior to the commencement of IOT&E.
- The completion of the second period of IOT&E embarked operations demonstrated that the procedural modifications successfully resolved the DCGS-N server problem that had necessitated the earlier suspension of testing.
- The IOT&E results are expected to be published in December 2009.

Recommendations

- Status of Previous Recommendations. This is the first annual report for this program.
- FY09 Recommendations. None.

E-2D Advanced Hawkeye

Executive Summary

- The E-2D Advanced Hawkeye continues to improve in aircraft and radar system performance.
- The E-2D Program Office completed a planned transition from St. Augustine, Florida, to Naval Air Station (NAS) Patuxent River, Maryland.
- The Commander, Operational Test and Evaluation Force (COTF) conducted an operational assessment (OT-B1) on the E-2D Advanced Hawkeye from September 29 to November 12, 2008.
- The Navy completed Milestone C and was authorized to proceed with low-rate initial production (LRIP) Lots 1 and 2 after a critical Nunn-McCurdy Breach in June 2009.

System

- The E-2D Advanced Hawkeye is a carrier-based Airborne Early Warning and Command and Control aircraft.
- Significant changes to this variant of the E-2 include replacement of the radar system, the communications suite, the mission computer, and the incorporation of an all-glass cockpit.
- The radar upgrade replaces the E-2C mechanical scan radar with a radar array that has combined mechanical and electronic scan capabilities.
- The upgraded radar is designated to provide significant improvement in Hawkeye littoral, overland, clutter management, and surveillance capabilities.

Mission

The Combatant Commander, whether operating from the aircraft carrier or from land, will use the E-2D Advanced Hawkeye to accomplish the following missions:

- Theater air and missile sensing and early warning
- Battlefield management, command, and control
- Acquisition, tracking, and targeting of surface warfare contacts
- Surveillance of littoral area objectives and targets
- Tracking of strike warfare assets

Prime Contractor

- Northrop Grumman Aerospace Systems, St. Augustine, Florida

Activity

- COTF conducted an operational assessment (OT-B1) on the E-2D Advanced Hawkeye from September 29 to November 12, 2008. COTF issued their Final Report on this operational assessment in March 2009. All testing was conducted in accordance with a DOT&E-approved Test and Evaluation Master Plan (TEMP) and test plan.
- COTF conducted integrated testing in January 2009 to verify improvements in target tracking and overland radar detection.
- DOT&E approved the E-2D Advanced Hawkeye TEMP for Milestone C.
- The Under Secretary of Defense (Acquisition, Technology and Logistics (USD(AT&L)) directed the Navy to declare a significant Nunn-McCurdy Breach in April 2009 and conduct a review similar to that required for a critical breach.
- The Navy declared a critical Nunn-McCurdy Breach in June 2009 due to cost growth.
- The USD(AT&L) approved Milestone C including, but not limited to, the following program direction:
  - Entry into LRIP for Lots 1 and 2 (two aircraft each)
  - Long lead procurement for LRIP 3
  - Revised procurement profile to contain production costs
  - Establishment of exit criteria for the FY10 operational assessment
- The E-2D Program Office completed the planned relocation of E-2D developmental and integrated testing from St. Augustine, Florida, to NAS Patuxent River, Maryland, in July 2009.

Assessment

- The operational assessment demonstrated satisfactory aircraft and radar system performance. Radar integration efforts must continue to improve target tracking and overland detection performance. DOT&E observed two areas of significant risk to successful completion of IOT&E: interoperability (due to the Cooperative Engagement Capability program development schedule) and training (due to lack of maintenance trainers for IOT&E maintenance personnel).

- The E-2D program must remain fully funded in order to complete development of training, maintainability, and Logistic Support capability.
- The radar system reliability, specifically mean time between failure, did not meet established requirements during the operational assessment and must continue to improve. The E-2D program does have a reliability growth program and is required to achieve specific radar system performance levels as exit criteria for LRIP Lots 1 and 2.
- The operational assessment scheduled for FY10 will allow an in-depth assessment of radar performance including improvement in system reliability maturity.

Recommendations

- Status of Previous Recommendations. The Navy satisfactorily addressed the previous recommendations.
- FY09 Recommendation.
  1. The Navy should revise the TEMP for approval before the Defense Acquisition Board program review in FY11.

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

Executive Summary
- The Navy's application of integrated testing of the EA-18G enabled early identification of areas of risk. This early identification provided the Navy more time to aggressively pursue resolution of risk areas and deficiencies.
- Integrated Operational Test and Evaluation (IOT&E) occurred from October 1, 2008, to May 4, 2009, and included 471 flight test hours.
- DOT&E completed its EA-18G Beyond Low-Rate Initial Production (BLRIP) Report and Live Fire Test and Evaluation survivability assessment in September 2009.
- The EA-18G is operationally effective, but not operationally suitable based upon poor maintainability, Built-in Test (BIT) performance, and interfaces with the legacy ALQ-99 jamming pods. The EA-18G is survivable in its planned operational environment.

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 the AEA system into the F/A-18F includes:
  - Modified EA-6B Improved Capability III ALQ-218 receiver system
  - Advanced crew station
  - Legacy ALQ-99 jamming pods
  - Communication Countermeasures Set System
  - Expanded digital Link 16 communications network
  - Electronic Attack Unit
  - Interference Cancellation System that supports communications while jamming
  - Satellite receive capability via the Multi-mission Advanced Tactical Terminal
- Additional systems include:
  - Active Electronically Scanned Array 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 countering enemy radar and communications.
- Commanders use the EA-18G capabilities to:
  - Jam integrated air defense systems
  - 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 accurate HARM targeting
  - Provide the EA-18G crew air-to-air self-protection with AMRAAM

Prime Contractor
- The Boeing Company, Integrated Defense Systems, St. Louis, Missouri

Activity
- DOT&E approved a third revised Test and Evaluation Master Plan (TEMP) (Revision C) in May 2008 that was aligned with the Capability Production Document. This document incorporated the entrance criteria for the IOT&E (OT-C1) that included 471 flight test hours.

- The EA-18G entered IOT&E on October 1, 2008, and concluded May 4, 2009.
- During IOT&E the EA-18G participated in multiple operational test events, including Mission Employment Large Force Exercises (LFEs) in December 2008. The LFE provided an operational environment to better assess interoperability with other Services and agencies. In particular, Multi-functional Information Distribution System and Link 16 information on targeting and threat radar site locations was passed between various other participants of the LFE.
- The Navy also conducted operational testing at the China Lake Electronic Combat Range and aircraft carrier suitability onboard CVN 74.
- DOT&E approved a fourth revised TEMP (Revision D) in August 2009 that included additional detail for FOT&E.
- The Navy conducted testing in accordance with the DOT&E-approved TEMPs and test plan.
- The Navy conducted additional, limited testing of software to address BIT deficiencies in July of 2009.
- DOT&E completed the EA-18G BLRIP Report and LFT&E Report in September 2009.

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 developmental problems.
- The EA-18G is operationally effective, but not operationally suitable based upon poor maintainability associated with ALQ-218 BIT performance and interface with the legacy ALQ-99 jamming pods.
- Additional testing in July of 2009 of software version H5E+ indicates that the newer software may have eliminated many of the BIT problems. The Navy has scheduled a Verification of Correction of Deficiencies for September 2009 and FOT&E for spring of 2010 that will allow full evaluation of the new software, as well as other Navy actions to improve current suitability problems. The Navy's aggressive problem solving demonstrated throughout system development is likely to result in BIT software maturation.
- The Live Fire test program showed that the EA-18G is survivable, but has Situational Awareness limitations that increase its susceptibility due to the lack of a dedicated radar warning receiver capability.

Recommendations

- Status of Previous Recommendations. There were no previous recommendations from FY08.
- FY09 Recommendations. The Navy should:

EA-18G Aircraft

1. Continue Verification Correction of Deficiency testing and FOT&E to confirm maintainability problems have been fixed.
2. Improve reliability of the current ALQ-99 pods and consider accelerated development of the Next Generation Jammer.
3. Minimize aircrew workload management to include upgrading the pilot Tactical Situation Display comparable to the EA-6B.
4. Improve hardware and software diagnostic tools for the ALQ-218 and update the Interactive Electronic Technical Manual System accordingly.
5. Conduct survivability studies to assess the benefits of a threat warning system that could provide timely notification of types and locations of targeting threats.
6. Assess the safety and performance benefits of adding higher performance engines.

Electronic Warfare Warfighting Improvements

7. Support ongoing DoD efforts to investigate, evaluate, and make recommendations to improve Enterprise Electronic Warfare test capabilities associated with open-air ranges, test and evaluation facilities, concepts, processes, and procedures.
8. Assess requirements to improve Electronic Warfare modeling and simulation capabilities to support ground testing of future AEA capabilities, to include multi-signal threat environments.
9. Assess the need for and benefits of building a more capable threat range at Naval Air Station Whidbey Island, Washington.

Expeditionary Fighting Vehicle (EFV)

Executive Summary

- The Marine Corps Operational Test and Evaluation Activity (MCOTEA) observed promising results during a Water Directional Stability test in October 2008. MCOTEA also observed a developmental test event that used the existing prototype vehicles ("SDD-1" vehicles) to examine system performance during riverine operations.
- Program Manager Advanced Amphibious Assault (PM-AAA) completed developmental underwater explosion (UNDEX) shock testing in July 2009 on an SDD vehicle to examine system-level shock response and to verify performance requirements.
- Near-term testing of planned updates to the SDD-1 vehicles to demonstrate approximately 40 modifications addressing performance and reliability shortfalls has slipped to FY10.

System

- The Expeditionary Fighting Vehicle (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 7.62 mm 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 Land Systems, Woodbridge, Virginia

Activity

- The prime contractor continues to build seven redesigned prototype vehicles ("SDD-2" vehicles) to support developmental and operational testing that is scheduled for FY10 through FY14.
- MCOTEA participated in combined developmental and operational testing in October 2008 in which a modified SDD-1 prototype vehicle demonstrated a correction to the steering deficiency discovered in the 2006 Operational Assessment. MCOTEA also observed a developmental test event that used the SDD-1 vehicles to examine system performance during riverine operations. This event was conducted at the Aberdeen Test Center, Maryland, and then at Camp Lejeune, North Carolina.
- PM-AAA completed developmental UNDEX shock testing in July 2009 on an SDD vehicle to examine system-level shock response and to verify performance requirements. The LFT&E Integrated Product Team participated in the UNDEX test planning and will be provided data from these tests.
- A Ballistic Vulnerability Test (BVT) has been planned using two of the SDD vehicles. The BVT will include emerging threats including roadside and underbody IEDs and mines, and

a substantial small arms and fragment simulator ballistic test effort.

Assessment

- Near-term testing of planned updates to the SDD-1 vehicles to demonstrate approximately 40 modifications addressing performance and reliability shortfalls has slipped to FY10. Of particular concern is that three of four developmental and operational test events that were planned for FY09 were postponed until FY10. These events were expected to provide information to reduce risk for the SDD-2 vehicles, but now will not.
- The riverine operations event provided useful information on the effects of riverine debris on the propulsion system and engine operations. Initially, ingested debris accumulated on the radiator, causing engine operating temperatures to rise. Debris also damaged the water jet and its housing. Between the Aberdeen Test Center phase and the Camp Lejeune phase, the program installed protective grates to prevent ingestion of large debris into the waterjets, and screens to reduce the accumulation of debris on radiators. Additional modifications are planned to further limit the accumulation of silt on the radiator. These changes will be examined during subsequent riverine testing using SDD-2 vehicles.
- Component-level testing and a Design for Reliability effort are ongoing to improve system reliability. There has been no system-level reliability testing since CY06, and none will start until the end of CY10. The program plans to demonstrate a mean time between operational mission failures of 22 hours or higher using SDD-2 vehicles before the next milestone review in FY12.
- The 2006 Operational Assessment revealed the EFV's inability to consistently get on plane in water without employing a driving technique that caused uncontrolled vehicle turns and unsafe operating characteristics. This problem was caused by the weight of the combat-loaded vehicle. System requirements have been reduced to lower vehicle weight. During the first of two planned water directional stability developmental and operational test events in October 2008, promising results were observed from a design modification (trim tabs installed on vehicle's transom flap). A second, multiple vehicle water directional stability developmental and operational test event will be conducted in 2QFY10.

Recommendations

- Status of Previous Recommendations. The Marine Corps is addressing all previous recommendations.
- FY09 Recommendations.
  1. The EFV is being developed to provide a forcible entry requirement, but there has been no end-to-end testing of the vehicle's weapon system in the water. The program should demonstrate this water gunnery capability before the Milestone C low-rate initial production decision.
  2. In response to the threat posed by IEDs and mines, the program is analyzing a protective underbody armor appliqué for installation and use during land operations. Given the possible impact of an underbody appliqué on other aspects of the vehicle's performance, the design, construction, integration, and testing of the appliqué should be completed as soon as possible and tested rigorously.

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

Executive Summary

- The Navy reported on the first FOT&E (FOT&E 1) of the APG-79 radar with System Configuration Set (SCS) H4E in FY09. Significant deficiencies remain in radar performance, especially in short range dogfight engagements. Also, several suitability deficiencies remain, including continued poor reliability, poor built-in test performance, and a system anomaly that could mask an overheat condition, causing a potential fire hazard. The Program Office has proposed an engineering change to address this anomaly; it will be implemented and flight tested in FY10.
- Because development of the combat capability of the APG-79 was concurrent with IOT&E, it was problematic for the Navy to correct deficiencies observed during IOT&E prior to deployment or FOT&E 1. Additionally, those fixes that were implemented came at the expense of new functionality expected in the first combat software build. The Navy deployed APG-79 equipped F/A-18E/F aircraft prior to the end of FOT&E 1 and prior to correction of all identified deficiencies. Commander, Operational Test and Evaluation Force (COTF) identified specific deficiencies for correction prior to FOT&E 2.
- The Navy conducted Software Qualification Test (SQT) of the SCS H5E from October 2008 through May 2009 and of SCS 21X from June through September 2009. The H5E software was an improvement over previous versions and over 120 previous anomalies were corrected. Problems remain in the air warfare capability for both APG-79 and APG-73 radar systems including Electronic Warfare threshold shortfalls that increase the susceptibility of the aircraft.

System

- The F/A-18E/F Super Hornet is the Navy's premier strike fighter aircraft and replaces 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.
- Major combat capabilities are embodied in the operational software builds known as SCS. Two software programs are involved: the "X-series" for the legacy computer systems in the early aircraft and the "H-series" for the later aircraft with updated processors. The current fleet SCS for Block 2 Super Hornets is H5E. Super Hornets prior to Lot 26 (as well as legacy Hornets F/A-18 (A+/C/D)) currently operate with SCS 20X. The 21X upgrade is intended to enable all aircraft to operate with the same functionality as the Block 2 Super Hornets. Super Hornet capability improvements remain under DOT&E oversight.

- The F/A-18E/F Lot 26 aircraft and beyond provide 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-guided weapons
  - Use of AIM-9 series infrared-guided missiles and 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
  - Increased fuel and weapons capacity
- The APG-79 Active Electronically Scanned Array (AESA) 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. It replaces the APG-73 mechanically scanned array and is intended to correct current APG-73 radar deficiencies.
- The aircraft carries the Advanced Targeting and Designation Forward-Looking Infrared System (ATFLIR) that the crew uses to locate surface and airborne targets. The ATFLIR will have an infrared marker and target designator/ranger capability in addition to being able to provide infrared and/or electro-optical streaming video via data link.
- The Super Hornet is also fitted with the Shared Reconnaissance Pod, Multi-functional Information Distribution System (MIDS) for Link 16 tactical data link connectivity, the Joint Helmet Mounted Cueing System (JHMCS), and Integrated Defensive Electronic Countermeasures. The Joint Mission Planning System

– Maritime (JMPS-M) is the fleet mission planning system. An infrared search and track system is under development.

Mission

- The F/A-18E/F provides the Aircraft Carrier Battle Group Commander with a multi-mission capable aircraft. Carrier Strike Group Commanders and Joint Force Air Component Commanders use the F/A-18E/F to:
  - Conduct offensive and defensive 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
  - Employ both the High-Speed Anti-Radiation Missile and the Advanced Anti-Radiation Guided Missile against enemy radars
  - 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

- The Boeing Company, Integrated Defense Systems, St. Louis, Missouri

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Activity

- COTF submitted their final report on the first FOT&E of the APG-79 (AESA) radar in January 2009. During that test, APG-79-equipped F/A-18E/F aircraft with SCS H4E completed 867 flight hours in 587 sorties. APG-79 (AESA) radar testing was intended to support the first fleet deployment of this system by verifying correction of deficiencies identified in IOT&E (2006), and evaluating the newly implemented Anti-Tamper capability and the inherent electronic protection capability of the radar.
- The Navy conducted testing of the 21X build between June and September 2009 in accordance with the DOT&E-approved Test and Evaluation Master Plan (TEMP) and test plan. The 21X build is the SCS for the legacy Super Hornets and other F-18 aircraft that do not have advanced mission computers and was intended to add capabilities common to those aircraft with the advanced mission computer/higher-order language software (e.g., H3E and H4E).
- The Navy conducted SQT of the SCS H5E from October 2008 through May 2009. F/A-18E/F aircraft with H5E software installed flew 1,100 flight hours in 793 sorties. In addition to providing initial capability for the EA-18G (reported separately), testing of the block H5E update testing assessed integration of JMPS, MIDS-Joint Tactical Radio System, Joint Stand-off Weapon C-1, Stand-off Land Attack Missile Expanded Response (SLAM-ER), and the Joint Helmet Mounted Cueing System – Night Vision Cueing Device (JHMCS-NVCD).

Assessment

- DOT&E agrees with COTF that the F/A-18E/F equipped with APG-79 (AESA) radar presents a considerable upgrade in technology; however, significant deficiencies remain in radar performance, especially in short range dogfight engagements. Several suitability issues remain, including failure to meet reliability requirements, poor built-in test performance, and a masking of an overheat condition, which is a potential fire hazard. The Program Office has an engineering change proposal to address this anomaly; it will be implemented and flight tested in FY10. Development of the full electronic warfare capability of the radar continues to be deferred to later software builds; SCS H6E and H8E are currently planned to implement these capabilities.
- F/A-18E/F equipped with APG-79 (AESA) radar demonstrate an improved warfighting capability over the legacy APG-73 radar.
- Because APG-79 (AESA) equipped F/A-18E/F aircraft are already deployed, COTF did not make additional Fleet release recommendations. COTF identified specific deficiencies for correction prior to FOT&E 2 in April 2010.
- H5E JHMCS display upgrades provided notable improvements and over 120 previous anomalies were corrected from the H4E software set. Electronic protection capability deficiencies and performance are not resolved for both APG-79 (AESA) and APG-73 radar systems.
- IOT&E of the APG-79 identified major deficiencies. COTF's assessment found the system not effective and not suitable but recommended the release for training pending correction of deficiencies. The Navy elected to deploy the F/A-18E/F aircraft with the new radar and found that it is a significant capability improvement over the APG-73 even with the reported deficiencies.

Recommendations

- Status of Previous Recommendations. The Navy has made progress in addressing the recommendation from FY08. The two FY07 recommendations remain valid.
- FY09 Recommendations. The Navy should:
  1. Correct APG-79 (AESA) deficiencies identified in the COTF assessment prior to FOT&E 2.
  2. Continue to improve the APG-79 (AESA) mean time between operational mission failure rate.
  3. Conduct operationally representative end-to-end missile shot testing to demonstrate multi-AIM-120 support with the APG-79 and current SCS, as well as develop and characterize the full electronic warfare capability of the AESA radar.

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

Executive Summary

- FOT&E for the UH-1Y was conducted from July to October 2009, and focused on the evaluation of satellite communications, Bright Star Block II multi-sensor imaging system, System Configuration Set 5.2, the Optimized Top Owl (OTO) 2.0B Helmet-Mounted Sight Display, and previously identified deficiencies.
- A second deployment of UH-1Y aircraft is scheduled for the 1QFY10.
- Phase 3 of IOT&E for the AH-1Z is scheduled to begin in March 2010.
- The H-1 Upgrades program is a covered program for LFT&E. All scheduled LFT&E on both aircraft has been completed. The UH-1Y was found to be survivable with the exception of the main rotor gearbox, which does not meet its required endurance with loss of lubrication.

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. 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 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, Amarillo, Texas

Activity

- In FY09 Commander, Operational Test and Evaluation Force conducted FOT&E for the UH-1Y at White Sands Missile Range, New Mexico, and at China Lake, Camp Pendleton, and Twentynine Palms, California. FOT&E for the UH-1Y took place from July through October 2009 and was conducted in accordance with a DOT&E-approved Test and Evaluation Master Plan and test plan.
- Test operations consisted of both day and night land-based missions and test articles consisted of two production representative UH-1Y aircraft with AV-8B, AH-1W, and AH-1Z providing additional resource support. The Command and Control mission area was evaluated during exercise Enhanced Mojave Viper.
- Focus for the UH-1Y FOT&E was to evaluate the Bright Star Block II, satellite communications (SATCOM), System Configuration Set 5.2, OTO 2.0B Helmet-Mounted Sight Display, and the deficiencies previously identified during IOT&E Phase 2 conducted in FY08.
- The second deployment of UH-1Y aircraft is scheduled to occur during 1QFY10.
- The 2008 IOT&E of the AH-1Z was stopped because of performance deficiencies. The program has completed development and is scheduled to begin IOT&E Phase 3 in 2QFY10.

Assessment

- Evaluation of the UH-1Y in FOT&E is underway with testing expected to be completed in 1QFY10. Twenty-six sorties have been flown and so far nothing precluding aircraft employment has been identified with regard to the introduction of the

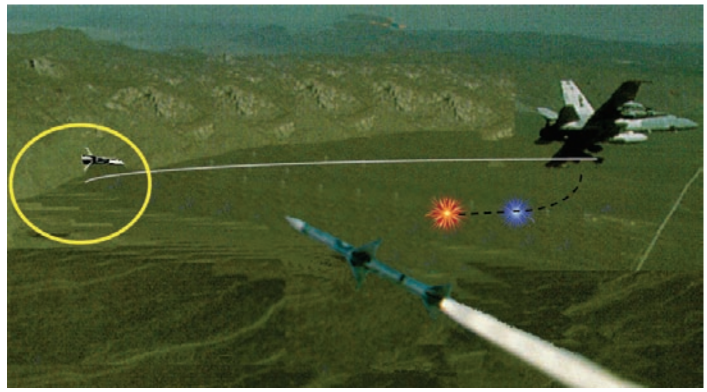
SATCOM, OTO 2.0B, Bright Star Block II, and System Configuration Set 5.2.
- A redesign effort to increase the structural integrity and service life for the cuff and yoke is planned for FY10 with initial aircraft testing being planned for FY12. Additionally, a heads-up display of "g" rate change is planned to be introduced with System Configuration Set 6.0. This is designed to provide pilots with increased awareness of aircraft maneuverability during high gross weight and high density altitude operations. Deficiencies associated with the helmet performance and the OTO Helmet-Mounted Sight Display during IOT&E Phase 2 have been mitigated with the introduction of OTO 2.0B.
- Deficiencies noted during IOT&E and unique to the AH-1Z have shown significant improvement during developmental test and are being readied for evaluation during IOT&E Phase 3. They include Target Sight System reliability and performance deficiencies and rocket and AGM-114 Hellfire missile delivery effectiveness.
- The UH-1Y was found to be survivable, with the significant exception of the main rotor gearbox, which does not meet its required endurance after a loss of lubrication following ballistic penetration. The AH-1Z report has not been published, but it has the same main rotor gearbox vulnerability.

Recommendations
- Status of Previous Recommendations. The program is addressing all previous recommendations.
- FY09 Recommendations. The Navy should:
  1. Continue efforts to redesign the cuff and rotor thereby increasing its structural integrity and service life and eliminating maneuvering restrictions at high gross weights and high density altitudes.
  2. For the UH-1Y, increase the load capacity of the Improved Defensive Armament System and address the gun depression angle limitation which restricts defensive fields of fire.
  3. Fund and conduct LFT&E of the main rotor gearbox.
  4. Address water intrusion into the tail rotor for both AH-1Z and UH-1Y identified during IOT&E because of its negative impact on aircraft availability and increased maintenance burden.

Integrated Defensive Electronic Countermeasures (IDECM)

Executive Summary

- Testers found Integrated Defensive Electronic Countermeasures (IDECM) Block 3 operationally effective during FY08 IOT&E, but not operationally suitable due to several major deficiencies regarding reliability and safety. DOT&E concurred with this assessment.
- IDECM Block 3 Milestone III was moved to 1QFY11 to accommodate the correction of deficiencies identified during IOT&E.
- IDECM Block 4 completed its hardware preliminary design review. A revised Test and Evaluation Master Plan (TEMP) is scheduled to be completed prior to the Critical Design Review planned for November 2009.



System

- The IDECM system is a radio frequency, self-protection electronic countermeasure suite on F/A-18 aircraft. The system is comprised of onboard and off-board components. The onboard components receive and process radar signals and can employ onboard and/or off-board jamming components in response to identified threats.
- 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 include an onboard radio frequency receiver and jammer. The F/A-18E/F installation includes off-board towed decoys. The F-18C/D installation includes only the onboard receiver/jammer components and not the towed decoy.
  - IB-1 combined the legacy onboard system (ALQ-165) with the legacy (ALE-50) off-board towed decoy (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 intend to use IB-3's and IB-4's complex jamming capability to increase survivability against modern radar guided threats.

Prime Contractors

- ALE-55: BAE Systems, Nashua, New Hampshire
- ALQ-214: ITT Electronic Systems, Clifton, New Jersey
- ALE-50 and Improved Multi-purpose Launch Controller (IMPLC): Raytheon Electronic Warfare Systems, Goleta, California

Activity

- Commander, Operational Test and Evaluation Force (COTF) issued their report on the IB-3 IOT&E that was completed in FY08.
- The Navy postponed IB-3 Milestone III to 1QFY11 to allow time to produce modified ALE-55 decoys and correct suitability and safety issues identified during IOT&E.
- The Navy began laboratory testing to confirm the corrections to the IB-3 performance. Flight testing will be conducted in FY10 to verify corrections.
- The Navy modified the IB-4 upgrade acquisition strategy to an engineering change proposal from a conventional milestone acquisition program.
- The IB-4 TEMP update is scheduled to be completed prior to the Critical Design Review planned for 1QFY10.

Assessment

- The IB-3 IOT&E test allowed for a comprehensive evaluation of operational effectiveness and suitability of the system as installed in the F/A-18E/F while performing representative missions. COTF reported that the IB-3 system was operationally effective, but not operationally suitable, citing several safety concerns and poor reliability. DOT&E concurred with this assessment.

- The IB-3 demonstrated significantly improved operational effectiveness compared to the legacy ALE-50 towed decoy. It provided enhanced aircraft survivability against a broad array of surface-to-air missile threat systems.
- While the safety issues that resulted in a test stoppage in FY06 were resolved, there were three new safety issues uncovered during FY08 IB-3 testing. These included uncommanded decoy deployments, a decoy that partially deployed within its launching canister, and the inability to sever a decoy.
- While the system met many of its suitability requirements, it suffered from poor stowed and deployed reliability and a very high Built-in Test (BIT) false alarm rate. There were multiple instances of decoy magazines that required re-insertion or cleaning for proper function. DOT&E also noted that when a decoy was partially severed (signal line cut but tow line intact), there was no indication to the pilot.
- Inherent to the design of IB-3 are several limitations that could be mitigated by modifications to Navy tactics, techniques, and procedures to maximize the effectiveness of the countermeasures.
- Only two-thirds of key threats were 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 were adequately represented in developmental and operational testing.

Recommendations

- Status of Previous Recommendations. The Navy is satisfactorily addressing the two FY08 recommendations.
- FY09 Recommendations.

IDECM System

1. The Navy should correct decoy safety, maintenance, and reliability issues, reduce the BIT false alarm rate, and confirm the corrections in laboratory and flight tests.
2. The Navy should develop hardware and/or software changes to provide the pilot with correct indications of the status of a deployed decoy and whether a decoy was successfully severed.
3. The Navy should improve maintenance procedures and training to reduce the incidence of incorrectly installed magazines and contaminated electrical contacts.
4. The Navy should investigate the susceptibility and effects of IDECM on threat missile fuses.
5. The Navy should continue to fund and develop new countermeasure techniques to improve IDECM effectiveness and keep pace with threat advancements.
6. The Navy should explore new tactics, techniques, and procedures to provide optimal aircraft and aircrew survivability when IDECM is employed.

Electronic Warfare Warfighting Improvements

7. In coordination with DoD and other electronic warfare programs, the Navy should develop an enterprise approach to updating and upgrading laboratory and open-air range modeling and simulation capabilities.
8. In coordination with the Defense Intelligence Agency, the Navy should update the threat lethal radii and/or the evaluation processes that are used to determine whether simulated shots are hits or misses.

Joint High Speed Vessel (JHSV)

Executive Summary

- The Joint High Speed Vessel (JHSV) is expected to be a high-speed, shallow-draft vessel intended for rapid intra-theater transport of medium-sized Army and Marine Corps payloads.
- A Navy-led Operational Assessment (OA) in January 2009 identified multiple areas of risk to the program's achieving operational effectiveness and suitability.
- The JHSV will likely meet or exceed its threshold requirements; however, missions other than basic transport, as outlined in the Capabilities Development Document (CDD) and Concept of Operations (CONOPS), may prove to be too challenging unless the program pursues objective requirements in selected areas such as ammunition storage and communications.
- DOT&E approved a LFT&E Management Plan with an alternative waiver from full-up system-level testing in July 2008. JHSV is not shock hardened (designed to sustain operations following an explosive laden attack) and will not be subjected to a Full Ship Shock Trial.

System

A joint Army and Navy (lead) acquisition program, the JHSV will be a modified version of an existing commercially available catamaran designed primarily to serve as a high-speed, shallow-draft medium-lift intra-theater transport vessel and bridge the gap between low-speed sealift and high-speed airlift. Classified as a non-combatant, it will be constructed to American Bureau of Shipping standards and will not be required to meet Navy survivability standards. JHSV will:

- Be propelled by four waterjet propulsors powered by four diesel engines
- Have an overall length of 338 feet with a maximum draft of 15 feet
- Transport 600 short tons of troops, supplies, and equipment 1,200 nautical miles at an average speed of 35 knots with significant wave height of 4 feet
- Support 312 embarked personnel for up to 96 hours or 104 embarked personnel for 14 days
- Operate in primarily permissive environments with limited self-defense consisting of only crew served weapons – four 50-caliber mounts
- Operate with a crew of no more than 41 uniformed Army personnel (Army version) or Military Sealift Command (MSC) civilian mariners augmented by a mission-based detachment of Navy personnel (Navy version).

Mission

- Combatant Commanders may employ the JHSV in solely a transport/resupply role in benign, permissive environments to:

  - Rapidly transport medium payloads of Army and Marine Corps cargo and combat-ready personnel over intra-theater distances between shore nodes
  - Deliver personnel and combat-loaded vehicles and equipment ready to be employed regardless of infrastructure or land-based support
  - Support sustainment of forces between advanced bases, ports, and austere littoral access points too difficult for larger ships to access
- As delineated in both the CDD and each Service CONOPS, Combatant Commanders may also employ the JHSV to conduct missions that could place the ship in potentially non-permissive environments and may prove to be too challenging for the ship as designed to threshold requirements:
  - Noncombatant Evacuation Operations
  - Humanitarian Assistance/Disaster Relief
  - Support of Special Operations Forces to include capability to launch a SEAL Delivery Vehicle
  - Afloat Forward Staging Base in support of SOF
  - Intermediate Sea Base in support of Carrier Strike Group Interdiction Operations
  - Mobile Headquarters or small command ship
  - Network interoperability to support Army battle command on the move capability – mission planning and rehearsal en route to objective
  - An "enabler" of the Seabasing concept – an alternative means of delivery from advanced bases and Combat Logistic Force ships to sea base forces (up to Sea State 4).

Prime Contractor

- Austal USA, Mobile, Alabama

Activity

- In November 2008, the program received Milestone B certification to start Engineering and Manufacturing Development. The Defense Acquisition Executive directed the Navy to report the status of the most significant risks to operational effectiveness and suitability identified during the OA at the next program review Defense Acquisition Board.
- In November 2008, Austal USA was selected as the shipyard to build the first 10 (low-rate initial production) ships. Five will be delivered to the Army and five to the Navy. The acquisition strategy identifies a total of 18 ships. IOT&E on the first Army and Navy vessels is planned for FY12 and FY13, respectively.
- In November 2008, the Navy completed the Preliminary Design Survivability Assessment Report for LFT&E.
- To date, the Navy has been successful in leveraging similar ship programs, such as Littoral Combat Ship (LCS), and other resources to develop an adequate LFT&E program. However, some knowledge gaps have been identified which challenge the modeling and simulation tools in assessing the vulnerabilities of aluminum, nontraditional hull-forms constructed to primarily commercial standards.
- In January 2009, a combined Navy, Army, and Marine Corps Operational Test Agency team conducted an OA (OT-B1) per the DOT&E-approved OA Test Plan. Experienced fleet operators from the Army, Navy, MSC, and Marine Corps reviewed ship plans and specifications, including data acquired from previously leased experimental craft in an effort to influence ship design prior to the initial critical design review.

Assessment

- The OA revealed operational effectiveness and suitability risks to achieving the basic point-to-point transport mission:
  - The absence of forced ventilation and air quality monitors in the Mission Bay jeopardizes the safety of the crew and embarked force during onload and offload of vehicles and equipment, particularly in port or at anchor when there is little natural circulation.
  - Storage space for embarked force personal equipment is inadequate. Although an additional unassigned space was added following the initial design review, the ship only provides approximately half of what is required per current DoD transportation allowances.
  - JHSV requirements do not include any metrics for Reliability, Availability, and Maintainability (RAM).
  - The size and make-up of the Navy Military Detachment (MILDET) designed to augment the MSC crew for specific operational evolutions has not been determined and no decision has been made on whether the MILDET(s) will be temporary (mission based) or permanent.
- The OA revealed operational effectiveness and suitability risks to achieving additional required mission sets as delineated in both the CDD and each Service CONOPS with just the basic (threshold) JHSV. The following were identified:
  - The absence of nighttime compatible lighting requires the ship to extinguish Mission Bay lighting at night. This precludes Mission Bay activity during nighttime flight operations when using Night Vision Devices (NVD).
  - Military forces embarked on the JHSV will be required to store all ammunition in the vehicles secured in the Mission Bay. There are no magazines other than for the ship's weapons provided for force protection. The JHSV is prohibited from transporting break bulk or palletized ammunition. This could be problematic for embarked forces without vehicles, particularly for Special Operations missions.
  - JHSV is prohibited from operating with helicopters equipped with offensive air-launched weapons (missiles, bombs, rockets), limiting their ability to support Special Operations missions or sustainment of a forward deployed force.
  - The JHSV threshold communications suite is inadequate to support any mission other than basic point-to-point transport of forces. The Services will be charged with installing objective upgrades to support additional capabilities as described in both the concept of operations and requirements document.
  - There is limited capability to provide a graduated response to developing Anti-Terrorism/Force Protection threats. A minimally manned crew will have difficulty manning all four .50-caliber mounts for an extended period of time.
- JHSV is expected to be survivable in completely permissive environments only. Support of Special Operations missions and other combat related missions risks placing the ship in non-permissive environments, thus introducing survivability liabilities to the crew and embarked personnel. JHSV is not designed or expected to be survivable against weapons effects encountered in combat missions.
- The LFT&E Preliminary Design Survivability Assessment and subsequent discussions with the LCS program directed attention on the Navy's knowledge gaps in assessing the vulnerabilities of aluminum, nontraditional hull-forms primarily constructed to commercial standards. These knowledge gaps challenge this test and evaluation program, which relies almost exclusively on Modeling and Simulation (M&S):
  - Lack of relevant test data prevents the validation of LFT&E M&S.
  - Limited testing resources preclude credible LFT&E assessments.

Recommendations

- Status of Previous Recommendations. This is the first annual report for this program.
- FY09 Recommendations. The Navy should:
  1. Provide forced ventilation or develop tailored techniques and procedures for operating vehicles in the Mission Bay along with a means to monitor the environment to prevent accumulation of toxic or explosive gases.
  2. Increase the available embarked force storage space to meet current defense transportation regulations for a footprint of 312 personnel.
  3. Identify measurable and testable requirements for RAM and a means to monitor reliability growth in the Test and Evaluation Master Plan.
  4. Determine the MILDET size, billet structure, and whether it will be permanent or temporary (mission based). If it will be temporary, further determine how many there will be, where they will originate from, and who will sustain them.
  5. Identify and pursue a resolution to Mission Bay lighting that would allow nighttime Mission Bay and NVD flight operations.
  6. Provide a means to enable an embarked force without vehicles to stow weapons and ammunition or, state this limitation clearly in the CONOPS and provide the source for a certified portable magazine.
  7. Pursue design changes or additions that would permit JHSV to land and operate with helicopters armed with air-launched weapons or, incorporate this limitation in a CONOPS revision.
  8. Pursue installation of selected capability objective communications equipment designed to increase situational awareness to enable the ship to accomplish required missions other than basic intra-theater transport or, incorporate this limitation in a CONOPS revision.
  9. Pursue objective force protection requirement for installation of Remote-Operated Small Arms Mount resulting in increased crew situational awareness and response time.
  10. Identify survivability liabilities to the crew and embarked personnel when JHSV supports combat related missions that may place the ship in non-permissive environments.
  11. Continue the coordination with similar ship programs, such as LCS, and other sources within the Navy to pursue testing opportunities to address knowledge gaps in assessing the vulnerabilities of aluminum, nontraditional hull-forms primarily constructed to commercial standards.

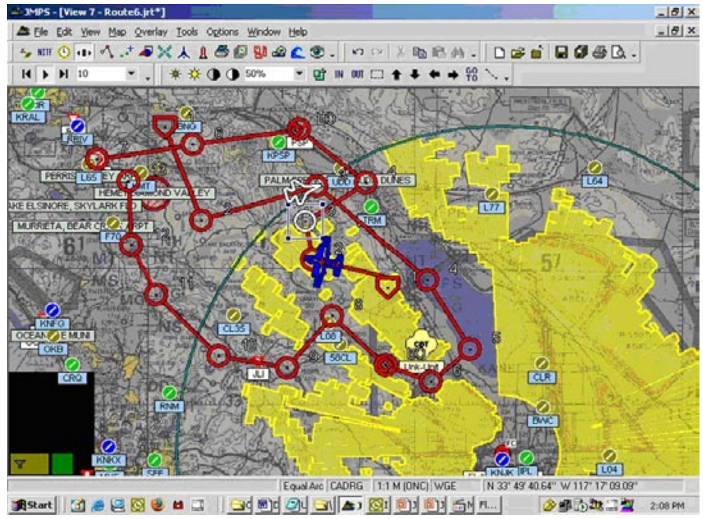
Joint Mission Planning System – Maritime (JMPS-M)

Executive Summary

- PMA-281 Mission Planning Systems, the Navy Joint Mission Planning System – Maritime (JMPS-M) Program Manager, is modifying Framework 1.2 to integrate new mission planning features and federated applications, and is planning to re-host Mission Planning Environments (MPEs) to the new Joint Framework 1.4.
- The Navy and Marine Corps JMPS-M for host platforms has demonstrated improved results during developmental and operational tests.
- 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 core.
- An 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 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 should be able to collaborate on mission planning, even when operating from different bases.

Prime Contractor

- Framework: BAE Systems, San Diego, California

Activity

Framework 1.4

- The Navy JMPS-M Program Manager, PMA-281, is continuing development with the Air Force on a new JMPS Framework 1.4, which will replace Framework 1.2 and integrate new mission planning features and federated applications.
- The Navy successfully completed preliminary design review of Framework 1.4 software.

Platforms

- PMA-281 conducted the following DOT&E-monitored developmental tests on JMPS-M platform MPEs in order to assess risks to successful operational test results:
  - Marine Helicopter MPE version 2.0 at Naval Air Station (NAS) Point Mugu, California
  - Marine Helicopter MPE version 2.1 at NAS Point Mugu, California
  - C-2A MPE version 1.0 at NAS Point Mugu, California
  - CVIC (Carrier Intelligence Center) MPE version 1.0 at NAS Point Mugu, California
  - P-3C MPE version 2.0 at NAS Point Mugu, California
- Commander, Operational Test and Evaluation Force (COTF) conducted the following operational tests on JMPS-M platform MPEs:

- EA-18G JMPS version 2.2.1 at Nellis AFB, Nevada, and China Lake, California, during December 2008 through February 2009
- F-18 JMPS version 2.2 at China Lake, California, in February and March 2009
- Navy Legacy Helicopter (NLH) JMPS version 1.0 at Norfolk NAS, Virginia, and Jacksonville NAS, Florida, in January and February 2009
- MV-22 MPE version 1.1 FOT&E in conjunction with a platform software upgrade operational test at Kirtland AFB, Albuquerque, New Mexico, in May and June 2009
- The 18th Flight Test Squadron conducted an operational test of the V-22 JMPS version 1.1 using CV-22 operators from the 8th Special Operations Squadron at Hurlburt Field in March 2009
- AV-8B JMPS version 2.1 in conjunction with a platform software upgrade operational test at Marine Corps Air Station Yuma, Arizona, and China Lake NAS, California in June and July 2009

• All operational testing was conducted in accordance with DOT&E-approved Test and Evaluation Master Plans (TEMPs) and test plans.

JMPS-E

• DOT&E sponsored several JMPS-E test strategy planning meetings with Navy and Marine Corps program management and developmental/operational testers, which resulted in an approved requirements clarification letter from the Navy (N88). Marine Corps Test and Evaluation Agency discontinued test oversight of JMPS-E pending completion of development of Marine Corps amphibious planning functionality within the JMPS-E MPE.
• PMA-281 conducted and DOT&E monitored developmental testing of the JMPS-E version 1.0 at the Naval Amphibious Base, Coronado Island, California.
• DOT&E approved the COTF JMPS-E Test Concept for IOT&E that will occur in spring 2010 during pre-deployment training aboard amphibious ships in San Diego, California.

Assessment

Platforms

• Results from a developmental test effort of the Marine Helicopter MPE version 2.0 indicate that there are functionality and stability issues with this MPE. The configuration that was tested would likely not be found effective or suitable during operational test.
• Results from a Marine Helicopter JMPS MPE version 2.1 developmental test indicated that the MPE has potential to mature as a true attack helicopter mission planning tool, but was not ready for operational test or fleet release. Deficiencies identified included inaccurate and difficult fuel planning and difficulty in printing required forms.
• Results from a C-2A JMPS MPE version 1.0 developmental test indicate that the MPE will support C-2A operations with potential difficulties noted in the area of planning instrument flight rules routes and system stability.
• Results from a developmental test event of the CVIC MPE version 1.0 indicate that the basic mission planning data can be transferred to an aircraft, but that more robust training is needed for aircrews to effectively use the MPE.
• Results from a P-3 JMPS MPE version 2.0 developmental test indicated that the MPE provided added mission planning capabilities but there were major deficiencies related to the Flight Performance Module application, which supports fuel and endurance calculations, access to external sources of needed mission planning data such as weather and optimum path routing, and support weapons employment planning for the Stand-off Land-Attack Missile-Expanded Response.
• The EA-18G MPE version 2.2.1 is operationally effective and suitable. There were no major deficiencies found and minor deficiencies were attributed to training issues and the complexity of JMPS. JMPS barely met the 30-hour reliability requirement, demonstrating that MPE stability continues to be a hindrance to planning.
• Test results for the F-18 MPE version 2.2 indicates that this MPE will be found operationally effective and suitable with major deficiencies relating to MPE functionality and system stability. The MPE computer workstations used in the test event displayed a grounding problem that needs to be resolved prior to fielding.
• The NLH MPE version 1.0 is operationally suitable for SH-60B, SH-60F, MH-53E, and HH-60H aircraft. COTF assessed the NLH MPE version 1.0 as operationally effective for SH-60B and SH-60F aircraft and not operationally effective for MH-53E and HH-60H aircraft. The major deficiency cited for MH-53E operations was that JMPS restricts the flexibility of mission planning by removing the ability to conduct GPS-guided nonprecision approaches. The MPE's major deficiency regarding HH-60 mission planning was the limited capability to plan operations in a threat environment. The lack of capability to provide threat masking hinders aircrew attempts to plan a flight path that minimizes aircraft threat susceptibility. Information assurance was also cited as an MPE deficiency.
• DOT&E analysis of FOT&E test data indicates the V-22 JMPS MPE v1.1 is effective and suitable and is recommended for fielding. The V-22 version 1.1 MPE is acceptable to aircrew, but stability and compatibility deficiencies with the Portable Flight Planning System used by other Air Force Special Operations aircraft are still a limiting factor. The flight performance model is also immature in that it requires aircrew to manually calculate fuel burn.
• The AV-8B MPE 2.1 is operationally effective and suitable. Three major deficiencies were documented during operational test. The AV-8B MPE failed to meet the established criterion for Military Training Route planning time; the AV-8B MPE hardware does not support a sufficient number of ruggedized PCMCIA cards to allow for reliable planning of GPS-guided munitions; and the AV-8B MPE is not authorized to operate on the Navy-Marine Corps Internet in an ashore environment, precluding automatic download and install of critical updates.

JMPS-E

- PMA-281 and COTF need to submit a TEMP Annex and IOT&E Test Plan for JMPS-E in order to obtain approval prior to the start of operational test. A coherent JMPS-E Acquisition Strategy, approved by the milestone decision authority, is required in order to properly develop follow-on increments of JMPS-E to include the Marine Corps amphibious planning functions.
- JMPS-E developmental testing has serious stability issues that need to be resolved prior to operational testing. Other issues include difficulty entering data, improper symbology display, field entries not permitting common planning functions, and overlays not displaying correctly.

Recommendations

- Status of Previous Recommendations. The Navy satisfactorily addressed all previous recommendations.
- FY09 Recommendations.
  1. The Navy should continue to improve JMPS-M MPE software stability to reduce the incidence of mission planning computer crashes.
  2. The Navy should continue to ensure that transfer of mission planning data to powered host platform computers occurs during developmental test.
  3. The Navy should conduct the necessary information assurance vulnerability certifications, obtain the necessary authorizations to directly connect, and then test the JMPS-M MPEs interactions with the external data network interfaces including the Navy-Marine Corps Internet, weather, and the Optimum Path Aircraft Routing System.
  4. The Navy should update the various host platform MPE Flight Performance Module applications to meet aircrew planning and accuracy expectations for fuel and endurance calculations as well as the impact of tactical maneuvering and staggered release of onboard stores such as weapons and deployable sensors.
  5. The Navy should submit a TEMP Annex for JMPS-E prior to commencing operational testing.
  6. The Navy will be required to produce an approved JMPS-E Acquisition Strategy for follow-on increments before development efforts can continue.

Joint Standoff Weapon (JSOW) Baseline Variant and Unitary Warhead Variant

Executive Summary

- The Navy completed formal test reporting in January 2009 on FY08 operational testing of the Block II Unitary variant of Joint Standoff Weapon (JSOW) to support a fielding decision. The Block II Unitary variant is operationally effective and suitable.
- The Air Force conducted operational testing of the Baseline variant of the JSOW with new Operational Flight Program (OFP) Version 10.3 software on the B-2 platform. Testing is in progress; however, test results to date did not resolve JSOW Baseline submunitions pattern placement inconsistencies observed in previous JSOW Baseline testing.

System

- The 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 Missile Systems, Tucson, Arizona

Activity

- The Navy completed formal test reporting of the JSOW Unitary Block II weapon in January 2009. Commander, Operational Test and Evaluation Force (COTF) evaluated the JSOW Unitary Block II as effective and suitable. This testing supported the Navy decision in FY09 to field the JSOW Unitary Block II weapon to the fleet.
- The Air Force conducted operational testing on the B-2 platform of the fielded JSOW Baseline variant using OFP Version 10.3 software in March 2009 in accordance with the DOT&E-approved Test and Evaluation Master Plan. This testing is to verify the correction of a previously identified capability mismatch between the software and B-2 displays. Testing is still in progress.
- The Navy is preparing the Test and Evaluation Master Plan for the JSOW Unitary Block III (renamed JSOW C-1) in support of testing in FY10-11.

Assessment

- DOT&E agrees with COTF's assessment of JSOW Unitary Block II performance. The results from FY08 testing indicate that the Navy successfully corrected deficiencies identified in DOT&E's 2004 IOT&E report and adequately addressed weapon survivability in realistic threat environments.
- Although aggregate results show that JSOW Baseline accuracy was within Operational Requirements Document threshold specifications, test results since FY05 consistently

demonstrated that there are anomalies in submunitions pattern accuracy. These inconsistencies remain largely unexplained.
- 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. Air Force planners will need to consider this to achieve combat success with JSOW Baseline.

Recommendations
- Status of Previous Recommendations. The Air Force is addressing the FY08 recommendation, which remains valid.
- FY09 Recommendation.
  1. DOT&E recommends continued monitoring of Baseline employment for factors causing dispersal inconsistencies. As the OFP Version 10.3 did not resolve submunitions pattern inaccuracies, operational users should balance submunitions dispersal with additional munitions on target for desired weapon effects.

KC-130J Aircraft

Executive Summary

- DOT&E approved Revision A to the KC-130J Test and Evaluation Master Plan (TEMP) in February 2009.
- The Navy completed Operational Test-IIID (OT-IIID) to assess the performance of a new Terrain Avoidance Warning System (TAWS) as well as other avionics and self-protection upgrades to the platform. The Commander, Operational Test and Evaluation Force (COTF) determined the KC-130J Block D system hardware and software modifications operationally effective and operationally suitable.
- KC-130J is flying with Operational Flight Program (OFP) software version 6.5, which brings the software inline with Air Force 6.0 OFP. A Common OFP between the Air Force and Marine Corps will result in reduced engineering and life-cycle costs for the program.
- The Marine Corps is pursuing an armed KC-130J (Harvest HAWK) to provide persistent direct fire and intelligence, surveillance, reconnaissance (ISR) in support of ground troops.

System

- The KC-130J is a medium-sized four-engine turboprop tactical transport aircraft modified with air and ground refueling capabilities.
- The KC-130J incorporates many of the C-130J attributes including a glass cockpit and digital avionics, advanced integrated diagnostics, defensive systems, and a cargo handling system.
- The KC-130J is outfitted with an air/ground refueling package consisting of an internally carried 3,600 gallon fuselage tank and a hydraulically-powered/electronically-controlled air refueling pod on each wing.
- The current Marine Corps KC-130J (Block D) is flying with OFP software 6.5 that brings the software in line with Air Force Block 6.0 OFP.

Mission

- Combatant Commanders use the KC-130J within a theater of operations for fuel and combat delivery missions which include the following:
  - Aerial refueling of fixed wing, tilt-rotor, and rotary wing platforms equipped with refueling probes
  - Ground refueling of land-based systems such as trucks and storage tanks
  - 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, Marietta, Georgia

Activity

- DOT&E approved Revision A to the KC-130 J TEMP in February 2009.
- The Navy completed FOT&E (OT-IIID) of the Block 6.5 software upgrade, which included a new TAWS, an enhanced Identification Friend or Foe Mode 5, and an upgraded Defensive Electronic Countermeasures/Aircraft Survivability Equipment suite with new self-protection expendable techniques in September 2009. COTF completed the testing in accordance with a DOT&E-approved test plan.
- In FY09 the Marine Corps pursued an armed variant of the KC-130J (Harvest HAWK) under a rapid development and deployment request in order to provide persistent direct fire and ISR in support of ground troops. This system will consist of a target sensor pod, Hellfire missiles, 30 mm cannon, and fire control station all designed for rapid reconfiguration. This system will not interfere with KC-130J primary aerial refueling or secondary assault support missions. System testing started in September 2009 with expected deployment in mid-FY10.
- LFT&E for Harvest HAWK will occur in FY10.

Assessment

- DOT&E concurs with the COTF determination that the KC-130J Block D system hardware and software modifications are operationally effective and operationally suitable.
- The addition of the TAWS and the capability of overriding the ALE-47 Countermeasures Dispensing System when the Aerial Refueling hoses are not stowed and locked enhance the capability of the aircraft to accomplish its tactical missions in nonpermissive environments.
- Harvest HAWK brings a new offensive mission to the multi-role KC-130J platform that requires redefined roles and responsibilities as well as adequate training and manning to maintain and operate the system.

Recommendations

- Status of Previous Recommendations. This is the first annual report for this program.
- FY09 Recommendation.
  1. The Navy must complete LFT&E with the Harvest HAWK capability.

Littoral Combat Ship (LCS)

Executive Summary

- The Defense Acquisition Executive authorized procurement of two FY09 ships, one of each design. Affordability and impending budget constraints have driven the Navy to cancel the FY10 solicitation and pursue a down select to one design for FY10 ships and beyond with a fixed price incentive contract.
- The Navy revised the T&E strategy to provide the lead ships to the fleet earlier, but with only one partial mission package capability rather than all three.
- The Navy intends to employ the two ships of the design not selected through their operational service life so the current T&E strategy reflecting comprehensive testing for both designs is still applicable.
- The Navy has directed their Operational Test Agency (OTA) to conduct a Quick Reaction Assessment (QRA) on Littoral Combat Ship (LCS) 1's operational capability to support a rapid early deployment.
- Early developmental test results revealed that LCS 1 is unable to meet the Navy's stability requirements and has exhibited inherent weaknesses in combat system component performance.
- LCS 2 experienced delays in completing Builder's Trials and planned delivery due to emergent propulsion related deficiencies.
- LCS was designated by the Navy as a Level I survivability combatant ship, but is not expected to achieve the degree of shock hardening required by the Capabilities Development Document (CDD).


LCS 1


LCS 2

System

- The LCS is 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:
  - LCS 1 is a semi-planing monohull constructed of steel and aluminum.
  - LCS 2 is an aluminum trimaran or stabilized monohull design.
- Common characteristics:
  - Combined (2) diesel and (2) gas turbine engines with (4) waterjet propulsors
  - Sprint speed in excess of 40 knots, draft of less than 20 feet, and range in excess of 3,500 nautical miles
  - Accommodate up to 76 (air detachment, mission module personnel, and core crew of no more than 50)
  - Identical Mission Package Computing Environment for mission module component transparency
  - Large hangar to embark MH-60R/S with multiple Vertical Take-off Unmanned Aerial Vehicles (VTUAVs)
  - 57 mm BOFORS Mk 3 gun with dissimilar gun fire control systems
- The designs have different combat systems for self-defense against anti-ship cruise missiles
  - LCS 1: COMBATSS-21, an Aegis-based integrated combat weapons system with a TRS-3D (German) Air/Surface search radar, Ship Self-Defense System Rolling Airframe Missile (RAM) interface (one 16 cell launcher), and a DORNA (Spanish) Electro-Optical/Infrared (EO/IR) for 57 mm gun fire control.
  - LCS 2: Integrated combat management system (derived from Dutch TACTICOS system) with a Swedish 3D Air/Surface search radar (Sea Giraffe), one RAM launcher integrated into Close-In Weapons System (Mk15 CIWS) search and fire control radars (called SeaRAM), and Sea Star SAFIRE EO/IR for 57 mm gun fire control.
- More than a dozen individual programs of record, involving sensor and weapon systems and other off-board vehicles, make up the individual mission modules. Some of which include:

- Remote Multi-Mission Vehicle, an unmanned semi-submersible that tows a special sonar to detect mines
- Organic Airborne Mine Countermeasures, a family of systems employed from an MH-60S designed to detect, localize, and neutralize all types of sea mines
- Unmanned Surface Vehicles, used in both mine and anti-submarine warfare applications
- VTUAV, specifically the Fire Scout

- The Navy plans to acquire a total of 55 LCS, the first four being a mix of the two competing designs and the remaining seaframes a single design.

Mission

- The Maritime Component Commander can employ LCS to conduct Mine Warfare, Anti-Submarine Warfare, or Surface Warfare (SUW), based on the mission package fitted into the seaframe. With the Maritime Security Module installed, the ship can conduct sustained Level 2 Visit Board Search and Seizure Maritime Interception Operations. Mission packages are designed to be interchangeable, allowing the Maritime Component Commander flexibility to reassign missions.
- 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 Prime: Lockheed Martin Maritime Systems and Sensors, Washington, District of Columbia;
  Shipbuilder: Marinette Marine, Marinette, Wisconsin
- LCS 2 Prime: General Dynamics Corporation Marine Systems, Bath Iron Works, Bath, Maine
  Shipbuilder: Austal USA, Mobile, Alabama

Activity

- DOT&E approved the Test and Evaluation Master Plan (TEMP) in December 2008.
- The Defense Acquisition Board held a Milestone A-Prime review on December 18, 2008, to proceed with procurement of two (one of each design) FY09 ships (LCS 3 and 4) and mission packages.
- On June 11, 2009, the Navy revised the T&E strategy to provide the lead ships to the fleet sooner albeit with only one (vice three) partial mission package capability.
- On September 22, 2009, the Navy unveiled a revised acquisition strategy to down select to one design for the FY10 ships and beyond. The Navy intends to employ the two ships of the unselected design through their operational life expectancy.
- LCS 1:
  - The Navy commissioned LCS 1 on November 8, 2008.
  - The Navy's Board of Inspection and Survey completed a second Acceptance Trial (AT-2) in May 2009 to examine aspects of the ship's performance that could not be evaluated during the initial trial.
  - The ship conducted structural test firings of core weapon systems and basic air defense performance characterization events in June 2009.
  - In July 2009, the Navy directed their OTA to conduct a QRA on the operational capability of USS *Freedom* (LCS 1) for maritime security operations in support of a rapid early deployment. A deployment nearly two years early will delay developmental testing and the initial phase of IOT&E until after the ship returns.
  - In September 2009, developmental test events were conducted in surface warfare and air defense. The Navy installed the initial increment of the Surface Warfare (SUW Mission Package, including two 30 mm gun mission modules and mission package application software, conducted structural test firings of both 30 mm guns, and completed several basic surface gunnery events.
- LCS 2:
  - Builder's Trials commenced in July 2009. Main propulsion engine material problems have delayed completion until October 2009.
  - Acceptance trials are scheduled for late November 2009.
  - Delivery is now scheduled for December 18, 2009.
- In July and August 2009, the Navy conducted end-to-end developmental testing of selected Mine Countermeasures (MCM) Mission Package components, including the Remote Multi-Mission Vehicle with the AN/AQS-20A towed sonar and the Unmanned Surface Vessel with the Unmanned Surface Sweep System using a containerized Mission Package Portable Control System embarked in Research Vessel Athena.
- Funding constraints have delayed the Navy from completing the survivability assessments for LCS 1 and LCS 2 LFT&E until 2010.

Assessment

- The proposed changes to acquisition will not alter the test and evaluation strategy. Ships of the unselected design will be fleet operational units and will undergo the same testing as those of the winning design.
- LCS 1:
  - Acceptance trial results assessed Deck and Weapons as unsatisfactory. Specific deficiencies include a non-standard anchor chain configuration, and combat system (COMBATSS-21) performance problems associated with the WBR-2000 passive Electronic Support Measure system, the TRS-3D radar, and the DORNA EO/IR gun fire control system.

- Analysis of the results of stability testing conducted in FY08 revealed that the ship will exceed limiting draft in the full load condition. This reduces the reserve buoyancy provided by compartments above the waterline and the ship's capability to withstand damage and heavy weather. This condition also renders the ship incapable of meeting the Navy's stability standard of withstanding flooding to 15 percent of the length along the waterline and could sink sooner than expected. The Navy intends to install external tanks to effectively lengthen the stern to increase buoyancy prior to early deployment and to modify the future hull design with a lengthened transom.
- Early fielding of lead ships in test remains consistent with recent Navy practice; e.g., USS *Virginia* (SSN 774) and USS *San Antonio* (LPD-17). As stipulated in Section 231 of the National Defense Authorization Act of 2007, an Early Fielding Report will be submitted.
- Although equipment performance issues delayed completion of the 30 mm gun structural test firings, results of those events and the core weapons structural test firings were satisfactory.
- Early air target tracking tests identified combat system performance deficiencies that will seriously degrade the ship's air defense capability unless corrected. Plans to repeat the tests with software upgrades were delayed by multiple TRS-3D radar power supply failures, the cause of which has not yet been identified.
- Completion of basic air defense performance characterization events has been delayed due to repeated TRS-3D radar power supply failures.

• LCS 2:
  - Builders trials were initially delayed due to reported leaks at the gas turbine shaft seals. More testing identified additional deficiencies related to the main propulsion diesel engines, thus further delaying completion of the trials until October 2009.

• MCM mission package end-to-end test objectives were met, but communication problems associated with the unmanned remotely controlled vehicles indicates more development of component systems is needed prior to fleet integration.

• LCS was designated by the Navy as a Level I survivability combatant ship, but neither design is expected to achieve the degree of shock hardening as required by the CDD. Shock hardening (ability to sustain a level of operations following an underwater explosive attack) is required for all mission critical systems, as required by a Level 1 survivability requirement. Only a few selected subsystems will be shock hardened, supporting only mobility to evacuate a threat area following a design-level shock event. Accordingly, the full, traditional rigor of Navy-mandated ship shock trials is not achievable, due to the damage that would be sustained by the ship and its many non-shock-hardened subsystems.

• The LCS LFT&E program has been hampered by the Navy's lack of credible modeling and simulation tools for assessing the vulnerabilities of ships constructed to primarily commercial standards (American Bureau of Shipping Naval Vessel Rules and High Speed Naval Craft Code), particularly aluminum and non-traditional hull forms. Legacy LFT&E models were not developed for these non-traditional factors, nor have they been accredited for such use. These knowledge gaps undermine the credibility of the modeling and simulation, and increase the amount of surrogate testing required for an adequate LFT&E program.

• The LCS is not expected to be survivable in a hostile combat environment as evidenced by the limited shock hardened design and results of full scale testing of representative hull structures completed in December 2006.

Recommendations

• Status of Previous Recommendations. The Navy satisfactorily addressed all but three of the previous nine recommendations. Recommendations concerning a risk assessment on the adequacy of Level I survivability, detailed manning analyses to include mission package support, and solidifying the acquisition strategy for long-range planning still remain.

• FY09 Recommendations. The Navy should:
  1. Continue to address LCS deficiencies identified in Acceptance Trials and early developmental testing and incorporate appropriate modifications, especially in stability and the TRS-3D radar performance and integration with other combat system components.
  2. Codify another revised T&E strategy in a TEMP revision that provides for completion of IOT&E in LCS 1 following early fielding deployment and supports completion of IOT&E in LCS 2 and subsequent ships prior to operational deployment.
  3. Enlist the support of the T&E community to evaluate the performance of LCS 1 and the Navy's shore support organization during the ship's first operational deployment and compile appropriate lessons learned.
  4. Assess the testable shock severity achievable during ship shock trials for both LCS variants in order to predict the degree of shock hardness and survivability expected of these ships in a combat shock environment.
  5. Develop a robust LFT&E program to address knowledge gaps in assessing the vulnerabilities of ships constructed primarily to commercial standards including aluminum structures and non-traditional hull-forms, to include 57 mm gun system and Non-Line-of-Sight missile lethality.

LPD-17 *San Antonio* Class Amphibious Transport Dock

Executive Summary

- The Navy declared IOT&E complete in December 2008, almost two years after start of the first test period. The Navy deferred remaining IOT&E events to FOT&E because of ship and test resource availability.
- LPD-17 is capable of completing its principal primary mission of Amphibious Warfare, but will have difficulty defending itself against a variety of highly proliferated threats in multiple warfare areas.
- Chronic reliability problems associated with critical ship systems across the spectrum of mission areas reduces overall ship suitability and jeopardizes mission accomplishment. The Navy's Board of Inspection and Survey identified similar problems in all of the first four ships of the class.
- The LFT&E analyses of data to assess vulnerability and survivability of the LPD-17 class will continue into FY10. Emerging results from these trials indicate the ships could not demonstrate the required levels of survivability, largely because of critical ship system failures after weapons effects.
- DOT&E's Beyond Low-Rate Initial Production (BLRIP) report will recommend FOT&E to complete outstanding test events and address an extensive list of deficiencies.

System

LPD-17 is a diesel engine powered ship designed to embark, transport, and deploy ground troops and equipment. Ship-to-shore movement is provided by Landing Craft Air Cushion (LCAC), Landing Craft Utility (LCU), Amphibious Assault Vehicles (AAVs), MV-22 tiltrotor aircraft, or helicopters. Key ship features and systems include the following:

- A floodable well deck for LCAC, LCU, and AAV operations
- A flight deck and hangar to support various Navy and Marine Corps aircraft
- Command, Control, Communications, Computers, and Intelligence facilities and equipment to support Marine Corps Landing Force operations
- A Ship Self-Defense System (SSDS) Mark 2 Mod 2 with Cooperative Engagement Capability equipped with Rolling Airframe Missiles (RAM), the SLQ-32B (V)2 (with Mk 53 NULKA electronic decoys) passive electronic warfare system, and radars (SPQ-9B horizon search radar and SPS-48E long-range air search radar) to provide air warfare ship self-defense
- Two Mk 46 30 mm gun systems and smaller caliber weapons to provide defense against small surface threats
- The Shipboard Wide Area Network (SWAN) serves as the data backbone for all electronic systems. LPD-17 is one of the first ships built with a fully integrated data network system.

Mission

A Fleet Commander will employ LPD-17 class ships to conduct Amphibious Warfare. The ship will normally deploy with a notional three-ship Expeditionary Strike Group (ESG) but can operate independently. 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 Ship Systems, Pascagoula, Mississippi

Activity

- The Navy declared IOT&E complete in December 2008, despite seven outstanding events. Competed testing was in accordance with the DOT&E-approved Test and Evaluation Master Plan and test plan. The Navy deferred the remaining

IOT&E events to FOT&E because of ship and test resource availability. The Navy's Operational Test Agency (OTA), Commander, Operational Test and Evaluation Force, has not yet released their final report.

- The OTA completed two IOT&E events in FY09, including Surface Warfare engagements on LPD-18 in October 2008 and a Rolling Airframe Missile engagement on the Self-Defense Test Ship in December 2008.
- The third ship of the class to deploy prior to completion of IOT&E, LPD-18, returned in August 2009. DOT&E submitted an Early Fielding Report to Congress in May 2008.
- FOT&E to assess the ships Probability of Raid Annihilation using a modeling and simulation test bed commenced in July 2009 and is expected to complete in October 2009. This effort will predict the ship's capability to defend itself against a raid of Anti-Ship Cruise Missiles.
- The Navy completed two major LFT&E tests, the Full Ship Shock Trial and the Total Ship Survivability Trial, in September 2008. The Navy and DOT&E completed analysis this year; final reports are expected in FY10.

Assessment

The following are DOT&E's observations and assessments based on testing completed to date:

- LPD-17 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.
- Reliability problems related to well deck ramps, ventilation, bridge crane, and Cargo Ammunition Magazine (CAM) elevators detracts from mission accomplishment and reduces amphibious warfare suitability.
- The engineering plant, as designed, is effective and met its mobility (speed, endurance) requirements.
- Reliability problems associated with the Engineering Control System (ECS), including frequent failures and high false alarm rates, and the electrical distribution system, including unexplained loss of service generators and the uncommanded opening of breakers, revealed shortfalls in manning and training to support sustained manual operation of the plant.
- The Navy's Board of Inspection and Survey (INSURV) identified similar deficiencies in identical areas (propulsion, auxiliaries, electrical, damage control, deck) during both acceptance and final contract trials across all four of the first ships of the class. Catastrophic casualties recorded prior to the Full Ship Shock Trial in LPD-19 and during LPD-17's deployment revealed serious fabrication and production deficiencies in the main lube oil service system.
- The ship is capable of supporting Command, Control, Communications, Computers, and Intelligence requirements in an ESG environment; however, reliability problems with the SWAN and the Interior Voice Communications System degrade command and control and are single points of failure during operations.
- The Navy still needs to validate critical Information Exchange Requirements and pursue a formal Information Support Plan to support a Joint Interoperability Certification.
- The LPD-17 exhibited difficulty defending itself against several widely proliferated threats, primarily due to:
  - Persistent SSDS Mk 2-based system engineering deficiencies
  - The ship's RAM system provided the only hard kill capability, preventing layered air defense
  - Problems associated with SPS-48E and SPQ-9B radar performance against certain Anti-Ship Cruise Missile attack profiles
  - Degraded situational awareness due to Mk 46 Gun Weapon System console configuration
- LPD-17 failed to satisfy its reliability requirement during the first five hours of an amphibious assault and its total ship availability requirement during IOT&E.
- 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 electrical distribution, chilled water, SWAN, and ECS) and difficulty recovering mission capability may offset some of the survivability improvements and have highlighted serious reliability shortcomings.

Recommendations

- Status of Previous Recommendations. All recommendations made in FY07 and FY08 remain valid.
- FY09 Recommendations. The Navy should:
  1. Formally address chronic reliability problems associated with amphibious warfare support equipment, propulsion and electrical systems, critical control systems to include the SWAN and ECS, and demonstrate the efficacy of fixes during FOT&E.
  2. Review and investigate reoccurring INSURV deficiencies and lube oil system failures, identify related design, quality control, or training problems, and develop corrective action plans for each.
  3. Complete validation of critical Information Exchange Requirements and pursue completion of a Joint Interoperability Certification.
  4. Pursue mitigations to the identified weaknesses and long-standing system engineering problems associated with the ships ability to defend itself against threats in multiple warfare areas.
  5. Demonstrate the ships ability to satisfy both its reliability and total ship availability requirements during FOT&E.
  6. Revise the Test and Evaluation Master Plan to reflect incomplete events and recommended FOT&E from the IOT&E to include a timeline for completion.
  7. Correct deficiencies identified in the Naval Sea Systems Command Total Ship Survivability Trial and Full Ship Shock Trial reports.

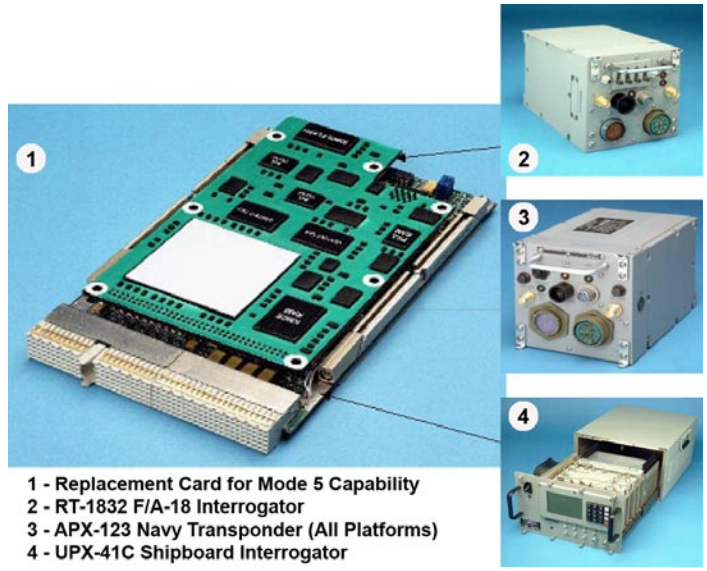
Mark XIIA Identification Friend or Foe (IFF) Mode 5

Executive Summary

- The Mode 5 Identification Friend or Foe (IFF) system continues to mature and is being integrated into Navy, Air Force, Army, and Marine Corps air, sea, and ground systems. Tests have indicated some system performance deficiencies including false targets, track swapping, and below threshold reliability.
- Mode 5 enterprise strategy and guidance continues to mature with the approval of the Joint Acquisition and Test Strategy and continued development of the Joint Operational Test Approach (JOTA).
- The Commander, Operational Test and Evaluation Force (COTF) conducted an operational assessment of Mode 5 in July 2009.

System

- The Mark XIIA IFF Mode 5 is a cooperative identification system that uses interrogators and transponders located on host platforms to send, receive, and process friendly identification data.
- Mode 5 serves as a component of a combat identification process used on ground-based systems and command and control nodes such as Patriot, sea-based systems such as Aegis-equipped ships, and military aircraft to include the E-3 Airborne Warning and Control System and E-2 Hawkeye.
- Mode 5 is a military-only identification mode, which modifies the existing Mark XII system and addresses known shortcomings of Mode 4. Mode 5 will eventually replace Mode 4 and allows National Security Agency-certified secure encryption of interrogations and replies. Primary features include:
  - A lethal interrogation format, which is used by a "shooter" prior to weapons release to reduce fratricide; this is done with the Mode 5 reply from the target even with his Mode 5 system in standby
  - A random-reply-delay, to prevent distorted replies from closely spaced platforms



1 - Replacement Card for Mode 5 Capability
2 - RT-1832 F/A-18 Interrogator
3 - APX-123 Navy Transponder (All Platforms)
4 - UPX-41C Shipboard Interrogator

- Mode 5 offers more modern signal processing, compatibility with legacy Mode 4 IFF systems and civilian air traffic control, and secure data exchange through the new waveform.

Mission

The Combatant Commander employs the Mode 5 to provide positive, secure, line-of-sight identification of friendly platforms equipped with an IFF transponder in order to differentiate between friend and foe.

Prime Contractors

- Navy and Army Mode 5 Programs: BAE Systems, Systems Integration and Electronics Division, Wayne, New Jersey
- Air Force Mode 5 Program: Raytheon Network Centric Systems Division, McKinney, Texas

Activity

- The Navy scheduled an IOT&E of Mode 5 in July 2009, which was to include air, land, and sea platforms from all four Services. The Air Force declared that the Mode 5 equipped F-15 aircraft required additional systems integration development and would not be operationally representative in time for the scheduled Mode 5 IOT&E.
- DOT&E deemed the IOT&E without four Mode 5 equipped F-15 aircraft not adequate to determine effectiveness and suitability. The Navy then decided to conduct the planned test as an operational assessment.
- COTF conducted an operational assessment of Mode 5 in July 2009.
- DOT&E approved the Joint Acquisition and Test Strategy for Mode 5.
- The Services, Operational Test Agencies (OTAs), and the OSD continued development of the JOTA.

- Marine Corps Operational Test and Evaluation Activity (MCOTEA) is reviewing documentation and test reports to support future Marine Corps ground sensor and C2 system Mode 5 implementation efforts and programmatic requirements.
- The Navy agreed to revise the Mode 5 Test and Evaluation Master Plan (TEMP) and initiate preparation of a Capability Production Document (CPD) to replace the Operational Requirements Document dated 2001.

Assessment

- Although COTF is still analyzing the Mode 5 operational assessment data, the preliminary DOT&E assessment is that additional development is required to resolve performance and integration deficiencies before the system is ready for IOT&E. Observed system deficiencies include false targets, targets swapping track identities, below threshold reliability, and several areas of incompatibility between Mode 5 and the Navy Aegis Combat System aboard DDG-class ships.
- There is no Memorandum of Agreement between the COTF, Air Force Operational Test Agency (AFOTEC), and Army Test and Evaluation Command, designating the Lead OTA for Mode 5 operational testing.
- The Mode 5 IOT&E must be a joint test and include Mode 5 assets from all four Services in order to completely assess interoperability of Mode 5 in a dense target environment.
- The Mode 5 TEMP revision and CPD are needed to correct inconsistencies, establish reliability and maintainability requirements for the Mode 5 test set, and provide differentiation between reliability and maintainability measures between shipboard and airborne Mode 5 systems.

Recommendations

- Status of Previous Recommendations. All previous recommendations have been satisfactorily addressed.
- FY09 Recommendations.
  1. The Navy should resolve Mode 5 integration and compatibility issues between aircraft and Aegis class DDGs before scheduling Mode 5 IOT&E in 2010.
  2. The Air Force should resolve Mode 5 integration issues in the F-15 aircraft before participating in the Navy Mode 5 IOT&E in 2010.
  3. The Services and OSD should complete development of the JOTA document before the end of 2QFY10.
  4. The Services should designate a Lead OTA for each of the planned Mode 5 operational test events and include this designation in the JOTA document.
  5. COTF and AFOTEC should enter into a Joint Memorandum or Agreement to conduct joint operational testing of Mode 5.
  6. MCOTEA should provide to COTF areas of interest and potential future involvement with ground sensor/C2 Mode 5 implementation.
  7. The Navy should continue plans to revise the TEMP and initiate a CPD in order to correct inconsistencies and clarify requirements.

MH-60R Multi-Mission Helicopter

Executive Summary

- Combined MH-60R/S FOT&E on Pre-Planned Product Improvement (P3I) components commenced in FY08 and is expected to continue into the latter half of FY11. This P3I effort, with associated software changes, is expected to mitigate operator workload problems found in the 2005 IOT&E that stemmed from mission system complexity and software deficiencies.
- While the MH-60R is a covered system for purposes of LFT&E, the ongoing P3I component integration effort does not affect the approved LFT&E Strategy, which has been completed. With few exceptions, the MH-60R was found to be robust and ballistically tolerant.

System

The MH-60R is a ship-based helicopter designed to operate from Cruisers, Destroyers, Frigates, Littoral Combat Ships, or Aircraft Carriers. It is intended 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 (FLIR) 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 the following:

- Under Sea Warfare, Anti-Surface Warfare, Area Surveillance, Combat Identification, and Naval Surface Fire Support missions previously provided by two different (SH-60B and 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 Aircraft Corporation, Stratford, Connecticut

Activity

- FOT&E (OT-IIIA) on the first phase of P3I components completed in September 2009 per the DOT&E-approved Test and Evaluation Master Plan and test plan. Nine of a total of 16 components scheduled to be integrated into the MH-60R were tested during this first increment. Although initial results are available, the final report from the Navy's Operational Test Agency (OTA) is not expected until December 2009.
- FOT&E for the remaining seven components is expected to complete sometime in FY11.
- The Navy released a quicklook message in January 2009 to alert the fleet of early test deficiencies with P3I components selected to support an early deployment with Carrier Strike Group THREE.
- In September 2009, the Navy's OTA submitted a MH-60R P3I Anomaly Report, a recourse to provide timely test failure and/or deficiency information to the Program Office.
- All LFT&E activities have been completed and reported in the Live Fire Test and Evaluation Report to Congress.

Assessment

- No significant improvement in crew workload during surface warfare engagements has been realized compared to previous testing.
- The addition of Link 16 allows the MH-60R to share sensor data directly with other battle group participants. However, inaccurate data fusion of link participant locations with the helicopter's sensors combined with incorrect track classifications degrades situational awareness. This requires constant attention from an already busy crew to maintain a stable picture.
- The Automatic Video Tracking (AVT) feature of the Multi-Spectral Targeting System (MTS) FLIR fails to meet tracking and engagement thresholds. The MTS failed to successfully engage threat representative high-speed targets with Hellfire missiles because the AVT failed to maintain lock with the auto-tracker. Attempts to manually track the target to provide terminal guidance proved too challenging.

- APX-118 Elementary Mode-S surveillance capability (providing an aircraft-unique 24-bit address identifier) is not certified and Mode-S Level 2 enhanced surveillance information fails to meet the threshold by not transmitting accurate track angle rate to traffic controllers.
- Although not a P3I component, the dipping sonar and primary component for the helicopter's Undersea Warfare (USW) mission, called the Airborne Low Frequency Sonar (ALFS), has experienced frequent miswrapping of its reel and cable assembly. Recent testing recorded five failures in 21 days of USW mission tasking. Poor reliability of this system has prevented testing the new configuration in the USW mission.
- The vulnerability assessment from LFT&E established that, with few exceptions, the MH-60R is robust and ballistically tolerant. The LFT&E program has been reported as complete.

Recommendations

- Status of Previous Recommendations. The Navy addressed two of the three previous recommendations. The remaining recommendation is still valid.
- FY09 Recommendations. The Navy should:
  1. Continue to pursue software and hardware enhancements to reduce the operator workload and allow the crew to focus more on mission execution.
  2. Resolve data fusion inaccuracies related to Link 16 by correcting integration problems between the precise participant location identifier and the aircraft's own sensors.
  3. Pursue a correction to the AVT feature of the MTS (FLIR) to increase the probability of a successful Hellfire engagement of a smaller, high-speed maneuvering vessel.
  4. Obtain a certification for elementary Mode-S and resolve the deficiency with the Level 2 enhanced surveillance to comply with new air traffic regulations and increase safety of flight.
  5. Identify the cause and corrective action to resolve the frequent failures of the ALFS reel and cable assembly.

MH-60S Multi-Mission Combat Support Helicopter

Executive Summary

- Combined MH-60R/S FOT&E on Pre-Planned Product Improvement (P3I) components commenced in FY08 and is expected to continue into the latter half of FY11. Although these components are only designed to enhance mission capability, there are deficiencies that warrant immediate attention.
- FOT&E for the Block 3A Armed Helicopter revealed that the designed container for the kits is not certified for shipboard storage and despite attempts to resolve, the Surface Warfare mission area remains undetermined.
- Correction of deficiencies and regression analysis continues on the Block 2A Airborne Mine Countermeasures (AMCM) variant following last year's decertification by the Program Executive Officer.
- While the MH-60S is a covered program for LFT&E purposes, the ongoing P3I component installation and testing will not affect the approved alternative LFT&E strategy.
- The Navy completed LFT&E on Blocks 1 and 3, and, with few exceptions, these versions were found to be robust and ballistically tolerant. LFT&E on Block 2 is ongoing.

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 – Fleet Logistics: Precision navigation and communications, maximum cargo, or passenger capacity
  - Block 2A/B –AMCM: AMCM systems operator workstation, tether/towing system, any one of five mine countermeasure systems currently under development
  - Block 3A – Armed Helicopter: Tactical moving map display, forward looking infrared (FLIR) with laser designator, crew-served side machine guns, dual-sided Hellfire air-to-surface missiles, and defensive electronic countermeasures
  - Block 3B – Armed Helicopter: Block 3A with addition of tactical data link (Link 16)
- P3I components add 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 employed 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 Aircraft Corporation, Stratford, Connecticut

Activity

- FOT&E (OT-IIIA) on the first phase of P3I components completed in September 2009. Testing was done in accordance with the DOT&E-approved Test and Evaluation Master Plan and test plan. Eight of a total of 13 components scheduled to be integrated into the MH-60S were tested during this first increment. Although initial results are available, the final report from the Navy's Operational Test Agency (OTA) is not expected until December 2009.
- FOT&E for the remaining five components is expected to complete in FY11.
- The Navy released a quicklook message in January 2009 to alert the fleet on early test deficiencies with P3I components

selected to support an early deployment with Carrier Strike Group THREE.
- OT-IIIA included some Block 3A Armed Helicopter FOT&E events to include aircraft carrier (CVN) shipboard compatibility and attempts to resolve the undetermined surface warfare (SUW) mission assessment.
- In September 2009, the Navy's OTA submitted a MH-60S P3I Anomaly Report, a recourse to provide timely test failure and/or deficiency information to the Program Office.
- Correction of deficiencies to include some redesign of critical components in the Block 2 AMCM variant, designed primarily to support systems that are part of the new Littoral Combat Ship (LCS) Mine Countermeasures Mission Package, is ongoing. Developmental testing on Block 2A with the AQS-20A sonar is scheduled to recommence 1QFY10 with IOT&E in June 2010.
- The MH-60S is a covered system for LFT&E. LFT&E has been completed on Blocks 1 and 3, and, with few exceptions, these versions were found to be robust and ballistically tolerant. LFT&E on Block 2 is ongoing.

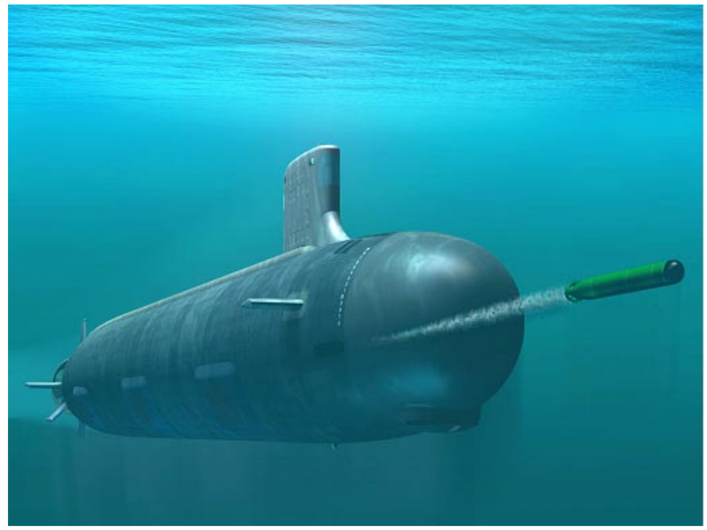
Assessment
- An OT-IIIA interim report submitted by the Navy's OTA in February 2009 assessed the MH-60S with Link 16 incorporated (Block 3B) as operationally effective and suitable. The report expedited a fleet introduction recommendation and facilitated deployment of the MH-60S with a new software system configuration in January 2009, prior to the final FOT&E report.
- The addition of Link 16 receive-only capability has increased MH-60S crew situational awareness of the maritime picture; however, OT-IIIA highlighted some significant deficiencies:
  - In-flight free text messaging is not available to respond to participating units. The crew is limited to using preformatted permission configured text messages.
  - The mission tasking function causes false indications to other participants and is prohibited from use during fleet flight clearance.
  - To date, no tactics have been published to incorporate Link 16 functionality into missions.
  - Joint "J" Voice, the primary Link 16 coordination net, is unavailable to aircrew in the cabin, requiring pilots to relay mission critical information via the internal net, further increasing the workload. This risks a breakdown in coordination and severely jeopardizes mission accomplishment.
  - A live video downlink via the imagery net is not available. The MH-60S is limited to exchanging only still frame imagery.
  - MH-60 Link 16 training is inadequate. Although a formal Navy course is being developed, the operators did not effectively understand nor demonstrate proficiency in operating the system.
  - There is no Naval Air Training and Operating Procedures Standardization (NATOPS) manual to support effective use of the MH-60S with Link 16.
- The Automatic Video Tracking (AVT) feature of the Multi-Spectral Targeting System (MTS) FLIR fails to meet tracking and engagement thresholds. The MTS failed to successfully engage threat representative high-speed targets with Hellfire missiles because the AVT failed to maintain lock with the auto-tracker. Attempts to manually track the target to provide terminal guidance proved too challenging.
- The Downed Aircrew Locator System (DALS) is rendered ineffective due to:
  - The MH-60S incompatibility with the Combat Survivor Evader Locater (CSEL) radio, the current survival radio employed by all Naval aviators.
  - The failure to receive Quickdraw messages, providing time-critical survivor information during terminal phase of the rescue.
- APX-118 Elementary Mode-S surveillance capability (providing an aircraft-unique 24-bit address identifier) is not certified and Mode-S Level 2 enhanced surveillance information fails to meet the threshold by not transmitting accurate track angle rate to traffic controllers.
- Block 3A Armed Helicopter Weapons System (AHWS) FOT&E during OT-IIIA revealed:
  - The ISU-90 container designed for package, handling, storage, and transportation of one entire AHWS kit is not certified for at-sea shipboard storage. All six containers assigned to the deploying squadron (HSC-8) were not permitted onboard USS *Stennis* (CVN 74), forcing the crew to store components not being used on pallets or on the hangar floor exposed to inadvertent damage.
  - The SUW mission remains undetermined. Two attempts at engaging high-speed, operationally realistic, evasive maneuvering targets with Hellfire missiles both during the day and at night surfaced the AVT failure to maintain lock. Both Hellfire missiles expended missed their intended targets.
- The Block 2 AMCM variant continues to struggle with the Carriage, Stream, Tow, and Recovery System (CSTARS) reliability. Additional testing with the AQS-20A revealed that the tow cable has a tendency to become tangled on the drum during periods of low tension and cable fairing damage caused by fitting interference still persists. A reliable CSTARS is essential to enable organic mine detection and neutralization.

Recommendations
- Status of Previous Recommendations. The Navy has addressed two of the eight FY07 and FY08 recommendations. The remaining recommendations are still valid.
- FY09 Recommendations. The Navy should:
  1. Develop a plan to expeditiously correct Link 16 deficiencies to lessen the impact on deploying squadrons.
  2. Pursue a correction to the AVT feature of the MTS (FLIR) to increase the probability of a successful Hellfire engagement of a smaller, high-speed maneuvering vessel.
  3. Provide the MH-60S interoperability with the CSEL survival radio and Quickdraw so that DALS can be

effectively utilized and enable the aircraft to successfully execute its Combat Search and Rescue mission.

4. Obtain a certification for elementary Mode-S and resolve the deficiency with the Level 2 enhanced surveillance to comply with new air traffic regulations and increase safety of flight.
5. Develop a plan to allow safe shipboard storage of Block 3A AHWS kit components when not installed and in use on the aircraft to include shipboard certification of a package, handling, storage, and transportation container.
6. Conduct additional FOT&E to demonstrate Block 3A AHWS operational effectiveness in the SUW mission.
7. Continue to pursue improved CSTARS reliability and software upgrades to enable the Block 2 variant capable of conducting successful organic Airborne Mine Countermeasure operations.

Mk 48 Advanced Capability (ADCAP) Torpedo Modifications (Mods)



Executive Summary

- The Navy completed operational testing of the Mk 48 Advanced Capability (ADCAP) Mod 6 Spiral 1 weapon in October 2008. The testing was adequate and revealed that the upgraded torpedo remains not operationally effective but is operationally suitable.
- The Navy started initial engineering testing of the Mk 48 Mod 7 Common Broadband Advanced Sonar System (CBASS) torpedo Phase II in FY09. The Program Office plans to conduct OT&E in FY11.

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 modifications are a series of hardware and software upgrades to the weapon.
- Mk 48 Mod 5, Mod 6, Mod 6 Spiral 1, Mod 6 Advanced Common Torpedo – Guidance and Control Box (ACOT), and Mod 7 CBASS Phase I are fielded torpedoes.
- The Mk 48 Mod 6 ACOT 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 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 and is intended to improve shallow-water performance.
- Mk 48 Mod 7 CBASS upgrades the Mk 48 ACOT 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 Integrated Defense Systems, Tewksbury, Massachusetts

Activity

- The Navy completed shallow-water operational testing and deep-water regression testing of the Mk 48 Mod 6 Spiral 1 torpedo, in accordance with a DOT&E-approved test plan, in October 2008.
- The Navy's Independent Test Authority, Commander, Operational Test and Evaluation Force (COTF), issued an Operational Test Report on the Mk 48 Mod 6 Spiral 1 torpedo in April 2009.
- The Navy completed development of an initial Test and Evaluation Master Plan (TEMP) to cover the Mk 48 Mod 7 CBASS Phase 2 torpedo. DOT&E approved the TEMP on November 5, 2009.
- The Navy started testing of CBASS Phase 2 software in parallel with TEMP approval. The program began initial engineering testing in FY09 and completed 36 in-water shots by the end of the fiscal year, with plans to shoot 40 others by the end of 1QFY10. An additional 60 developmental test shots are planned for later in FY10. The Program Office plans to conduct OT&E in FY11.

- The Navy conducted two successful Mk 48 Mod 6 Service Weapons Test events in FY09 using weapons selected from the warshot inventory. These test events confirm in-service torpedoes will still detonate after long term storage.
- Regression testing of the Mk 48 Mod 6 Spiral 1 confirmed that other areas of weapons performance were not degraded.
- For additional information on overall Mk 48 performance, see DOT&E's Mk 48 CBASS OT&E report dated January 2008.

Assessment

- The Navy conducted adequate operational testing of the Mk 48 Mod 6 Spiral 1 torpedo.
- The Navy incorporated CBASS software algorithms into the Spiral 1 torpedo to improve shallow-water performance, but testing demonstrated the performance was still below thresholds.
- Both COTF and DOT&E evaluate the Mk 48 Mod 6 Spiral 1 torpedo as not operationally effective but as operationally suitable.

Recommendations

- Status of Previous Recommendations. The Navy has made progress in addressing four of the six previous recommendations.
- FY09 Recommendation.
  1. The Navy should conduct a review of torpedo performance and current processes to improve performance in shallow water and countered environments.

Mk 54 Lightweight Torpedo

Executive Summary

- The Navy conducted adequate operational testing of the Mk 54 Vertical Launched Anti-Submarine Rocket (VLA) in 2009.
- The Mk 54 VLA is not operationally effective in its primary mission environment because the ship's Anti-Submarine Warfare (ASW) Combat System cannot effectively target the threat submarine. However, if the threat submarine could be accurately targeted, the VLA method of delivering the Mk 54 torpedo is operationally effective. The Mk 54 VLA is operationally suitable.
- Production of Mk 54 torpedoes continues, but release of the torpedo to the Fleet has been delayed pending compatibility improvements between the weapon and the launch platform's weapons control systems to reduce the torpedo's sensitivity to a stray fire control system voltage.

System

- The Mk 54 Lightweight Torpedo is the primary 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 VLA for rapid employment by surface ships.
- The High-Altitude Anti-submarine Warfare Weapons Capability (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 Integrated Defense Systems, Tewksbury, Massachusetts

Activity

- The Navy conducted operational testing of the VLA with an Mk 54 torpedo payload at the Pacific Missile Range Facility in February 2009. An *Arleigh Burke* class guided missile destroyer served as the launch platform for six VLAs. Since Navy safety regulations prevent employment of the VLA against a manned submarine target, the Navy utilized Mk 30 Mobile ASW targets for the operational tests. All six of the missiles flew to the designated aim-point and delivered working Mk 54 torpedoes.
- The Navy's Commander, Operational Test and Evaluation Force (COTF) issued an IOT&E report on the Mk 54 VLA in June 2009 and assessed the Mk 54 VLA as effective and suitable, but identified that the ship's sensors were not effective in locating and targeting the submarine threat.
- The Navy delayed Fleet release of Mk 54 capability other than Mk 54 VLA pending modifications to mitigate a platform compatibility issue. For all launch platforms, testers discovered a stray voltage in the interface between the torpedo and launch platform's weapon control system that affects torpedo pre-launch settings. Mk 54 torpedo payloads deployed via VLA are not affected.
- To support high-altitude deployment of the Mk 54 torpedo from the new P-8A Maritime Patrol Aircraft, the Navy

conducted demonstrations of several HAAWC proof of concept prototypes. The program has initiated a competition for the HAAWC design and development.
- On September 12, 2008, COTF identified the lack of a threat-representative set-to-hit target as a severe test resource limitation for evaluating the Mk 54 Mod 0 torpedo. The Navy's testing to evaluate the terminal homing phase of the Mk 54 torpedo attack was pre-maturely terminated in August 2006 when the Weapons Set-to-Hit Torpedo Threat Target surrogate sank. This testing remains incomplete.

Assessment
- The Mk 54 VLA is not operationally effective in its primary mission environment because the ship's ASW Combat System cannot effectively detect, classify, and target a threat submarine and the Mk 54 torpedo has not demonstrated satisfactory performance. However, if the threat submarine could be accurately targeted, the VLA method of delivering the Mk 54 torpedo is operationally effective. The Mk 54 VLA is operationally suitable.
- The Navy has not completed sufficient operational testing of the Mk 54 torpedo payload to verify its effectiveness. The testing completed so far indicates the Mk 54 torpedo may not be effective in attacking the target.
- DOT&E is preparing a classified OT&E Report expected to be delivered in early FY10.

Recommendations
- Status of Previous Recommendations. The Navy is making progress in writing requirements for the Mk 54 upgrades but has not implemented the other FY08 recommendation.
- FY09 Recommendations. The Navy should:
  1. Implement the recommendations in the DOT&E OT&E Report and COTF's report.
  2. Investigate the need for improvements to the AN/SQQ-89 ASW Combat System to detect, classify, and target new threat submarines.
  3. Obtain needed set-to-hit target and complete the terminal homing testing of the Mk 54 torpedo.

Mobile User Objective System (MUOS)

Executive Summary

- The Mobile User Objective System (MUOS) continues to realize schedule and technical risks due to the technical complexity of the spacecraft, ground and software elements, and programmatic interdependencies with the Joint Tactical Radio System (JTRS) and Teleport system.
- Delays in the launch of MUOS Space Vehicle 1 increase the risk of an Ultra High Frequency (UHF) satellite communications gap as the earlier generation of operational UHF follow-on system satellites become unavailable for service.

System

- MUOS is a satellite-based communications network designed to provide worldwide, narrowband, beyond line-of-sight point-to-point and netted communication services to multi-Service organizations of fixed and mobile terminal users. MUOS is designed to provide 10 times the throughput capacity from current narrowband satellite communications (SATCOM). MUOS intends to provide increased levels of system availability over the current constellation of UHF follow-on satellites, as well as, improved availability for small, disadvantaged, terminals.
- MUOS consists of six segments:
  - The space transport segment consists of four operational satellites and one on-orbit spare. Each satellite hosts two payloads: a legacy communications payload that mimics the capabilities of a single UHF follow-on satellite, and a MUOS communications payload.
  - The ground transport segment is designed to manage MUOS communication services and allocation of radio resources.
  - The network management segment is designed to manage MUOS ground resources and allow for government-controlled precedence based communication planning.
  - The ground infrastructure segment is designed to provide transport of both communications and command and control traffic between MUOS facilities and other communication facilities.
  - The satellite control segment consists of MUOS Telemetry, Tracking, and Commanding facilities at Naval Satellite Operations Center (NAVSOC) Headquarters and Detachment Delta.
  - The user entry segment is intended to provide a definition of the Common Air Interface (CAI) and protocols, formats, and physical layer characteristics for MUOS compatible communication services. The JTRS is responsible for developing and fielding MUOS compatible terminals.

Mission

Combatant Commanders and U.S. military forces deployed worldwide will use the integrated MUOS SATCOM system to accomplish globally assigned operational and joint force component missions with increased operational space-based narrowband, beyond line-of-sight throughput, and point-to-point and netted communications services

Prime Contractor

- Lockheed Martin Space Systems, Sunnyvale, California

Activity

- MUOS Space Vehicle 1 is in production and the program manager is working to resolve technical challenges of integrating components onto the spacecraft bus and payload.
- The program manager completed satellite control hardware installation and initial satellite control software integration testing in December 2008 at the NAVSOC Headquarters, Point Mugu, California, and at the NAVSOC Detachment Delta facility, Schriever AFB, Colorado.
- The Program Office conducted a satellite control segment failover testing between the NAVSOC Headquarters, Pt. Mugu, California, and the Detachment Delta facility, Schriever AFB, Colorado, to exercise the ability to handover satellite control functions between the primary and backup sites.
- The program manager successfully conducted the Preliminary Design Review for the CAI waveform application software

necessary for interfacing with the JTRS mobile terminal in March 2009.
- The program manager is installing the ground infrastructure hardware in Hawaii, Virginia, Sicily, and Australia.
- The Commander, Operational Test and Evaluation Force (COTF) has participated in the integrated test program in accordance with the DOT&E-approved operational assessment plan. The integrated test team has executed a series of developmental tests that will lead to a COTF Operational Assessment in early FY10. These test events have been instrumental in finding deficiencies in the system prior to full operational testing.

Assessment
- The MUOS program is making progress; however, schedule and technical risks continue to emerge due to the complexity of spacecraft payload, control and software elements, the challenge of increasing operational system throughput capacity, and information assurance.
- Unanticipated technical challenges developing and integrating the legacy payload have contributed to delays and the program manager has reduced the scope of developmental testing to maintain the development schedule.
- The technical challenges with MUOS Space Vehicle 1 are adversely impacting the schedule for MUOS Space Vehicle 2.
- The delay of the launch of MUOS spacecraft beyond FY09 increases the risk of an UHF satellite communications gap as the earlier generation of operational UHF follow-on system satellites become unavailable for service.
- COTF cannot adequately test the MUOS capacity requirements in the IOT&E due to an insufficient number of JTRS-equipped mobile users. COTF will need to supplement IOT&E data with validated modeling and simulation or other data to evaluate the system's ability to operate at its planned capacity levels.

Recommendations
- Status of Previous Recommendations. There are no outstanding recommendations for the program.
- FY09 Recommendations. The Navy should:
  1. Explore a means to operationally load the system to adequately test and evaluate MUOS capacity during the IOT&E.
  2. Incorporate rigorous integrated test and evaluation of the legacy communications capabilities in its IOT&E plan.

MV-22 Osprey

Executive Summary

- The MV-22 is the Marine Corps variant of the V-22 tiltrotor aircraft. The aircraft replaces the aging CH-46 and CH-53D medium lift helicopters. The Osprey is intended to operate in the ship-to-shore assault mission to support Marine Air-Ground-Task Force operations to support maneuver, operations ashore, tactical recovery of aircraft and personnel, and amphibious evacuation. The aircraft is capable of both self-deployment and afloat operations.
- VMX-22 executed an adequate and approved follow-on operational test to evaluate upgraded flight control software, enhancements to mission equipment, and to develop high altitude and mountainous terrain tactics and procedures. The testing gathered the necessary data to evaluate both effectiveness and all reliability, maintainability, and availability suitability metrics, as well as human factors, safety, shipboard compatibility, and mission planning system support. The detailed analysis of the test results are in progress.
- The V-22 program should aggressively continue to pursue development of an effective defensive weapon system, battle damage repair procedures, cold weather testing in conjunction with improvements to the ice protection system, air-refueling and defensive maneuvering envelope expansion, and improved engine and drive-train subassembly reliability.

System

- The MV-22 is a tilt-rotor aircraft capable of conventional wing-borne flight and vertical take-off and landing.
- The Marines intend to replace the aging CH-46 and CH-53D helicopters.
- The MV-22 can carry 24 combat-equipped Marines and operate from ship or shore.
- It can carry an external load up to 10,000 pounds over 40 nautical miles ship-to-shore and return.
- It can self-deploy 2,267 nautical miles with a single aerial refueling.

Mission

- Squadrons equipped with MV-22s will provide medium-lift assault support in the following operations:
  - Ship-to-Objective Maneuver
  - Sustained operations ashore
  - Tactical recovery of aircraft and personnel
  - Self-deployment
  - Amphibious evacuation
- Currently deployed squadrons are providing high-tempo battlefield transportation in Iraq and Afghanistan.

Prime Contractors

- Bell Helicopter, Amarillo, Texas, and The Boeing Company, Ridley Township, Pennsylvania (Joint Venture)

Activity

- The Navy Commander Operational Test and Evaluation Force/Marine VMX-22 Tiltrotor Test Squadron conducted a multi-phased follow-on integrated developmental and dedicated operational test. The Integrated Test (IT-IIIE) integrated phase was accomplished from March 15, 2007, to July 10, 2009. The dedicated OT-IIIE FOT&E phase was executed from May 26 to July 10, 2009. All testing was as approved in the Test and Evaluation Master Plan and test plans, and DOT&E observed the dedicated operational test phase.
- The integrated testing phase focused on subsystem evaluations and tactics, techniques, and procedures for: fast-rope and parachute operations, airdrop of material and resupply, high altitude and mountainous operations (day and night), defensive weapon system, countermeasures testing, shipboard compatibility, and assault zone tactics. The test venues included: Naval Air Stations Fallon, Nevada; Yuma, Arizona; and China Lake, California, as well as shipboard operations aboard the USS *Ponce*, USS *Fort McHenry*, and USS *Bataan*.

- VMX-22 self-deployed four operationally representative aircraft from Marine Corps Air Station, New River, North Carolina. Dedicated operational testing was staged from the deployed forward operating base at Kirtland AFB, New Mexico, with operationally realistic missions on the Fort Carson, Colorado, Range complex.
- The evaluation addressed flight control software upgrades, the chaff/flare countermeasures upgrade, missile warning sensor, an aft cabin Situational Awareness upgrade for embarked troop commanders, enhanced ground refueling capability using the Osprey as the host donor for vehicle and aircraft refueling at austere locations, and mission planning system improvements.
- The approved mission scenario set included a realistic cross-section of core Marine Corps battlefield tasks for: pre-assault raid insertion of Force Reconnaissance teams, resupply support, assault support/airdrop and battlefield circulation, rotors turning ground refueling at a forward location, tactical recovery of personnel, and simulated casualty evacuation.
- All missions were also designed to allow development of high altitude and mountainous operations tactics and to explore survivability enhancement tactics for assault operations.

Assessment

- The testing was executed as approved by DOT&E and was adequate to determine operational effectiveness and suitability of the MV-22 Block 10/B.
- Detailed analysis of the test data is ongoing.
- The suitability evaluation will include comparison of the IT-IIIE and OT-IIIE data with previous testing to identify trends in reliability, maintainability, and availability of the MV-22.
- The effectiveness evaluation will include assessment of the high altitude operational capability and survivability effects of both MV-22 system upgrades and Marine Corps tiltrotor tactics development.

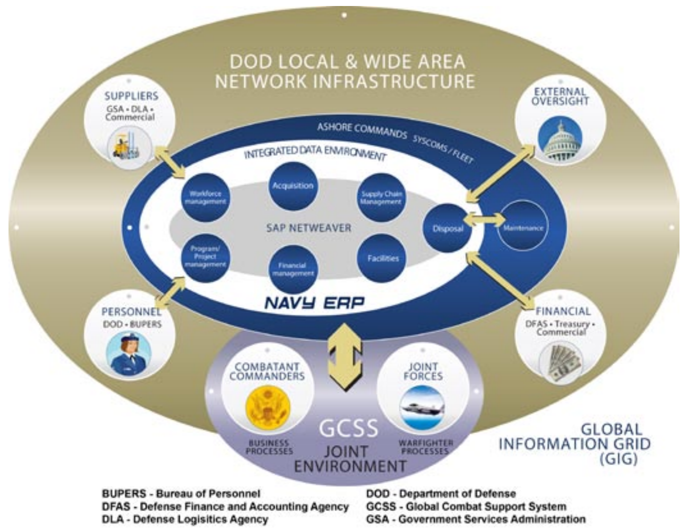
Recommendations

- Status of Previous Recommendations. The program satisfactorily addressed seven of the 10 previous recommendations. The three remaining are valid.
- FY09 Recommendations.
  1. The program should continue integrated Marine Corps/Air Force development and testing of an effective defensive weapon system, battle damage repair procedural development, realistic cold weather testing in conjunction with improved ice protection system reliability, expansion of the defensive maneuvering and air-refueling altitude envelopes, and improved engine and drive-train subassembly reliability.
  2. The Navy should consider increasing the priority of correction of known deficiencies of the MV-22.

Navy Enterprise Resource Planning (ERP) Program

Executive Summary

During FY09, Commander, Operational Test and Evaluation Force (COTF) conducted an FOT&E of Navy Enterprise Resource Planning (ERP) Release 1.0 at the Naval Systems Supply Command (NAVSUP), Mechanicsburg, Pennsylvania, and Naval Air Systems Command (NAVAIR), Naval Air Station, Patuxent River, Maryland. The FOT&E was conducted in accordance with the DOT&E-approved test plan. Change management and financial management deficiencies identified during IOT&E were successfully mitigated. The system was determined to be operationally effective and suitable. Based upon FOT&E results, DOT&E concurred with the COTF assessment and recommended full fielding of Navy ERP Release 1.0.



System

- Navy ERP is an integrated mission support system that modernizes and standardizes Navy support operations, provides financial transparency and total asset visibility across the enterprise. Navy ERP uses a commercial off-the-shelf product, configured to integrate with Navy and DoD requirements, that unifies and streamlines mission support activities using the same data set, available in near real time.
- The Navy ERP system is being incrementally implemented in two releases: financial and acquisition management; and the single supply solution. The current system of record will serve more than 64,000 users in more than 120 locations around the world. The Program Office has been tasked to investigate the requirements for implementing the system in an additional 13 Navy commands in future years.
- Navy ERP was approved by the Assistant Secretary of the Navy (Financial Management and Comptroller) on October 1, 2008, as the Financial System of Record for current users and "all future users of this system." When the current program of record is in place, the system will be used to manage more than 53 percent of the Navy's Total Obligation Authority. The system supports Command's ability to produce auditable financial statements, enabling compliance with federal financial and security standards Chief Financial Officers Act of 1990 and the DoD Information Assurance Certification and Accreditation Process.

Mission

- The Navy utilizes Navy ERP to modernize and standardize financial, workforce, and supply chain management across the Navy Enterprise.
- The system improves Navy leadership decision making, enabling more effective and efficient support of the warfighter.

Prime Contractor

- International Business Machines (IBM), Bethesda, Maryland

Activity

- Based upon the IOT&E and a subsequent Verification of Correction of Deficiencies, the program manager was authorized to continue the limited fielding of Navy ERP to NAVSUP in 1QFY09 to support an FOT&E.
- COTF conducted the FOT&E from February 23 to May 8, 2009, at NAVSUP and NAVAIR, to determine whether financial management and change management deficiencies identified during IOT&E were resolved.

Assessment

- DOT&E assessed the FOT&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 effective and suitable. NAVSUP and the program manager have effectively mitigated change management deficiencies identified during IOT&E. NAVSUP's early and active engagement in deployment preparations resulted in a successful Navy ERP Release 1.0

transition. Other significant factors facilitating NAVSUP's successful transition included the creation of the Navy Enterprise Senior Integration Board, enhanced change management guidance, and a lengthened deployment cycle. With early and active engagement, future receiving commands will benefit from change management process improvements.
- Financial management deficiencies identified during the IOT&E have been adequately mitigated at NAVAIR. Navy ERP system capability enhancements and business process refinements have enabled NAVAIR to effectively complete its business mission. NAVAIR has reduced the labor required to support the Navy ERP implementation from an additional 200 work years during IOT&E to 72 work years during FOT&E. Although the additional labor necessary to support day-to-day operations will likely diminish over time, business operations will require a higher sustained level of effort to produce the financially compliant Navy ERP results.

Recommendations
- Status of Previous Recommendations. The program manager successfully completed FY08 recommendations.
- FY09 Recommendations. None.

P-8A Poseidon

Executive Summary
- DOT&E approved an operational assessment (OA) test plan in September 2009. The Navy began testing in the Systems Integration Lab (SIL) to support the Milestone C decision.
- 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 suite that consists of a radar warning receiver, chaff/flare dispenser, MWS, directed infrared countermeasures, and Electronic Warfare Management Unit 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 the following:
- 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
- The Boeing Company, Integrated Defense Systems, St. Louis, Missouri

Activity
- The Boeing Company conducted the first contractor test flight of the T-1 (test) aircraft on April 25, 2009, and the first contractor test flight of the T-2 aircraft on June 5, 2009. Both test flights were approximately three-hour limited systems check flights conducted in the Seattle, Washington, area.
- The Boeing Company conducted structural testing on the S-1 (static test) aircraft throughout 2009 in order to support the airworthiness flight testing. The initial structural testing was required to clear 80 percent of the flight envelope. Structural testing will continue through 2010 to clear 100 percent of the flight envelope.
- DOT&E approved an OA test plan in September 2009. The Navy began testing in the SIL to support the Milestone C decision. The focus of the OA is to test the software and hardware functionality, integration, and interoperability in a laboratory environment using actual P-8A hardware and software. The Navy conducted the tests using scenarios in simulated, yet operationally representative, environments. Navy personnel operated the P-8A equipment during testing, i.e., flying the aircraft simulator and manning the aircrew workstations. The OA is scheduled to conclude in November 2009.
- Detailed planning continued for the first five test aircraft being tested during the system development and demonstration (SDD) phase. Once all test aircraft are delivered to the Navy, there will be approximately 35 test flights per month during SDD. The IOT&E is scheduled to begin in February 2012.

- Flight testing of the T-1 began in October 2009. The T-1 test aircraft is used for airworthiness testing; it is heavily instrumented, but does not have the mission systems (e.g., sensors) integrated onboard the aircraft. Flight testing of T-2 is scheduled to start in February 2010. The T-2 aircraft has the full mission equipment (e.g., sensors, onboard computers, and aircrew workstations) integrated onboard.
- The Navy has collected reliability and maintainability data throughout the OA and flight testing. A separate maintainability demonstration is scheduled to begin in November 2009.
- The Test and Evaluation Master Plan is being updated to support the Milestone C decision in May 2010.
- Contractor 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 and explosive fuel vapor sensors are being incorporated into the P-8A design to address these issues.

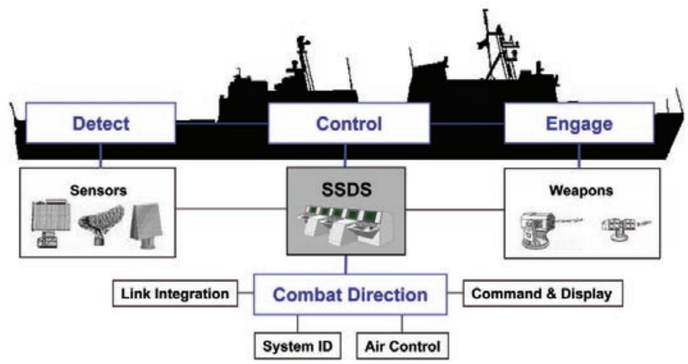
Assessment

- The structural testing required to clear 80 percent of the flight envelope was successful. Structural testing to clear 100 percent of the flight envelope has taken longer than expected and requires an additional seven months of scheduled testing on the S-1 test aircraft. The scheduled initial operational capability is not impacted.
- Live Fire testing planned for FY12 will assess the effectiveness of the design changes.

Recommendations

- Status of Previous Recommendations. The Navy is addressing previous recommendations.
- FY09 Recommendations. None

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 system is not yet operationally effective or operationally suitable.
- The Navy must conduct additional operational testing to demonstrate the correction of significant remaining deficiencies with SSDS Mark 2 and associated combat system elements.

System

- SSDS is a local area network that uses open computer architecture and standard Navy displays to integrate a surface ship's sensors and weapon systems to automate the detect-track-engage sequence for air defense.
- SSDS Mark 1 is the command and control system for LSD 41/49 class ships.
- SSDS Mark 2 has four variants:
  - The Mod 1 is used in CVN 68 class aircraft carriers.
  - The Mod 2 is used in LPD-17 class amphibious ships.
  - The Mod 3 is used in LHD 1 class amphibious ships.
  - The Mod 4 is in development for LHA 6 class amphibious ships.
  - A SSDS Mark 2 Mod is in development for CVN 78 class aircraft carriers.

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 multiple warfare areas

Prime Contractor

- Raytheon, San Diego, California

Activity

- The Commander, Operational Test and Evaluation Force (COTF) conducted FOT&E of the SSDS Mark 2 Mod 1 (CVN variant) on USS *Nimitz* (CVN 68) in February-March 2009 in accordance with a DOT&E-approved test plan. Lack of Evolved SeaSparrow Missile (ESSM) assets limited test events to manned aircraft tracking exercises and prevented COTF from completing test events that included ESSM firings. In addition, reduced availability of required Fleet assets delayed completion of SSDS Mark 2 Mod 1 operational testing. Testing also included an early assessment of SSDS Mark 2 Mod 1 information assurance capabilities. COTF has not yet issued a report on the operational test results from the February-March 2009 testing. USS *Nimitz* deployed in May 2009. The next scheduled SDSS Mark 2 Mod 1 operational test is scheduled for mid-FY10 with USS *Carl Vinson* (CVN 70).
- COTF continued to conduct FOT&E of the SSDS Mark 2 Mod 2 (LPD-17 variant) on the Self-Defense Test Ship in December 2008 in accordance with a DOT&E-approved test plan. Aerial target failures prevented COTF from completing all of the planned test events. The next SSDS Mark 2 Mod 2 operational test is scheduled for early FY10.
- COTF issued a report verifying correction of 12 major SSDS Mark 2 combat system deficiencies identified during previous operational tests.

Assessment

- The completed SSDS Mark 2 Mod 1 (CVN variant) operational tests show that the system remains not operationally effective and not suitable. Although correction of the 12 major combat system deficiencies has substantially

improved the system's performance, testing has revealed continued deficiencies with weapon employment timelines and training as well as sensor coverage and system track management deficiencies associated with combat system elements integrated with the SSDS Mark 2 Mod 1.
- SSDS Mark 2 Mod 2 (LPD-17 variant) operational tests have not demonstrated correction of previously uncovered deficiencies with sensor performance in the LPD-17 Advanced Enclosed Mast structure, vulnerabilities to certain ASCM threats, weapon performance in scenarios with potential fratricide, and 10 remaining major combat system deficiencies. Additionally, newly identified reliability deficiencies with combat system elements integrated with the SSDS Mark 2 Mod 2 will adversely affect the ability of the SSDS Mark 2 Mod 2 to fulfill its primary ship self-defense mission.
- The number of high severity software trouble reports associated with major elements of the SSDS Mark 2 combat system has been significantly reduced.
- Software reliability of the SSDS Mark 2 has been significantly improved.

Recommendations
- Status of Previous Recommendations. The Navy has satisfactorily completed three, partially addressed four, and not addressed five of valid previous recommendations.
- FY09 Recommendations. The Navy should:
  1. Assign a high priority to demonstrating, with adequate operational testing, corrections of identified major deficiencies with the SSDS Mark 2 Mod 1 and its integrated combat system elements to preclude further CVN deployments with ineffective and unsuitable SSDS Mark 2 Mod 1 systems.
  2. Assign a high priority to demonstrating, with adequate operational testing, corrections of identified major deficiencies with the SSDS Mark 2 Mod 2 and its integrated combat system elements to preclude further LPD-17 class deployments with deficient SSDS Mark 2 Mod 2 systems.
  3. Implement the Navy's Program Executive Office for Integrated Warfare Systems plan for more robust, end-to-end systems engineering and associated developmental/operational testing of SSDS-based combat system elements.
  4. Optimize SSDS Mark 2 weapon employment timelines to maximize weapon probability of kill.
  5. Ensure Fleet assets identified in operational test plans are available for SSDS Mark 2 Mod 1 operational tests planned for FY10.
  6. Ensure targets that represent subsonic sea-skimming and supersonic high-diving threats are available for SSDS Mark 2 Mod 1 operational tests planned for FY10.
  7. Ensure adequate funding is programmed for procurement of Threat D targets for SSDS Mark 2 operational testing in FY14.
  8. Ensure adequate funding is programmed for development and procurement of a threat representative anti-ship ballistic missile target for SSDS Mark 2 operational testing in FY14.

SSGN *Ohio* Class Conversion

Executive Summary

- The Navy completed FOT&E in November 2008 to demonstrate Special Operations capability using the SSGN Lockout Chambers (LOC).
- Due to a battery fire which extensively damaged the Advanced SEAL Delivery System (ASDS) vehicle in November 2008, planned future testing of a Dry Deck Shelter (DDS) and ASDS configuration is postponed indefinitely.

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 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 Special Operations Forces (SOF) personnel. Additionally, the Navy converted two SSGN missile tubes into LOCs 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 will employ the *Ohio* class SSGN for:

- Land attack strike missions, capable of launching Tomahawk cruise missiles
- Special Operations missions including all support and planning for two SEAL submersible vehicles
- Traditional attack submarine missions of Anti-Submarine Warfare, Intelligence, Surveillance, and Reconnaissance; Indications and Warnings; Electronic Warfare; Anti-Surface Ship Warfare; and Mine Warfare

Prime Contractor

- General Dynamics Electric Boat, Groton, Connecticut

Activity

- After an extensive redesign of the LOC opening mechanism, the Navy conducted LOC FOT&E in November 2008 aboard USS *Georgia*. The Navy issued their FOT&E report in April 2009.
- The last incomplete OT&E event consists of ASDS/DDS operations and will not be conducted due to a battery fire that extensively damaged the ASDS. The Navy and U.S. Special Operations Command have decided not to repair the ASDS. Instead they are pursuing a replacement program called the Joint Multi-Mission Submersible.
- The Navy agreed to conduct Information Assurance (IA) network penetration testing of SSGN systems, but intends to evaluate the results from testing on *Virginia* class attack SSNs prior to scheduling the SSGN test.

Assessment

- FOT&E demonstrated that once the LOC is certified, the SSGN will be effective and suitable for SOF missions using the organic lockout capability. The Navy demonstrated the LOC operations during a test event where diver emergency oxygen recompression capability was provided by another asset.
- SSGNs are currently limited in their ability to utilize the LOC because they lack an oxygen recompression capability in case of a diver accident. The Navy is in the process of installing this capability on two of the SSGNs.
- The redesign of the LOC opening mechanism successfully addressed the reliability issues with the previous design.
- 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 than an SSN. When configured with two DDSs, the SSGN can provide greater SOF delivery capability. Once configured with an oxygen recompression capability, the SSGN LOCs will provide SOF delivery capability without use of a DDS or ASDS.

- The SSGN's shorter High Data Rate (HDR) antenna, in comparison to the HDR on *Ohio* class SSBNs, requires 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 is working on a design modification, but has not yet identified funding for procurement and installation.
- Previous IA test results on submarines indicate that the SSGN may have IA vulnerabilities.

Recommendations

- Status of Previous Recommendations. No action has been completed on the FY08 recommendations.
- FY09 Recommendations. The Navy should:
  1. Conduct IA testing on an SSGN as soon as possible.
  2. Evaluate effect of HDR mast modification on SSGN detectability.

SSN 774 *Virginia* Class Submarine

Executive Summary

- The *Virginia* class submarine completed IOT&E in April 2009. The Navy issued its Operational Test Report in June 2009 and DOT&E issued its Beyond Low-Rate Initial Production (BLRIP) report to Congress in November 2009. The program plans to conduct a Milestone III full-rate production decision in December 2009.
- The IOT&E was adequate to assess most *Virginia* mission areas, with the following exceptions:
  - *Virginia's* ability to conduct Special Warfare Operations, Arctic Operations, and Anti-Submarine Warfare against diesel-electric submarines remain outstanding test requirements.
  - Additional testing is required to fully assess *Virginia's* Intelligence and Reconnaissance capabilities and *Virginia's* Anti-Surface Ship Warfare capabilities.
- *Virginia* is an effective and suitable replacement for the *Los Angeles* class submarine. The *Virginia* does not provide all the mission capabilities at the level required by the Operational Requirements Documents.
- Operational and Live Fire testing demonstrated that the *Virginia* class submarine is survivable in most expected threat environments.
- *Virginia* class performance is very dependent on the performance of separately-managed sub-systems that are integrated into *Virginia's* Non-Propulsion Electronics Systems (NPES). These sub-systems were often not designed to meet or did not demonstrate the ability to meet *Virginia's* requirements. Versions of many of these systems are also 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 designed to be capable of targeting, controlling, and launching Mk 48 Advanced Capability torpedoes, Tomahawk cruise missiles, and future mines
- Is designed to have 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 intended to 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; and Electronic Warfare
- Anti-Surface Ship Warfare
- Special Operations Force warfare
- Mine warfare
- Battle Group Operations

Prime Contractors

- General Dynamics Electric Boat, Groton, Connecticut
- Northrop Grumman Shipbuilding Newport News, Newport News, Virginia

Activity

- The Navy completed IOT&E of the *Virginia* class submarine in April 2009. Testing met the intent of the DOT&E-approved operational test plan. Because of material problems onboard the test ship, bad weather in the planned test areas, and schedule conflicts with target surrogates and test assets, the Navy had to reschedule several IOT&E events and use alternate venues. This extended the test period and led to some events being delayed until follow-on operational testing.

- The Navy's Operational Test Agency, Commander, Operational Test and Evaluation Force (COTF), issued its IOT&E report of *Virginia* in June 2009. COTF evaluated *Virginia* as effective and suitable.
- The Navy completed Live Fire testing on the *Virginia*, including 99 percent of required component shock qualification testing, by FY09.
- DOT&E issued a BLRIP report on November 12, 2009. This report was classified and included a limited distribution version to comply with the Navy's special security rules for submarine data.
- DOT&E approved a new *Virginia* Test and Evaluation Master Plan, Revision F in November 2009 to detail follow-on developmental and operational testing plans. Future testing of the *Virginia* class submarine will address:
  - Modernization of the *Virginia* submarine's NPES
  - Design changes planned for the third block of submarines
  - Operational testing not completed in IOT&E
  - Verification of the correction of deficiencies uncovered in IOT&E
- The program plans to conduct a Milestone III full-rate production decision in December 2009.

Assessment

- Because Navy security rules prohibit operating the *Virginia* in the vicinity of foreign SSKs, the Navy finished IOT&E without testing the *Virginia* class submarine against this primary threat of record. However, DOT&E found that sufficient information from testing the *Los Angeles* variant of *Virginia's* sonar systems against allied SSKs exists to assess *Virginia's* ASW search capability.
- The DOT&E's classified BLRIP report concluded the following:
  - ASW testing was marginally adequate during the IOT&E. In several cases, unusually favorable acoustic conditions or a noisy target diminished operational realism. Additional testing is required in this mission area, including testing with SSKs to fully evaluate *Virginia's* capability against this important threat. DOT&E has requested the Navy propose alternate methods to comply with their security restrictions and support this effort.
  - The Navy conducted adequate testing to assess mission performance in Strike Operations, Anti-Surface Ship Warfare attack, Battle Group Support Operations, Minefield Avoidance operations, and Special Operations with the Lock-out Trunk.
  - The Navy did not conduct adequate testing to assess *Virginia's* ability to search for surface ships in various environments or to fully assess portions of the ISR mission.
  - The Navy conducted several tests to evaluate *Virginia's* covertness (ability to be detected). Most of these tests were adequate for assessing the areas examined; however, additional testing is required in other areas.
- DOT&E's classified BLRIP report on *Virginia's* performance for all testing conducted concludes the following:
  - *Virginia* is an effective, suitable, and survivable replacement for the *Los Angeles* submarine with improvements in acoustic and electromagnetic covertness.
  - *Virginia's* operational effectiveness is dependent on the mission conducted. *Virginia* is effective for conducting Strike Operations, minefield avoidance operations, Battle Group Support, and Anti-Surface Ship Warfare attack (in most scenarios).
  - *Virginia* is effective for conducting ASW against the majority of submarines in benign and moderate acoustic environments. *Virginia* is not effective in more harsh acoustic environments or against the newer threats of record.
  - *Virginia* is effective for conducting some limited ISR missions depending on the intelligence collection requirements; however, additional testing is required.
  - *Virginia* was not fully evaluated for the Special Warfare mission, but has the potential to use the installed Lock-Out Trunk for SOF operations once the Navy certifies *Virginia* for diver oxygen recompression and storage of Special Warfare equipment and ordinance. Further testing is required to evaluate *Virginia's* capability with the Dry Deck Shelter and the Advanced SEAL Delivery System's replacement.
  - *Virginia* is operationally suitable. However, the reliability of several key engineering plant components, NPES equipment, Government Furnished Equipment, and the Photonics Mast need improvement.
  - Operational and Live Fire testing demonstrated that the *Virginia* class submarine is survivable in most expected threat environments. Details of the survivability assessment are classified and contained in the combined BLRIP report.
- *Virginia's* mission performance was found to be highly dependent on smaller acquisition programs that make up the *Virginia* NPES and weapons. The performance requirements or demonstrated performance of some NPES components do not support meeting *Virginia's* requirements. The Acoustic Rapid Commercial Off-the-Shelf Insertion for Sonar AN/BQQ-10 sonar, the TB-29 series towed array, the AN/BLQ-10 Electronics Support Measures and the Mk 48 Advanced Capability torpedo are examples of systems with known performance limitations or reliability problems that affected *Virginia's* performance during IOT&E.

Recommendations

- Status of Previous Recommendations. The Navy has not addressed one FY06 or the three FY08 recommendations.
- FY09 Recommendation.
  1. The Navy should implement the recommendations in the DOT&E BLRIP report and the COTF IOT&E Report.

STANDARD Missile 6 (SM-6)

Executive Summary

- The STANDARD Missile 6 (SM-6) Program is in low-rate initial production.
- The SM-6 OT&E will commence in March 2010.

System

- SM-6 is the latest evolution of the STANDARD Missile family of fleet air defense missiles that leverages two existing Raytheon product lines: the SM-2 Block IV and the Advanced Medium-Range Air-to-Air Missile (AMRAAM).
- SM-6 is employed from cruisers and destroyers equipped with Aegis combat systems.
- The SM-6 seeker and terminal guidance electronics derive from technology developed in the AMRAAM. SM-6 retains the legacy STANDARD Missile semi-active radar homing capability.
- SM-6 receives midcourse flight control from the Aegis combat system; terminal flight control is autonomous via the missile's active seeker or supported by the ship's radar.

Mission

- The Joint Force Commander/Strike Group Commander will use SM-6 for fleet air defense against fixed/rotary-winged targets and anti-ship missiles in the very-high to sea-skimming altitude regimes across the full missile kinematic performance envelope.
- The Joint Force Commander will use SM-6 as part of the Naval Integrated Fire Control – Counter Air (NIFC-CA) concept to provide extended range, over-the-horizon capability against at-sea and overland threats.

Prime Contractor

- Raytheon Missile Systems, Tucson, Arizona

Activity

- The Navy continued land-based developmental testing at White Sands Missile Range, New Mexico, conducting two flight tests.
- During the Control Test Vehicle-1 test on January 29, 2009, the SM-6 missile failed to launch. Post-test failure investigation determined the tactical seeker batteries prematurely squibbed, causing catastrophic mission computer failure. The contractor implemented corrective actions to missile circuitry to prevent this type of failure.
- Control Test Vehicle-1A retest on August 28, 2009, successfully demonstrated missile airframe performance across a wide flight dynamic envelope. This was a non-intercept mission.
- Although not officially part of the SM-6 test program, the Advance Area Defense Interceptor – 1 test on May 29, 2009, using a SM-6 missile, intercepted a BQM-74E target drone at White Sands Missile Range, New Mexico.
- DOT&E approved an update to the SM-6 Test and Evaluation Master Plan prior to Milestone C.
- The Defense Acquisition Executive approved Milestone C for the program on August 24, 2009.

Assessment

- The planned schedule for the at-sea testing, beginning in March 2010 at the Pacific Missile Range Facility (PMRF), Kauai, Hawaii, and concluding in September 2010, is aggressive.
- Risks to completion of at-sea testing in the planned timeframe include:
  - The reasonable likelihood of flight test failures
  - The need for certification of the supersonic sea-skimming target's flight termination system and integration of the supersonic sea-skimming target into the range infrastructure

- The planned maintenance closure of the PMRF runway for three months may impact test target deliveries
- The difficulty of coordinating multiple, stream raid target presentations

- The Navy does not have a clear test strategy for SM-6 in the NIFC-CA role. Testing of the SM-6/NIFC-CA capability will not occur until after the SM-6 full-rate production decision. Also required for the NIFC-CA capability is the Aegis Advanced Capability Build-12 and E-2D program; neither will deliver until after 2012.
- Testing of SM-6 against the full anti-ship cruise missile threat set will not occur until after the full-rate production decision because threat surrogate development and production are out of sync with the needs of the SM-6 program.

Recommendations

- Status of Previous Recommendations. There are no previous recommendations for this program.
- FY09 Recommendations.
  1. The Navy must continue to focus attention on completion of PMRF test preparation activities to prevent delays in developmental and operational testing.
  2. Complete certification of the supersonic sea-skimming target's flight termination system by January 2010 to ensure it does not impact operational testing planned for March 2010.

T-6 Avionics Upgrade Program (AUP)

Executive Summary

- The Navy intends to replace approximately 249 legacy T-34C aircraft with the T-6 Avionics Upgrade Project (AUP) aircraft (designated as the T-6B) for Navy primary pilot training.
- The Navy awarded a limited production contract in August 2009 for nine aircraft. The full production contract for the T-6B was awarded October 29, 2009.

System

- The Joint Primary Aircraft Training System (JPATS) is a system-of-systems for primary flight training, tailored to meet Air Force and Navy initial pilot training requirements.
- The JPATS consists of the T-6A/B Texan II air vehicles, simulators, and associated ground-based training devices; a Training Integration Management System; instructional courseware; and contractor logistics support.
- The Air Force has replaced the T-37B aircraft with the T-6A aircraft and the Navy will replace approximately 249 legacy T-34C aircraft with the T-6B aircraft. Both Services are replacing their associated ground-based training components.
- The Navy T-6B aircraft incorporates the AUP that was developed by the manufacturer as a company funded, independent research and development effort. The AUP replaces the cockpit displays in the T-6A aircraft with multi-functional displays; adds up-front control panels, two Integrated Avionics Computers (with GPS and a flight management system), an inertial reference system, integrated backup flight instruments, and a heads-up display (HUD).
- The T-6B includes structural enhancement of the fuselage, increasing the operational gross weight of the aircraft.
- The Navy anticipates the AUP will mitigate component obsolescence risks and comply with future Federal Aviation Administration (FAA) mandated navigational requirements.

Mission

- The Air Force, Navy, and Marine Corps use JPATS aircraft to train entry-level student pilots in primary flying skills to a level of proficiency at which they can transition into advanced training.
- The Navy intends to transfer some T-45 advanced jet training curriculum to the T-6B aircraft.

Prime Contractor

- Hawker Beechcraft Corporation, Wichita, Kansas

Activity

- DOT&E approved Annex I to the JPATS Test and Evaluation Master Plan in September 2008. The annex incorporated a Developmental T&E (DT&E) phase with assistance from operational testers (termed “DT&E Assist”) and an Operational Assessment. These test efforts have been completed.
- The Navy plans to accomplish DT&E and DT&E Assist testing for the T-6B Deferred Software Load (DSL) in 2QFY10. The DSL includes functionality for the HUD and FAA-certified software enhancements.
- The Navy will conduct a formal FOT&E of the T-6B beginning 4QFY10. The FOT&E will include an end-to-end system-level operational test of the T-6B aircraft, simulators, and courseware with a class of students.

- The Navy awarded a limited production contract in August 2009 for nine aircraft. The full production contract for the T-6B was awarded October 29, 2009.

Assessment

- Testing has demonstrated adequate system performance of all of the AUP subsystems; however, a complete assessment of the HUD could not be accomplished because the DSL was not available.
- The T-6B AUP aircraft provides significant improvement in situational awareness and avionics interfaces for the air crew and improved system redundancy compared to the T-6A aircraft.

Recommendations

- Status of Previous Recommendations. The Navy is addressing all previous recommendations.
- FY09 Recommendations. None.

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

Executive Summary

- The *Lewis & Clark* class of dry cargo ships (T-AKE) completed IOT&E in February 2007, is operationally effective in conducting its primary mission under peacetime, benign conditions, and is operationally suitable.
- The Navy completed FOT&E Part 1 (OT-IIIA) in April 2009. Testing included successful at-sea testing of the acoustic torpedo deception device (NIXIE), collection of Reliability, Availability, and Maintainability (RAM) data, and Information Assurance (IA) testing.
- The Navy delayed FOT&E Part 2 (OT-IIIB) including testing of the Advanced Degaussing System using the Advanced Mine Simulation System, until completion of the Magnetic Silencing Facility upgrades in Norfolk, Virginia, and San Diego, California, estimated in late FY10.

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 under contract 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 such as: an advanced degaussing system to reduce the ships magnetic signature against mines, shock resistance in selected equipment, and increased damage control measures in firefighting and stability
- 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

Mission

The Maritime Component Commander can employ 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 National Steel and Shipbuilding Company, San Diego, California

Activity

- The Navy completed FOT&E Part 1 (OT-IIIA) in April 2009 in accordance with the DOT&E-approved Test and Evaluation Master Plan and test plan. FOT&E Part 1 included at-sea testing of the acoustic deception torpedo countermeasure system AN/SLQ-25A (NIXIE), collection and assessment of RAM data, and completion of IA testing omitted during IOT&E.
- The Navy approved Change 1 to the Operational Requirements Document (ORD) in April 2009, effectively removing the requirement for an automated cargo load planning and inventory management system, referred to as the Shipboard Warehouse Management System (SWMS).
- On April 7, 2009, the Joint Interoperability Test Command issued a Joint Interoperability Certification for the *Lewis and*

Clark class (T-AKE 1-5) after having satisfied all Net Ready Key Performance Parameters.
- FOT&E Part 2 (OT-IIIB) is delayed until at least late FY10 due to delays in completing Magnetic Silencing Facility upgrades in Norfolk, Virginia, and San Diego, California.

Assessment
- T-AKE 4 successfully completed an acoustic trial off San Clemente Island and demonstrated that NIXIE was capable of masking the ships acoustic signature.
- Although the ORD does not specify quantifiable RAM metrics, the Navy's Operational Test Agency collected operational data on critical auxiliary support equipment during T-AKE 1 and 2 initial deployments. The data did not reveal any significant deficiencies.
- Follow-on IA testing in T-AKE 5 with an installed Intrusion Detection System (IDS) was inconclusive. Although some detection capability was demonstrated, inadequate training in network administration prevented the system from operating in an effective protective posture without outside assistance. Only a portion of the servers and workstations were configured properly during the test.
- Cost and technology problems associated with segregating classified and unclassified cargo inventory within the SWMS caused the Navy to remove the requirement for an automated cargo management system from the ORD.
- Although T-AKE was delivered without a chemical agent point detection capability, the ORD specifies a requirement for one. There is space to allow installation once an adequate system is fielded.
- The Navy is unable to test T-AKE for mine susceptibility using the Advanced Mine Simulation System until problems are resolved with the Advanced Degaussing System and the Navy completes the infrastructure upgrades to the Magnetic Silencing Facilities that will be used to calibrate these advanced systems.

Recommendations
- Status of Previous Recommendations. The Navy still needs to address one of the two FY06 recommendations and one of the six FY07 recommendations.
- FY09 Recommendations. The Navy should:
  1. Outfit all ships of the class with an IDS capability and ensure adequate training is provided to network administrators to foster effective IA.
  2. Conduct additional FOT&E to verify the IDS works as designed and validate the ships ability to detect, react, and restore network systems in the event of an intrusion.
  3. Pursue installation of a chemical agent point detection system as soon as the Navy fields a replacement.
  4. Resolve problems associated with the ships Advanced Degaussing System, coordinate calibration for all ships once the Magnetic Silencing Facilities are available, and conduct FOT&E using the Advanced Mine Simulation System to assess mine susceptibility.

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 FY09 test flights, the Tomahawk Weapon System continues to meet Navy standards for reliability and performance.
- The Navy conducted FOT&E OT-IIIE 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. Based on the FOT&E results the Tomahawk Weapon System continues to be effective and suitable.

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 Tactical Tomahawk Weapons System (TTWCS) also includes the Tomahawk Command and Control System (TC2S) and the shipboard Tomahawk Weapon Control Systems (TWCS). The TC2S and TWCS provide 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 Missile Systems, Tucson, Arizona

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 13 Tomahawk missile test launches during FY09.
- The Navy utilized the Tomahawk flight test program to verify correction of a Baseline IV missile engineering deficiency (Armed Fire Device) that had the potential to reduce missile reliability on some vertical launched missiles. The Navy plans to implement this correction for affected Fleet Missiles in FY10.
- The Navy utilized the Tomahawk flight test program for final validation of a new Anti-Jam GPS Receiver-4. In addition to resolving obsolescence issues, this receiver introduces improved performance and Selected Availability/Anti-Spoofing Module capability to the missile.
- The Commander, Operational Test and Evaluation Force 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 ("Strike over Secret"), vice the TOP SECRET level used for all previous Tomahawk operations. Operational Fleet Commands are implementing the Strike over Secret network.
- DOT&E has been participating with the Tomahawk program's T&E Integrated Product Team to update the Test and Evaluation Master Plan and develop a test plan to support the

next phase (OT-IIIF) of Tomahawk Weapon System FOT&E. This phase includes improvements to TTWCS and TC2S as well as correction of deficiencies remaining from OT-IIIE.

Assessment

- Based on FY09 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 to remain in operational use until 2020. DOT&E places high value on continuing to collect flight data to evaluate end-to-end system performance and reliability for all deployed and deployable Tomahawk missile variants.
- Due to differing weapon control systems configurations, Strike over Secret will not be available on all Tomahawk firing platforms; therefore, all users must retain the ability to revert to TOP SECRET. When non-Strike over Secret and Strike over Secret users combine for a strike mission, all users must guard against cross-contamination of classification levels, increasing the difficulty of strike coordination.
- Based on the 2008/2009 FOT&E results, the Tomahawk Weapon System continues to be effective and suitable.

Recommendations

- Status of Previous Recommendations. The one FY07 recommendation remains valid.
- FY09 Recommendations. None

Vertical Take-Off and Landing Unmanned Aerial Vehicle (VTUAV) (Fire Scout)

Executive Summary

- The Navy delayed IOT&E from June 2009 to 2QFY10 because of software development delays and problems associated with shipboard launch and recovery.
- Additional developmental testing is required to demonstrate air vehicle reliability, shipboard operations, data link, and payload operations.
- As an Operational Test Readiness Review entrance criterion, the system should demonstrate the ability to routinely perform a set of operationally representative missions.

System

- The Vertical Take-Off and Landing Unmanned Aerial Vehicle (VTUAV) is a helicopter-based tactical Unmanned Aerial System comprised of up to three Fire Scout air vehicles with payloads, a shipboard integrated Ground Control Station with associated tactical data links, and the Unmanned Aerial Vehicle Common Automatic Recovery System.
- The VTUAV is intended to have the following capabilities:
  - Combat radius: 110 nautical miles
  - Endurance at combat radius: 3 hours on station
  - Target Identification: Fast Inshore Attack Craft at 6 km range
  - Initial payload consists of the AN/AAQ-22D Bright Star II electro-optical and infrared imaging system with laser designator

Mission

Aviation detachments equipped with VTUAVs will perform reconnaissance, surveillance, target acquisition, and communications relay missions in support of littoral anti-submarine warfare, anti-surface warfare, and mine warfare operations.

Prime Contractor

- Northrop Grumman-Ryan Aeronautical, San Diego, California

Activity

- IOT&E was scheduled to start in June 2009. The planned start date has been delayed until 2QFY10 because of software development delays and shipboard compatibility problems.
- The program planned extensive shipboard testing during FY09. However, software development, mechanical problems, and weather combined to greatly reduce the amount of testing actually completed.
- Land-based developmental testing in 2009 focused on air vehicle envelope expansion, payload performance, and data link development.
- Operational test team air vehicle operators received training as part of the Integrated Test Team participation in developmental testing. Operationally representative flights have been limited to date because of developmental test flight restrictions.

Assessment

- Current procedures do not measurably increase probability of successful launch and recovery.
- Operational test team mission payload operators have yet to successfully employ the payload during operational vignettes.
- IOT&E software developed to date does not support critical VTUAV requirements (dual air vehicle control) and key enabling capabilities (hot refueling), and IOT&E has been delayed to 2QFY10.
- Vibration Monitoring System and technical publications immaturity have delayed operational testers from testing production representative air vehicles.
- The tactical data link used for transmitting payload imagery and as the primary air vehicle command and control link is not reliable. It has yet to be determined if the data link problems are systemic in nature or unique to the developmental test air vehicles and payloads.

Recommendations

- Status of Previous Recommendations. There are no outstanding previous recommendations.

- FY09 Recommendations.
  1. The program should conduct additional developmental testing to increase system effectiveness and operator proficiency during shipboard launch and recovery before IOT&E.
  2. Software development should focus on correcting deficiencies in order to enhance operational employment.
  3. The system should demonstrate the ability to routinely perform a set of operationally representative missions as an Operational Test Readiness Review entrance criterion.
  4. Production representative air vehicles should accumulate sufficient flight hours before IOT&E to demonstrate data link, payload, and air vehicle reliability.

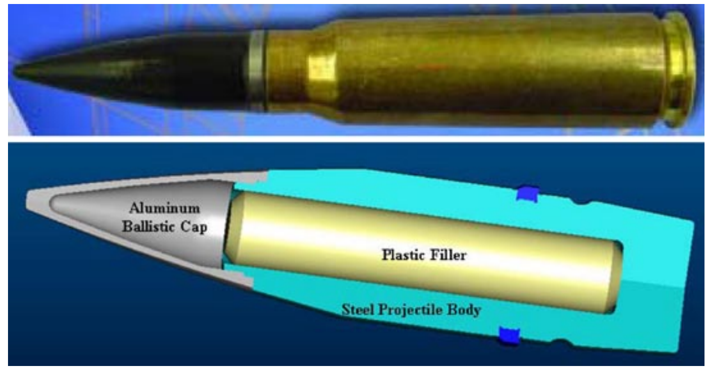
Air Force Programs

Air Force Programs

20 mm PGU-28/B Replacement Combat Round

Executive Summary

- Following lethality and operational testing in 2007, the Air Force's Air Combat Command assessed the Penetrator with Enhanced Lateral Effects (PELE) as effective and lethal, but not suitable. DOT&E agreed with that assessment.
- The suitability determination was due to ballistic differences between the PELE and the legacy PGU-27 that would require Aircraft Operational Flight Program adjustments and an unacceptably high rate of nose cap damage.
- The program is on hold pending resolution of the nose cap problem.
- The Air Force will conduct additional follow-on testing, to include lethality testing, to assess the effectiveness and suitability of the modified PELE. 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, in a cooperative effort with Diehl Munitionssysteme of Germany, developed the 20 mm PGU 28/B replacement cartridge by integrating 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 the 20 mm cannons on the 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, Armament Systems, Clearfield, Utah

Activity

- The Air Combat Command released their final report on the PELE in January 2008. That report contained both lethality and OT&E results and assessments and concluded the PELE was effective and lethal, but not suitable.
- Following a material change in the nose cap, instituted to address suitability problems sighted by the Air Combat Command, the Air Force conducted additional operational and lethality testing in 2008.
- That follow-on testing revealed that though the modified nose cap did address nose cap damage issues, in one instance, the nose cap separated from the main projectile following muzzle exit. As a result, the program is on hold pending resolution of that issue.

Assessment

- DOT&E concurred with the Air Combat Command's 2008 assessment that the PELE was effective and lethal, but not suitable. That determination was due to ballistic differences between the PELE and the legacy PGU-27 that would require Aircraft Operational Flight Program adjustments and because of an unacceptably high rate of nose cap damage.
- Testing conducted in 2008 to assess a modified nose cap demonstrated that the material change did not affect the lethality of the PELE. DOT&E again assessed the PELE as lethal against its intended target set.
- As noted above, an instance of nose cap separation did occur during that follow-on testing. The Air Force believes that the nose cap failure is related to a material issue that develops

during the nose cap molding process. The material issue, while it cannot be eliminated from the manufacturing process, can be identified via ultrasonic inspection of the nose caps prior to them being installed on the projectiles. The prime contractor is implementing this inspection process and is having new caps manufactured. Cartridges already produced will be modified. DOT&E concurs with that action.

- Follow-on testing will validate the success of the nose cap solution.

Recommendations

- Status of Previous Recommendations. The Air Force is satisfactorily addressing the two FY08 recommendations.
- FY09 Recommendation.
  1. Conduct additional ballistic testing to confirm that there is no change in lethality as a result of any modifications to the round.

Advanced Extremely High Frequency (AEHF) Satellite Communications System

Executive Summary

- The Air Force Operational Test and Evaluation Center (AFOTEC) conducted test planning for the upcoming Operational Utility Evaluation (OUE) in the 3QFY10. The OUE will focus on the Advanced Extremely High Frequency (AEHF) Mission Control Segment. The Air Force will field the Mission Control Segment to assume control of the Military Strategic, Tactical, and Relay (Milstar) constellation in advance of the launch of the first AEHF satellite.
- The Program Manager conducted additional thermal vacuum testing on Space Vehicle 1 to complement other inter-segment tests and confirm correction of all technical issues identified late in FY08.

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 is to 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 Executive authorized fabrication and assembly of the first four satellites and development of the Control and User segments. The Defense Acquisition Executive directed the Air Force to plan for the acquisition of satellite vehicles five and six. The exact number of satellites in the AEHF constellation is yet to be determined. The operational AEHF constellation is defined as four interconnected satellites per the AEHF Operational Requirements Document, dated October 2, 2000.

Mission

Combatant Commanders and operational forces worldwide will use the AEHF system to provide secure, responsive, and survivable space-based, strategic, and tactical military communications.

Prime Contractor

Lockheed Martin Space Systems, Sunnyvale, California

Activity

- The program manager conducted additional thermal vacuum testing on Space Vehicle 1 to complement other inter-segment tests and confirm correction of all technical deficiencies identified during an Executive Review in December 2008.
- Government developmental software testing has identified major problems with software maturity, particularly in the Mission Planning Element. The government is systematically verifying software quality as the contractor corrects each deficiency. The program manager plans for a comprehensive test of the software in FY10.

- AFOTEC is planning the OUE of the Mission Control Segment, scheduled for 3QFY10, and for the IOT&E, scheduled for FY12.
- The Program Executive Officer has submitted a revised Test and Evaluation Master Plan (TEMP) revision that addresses the changes to the acquisition and test strategies that have occurred since DOT&E approved the TEMP in FY01.
- AFOTEC cancelled the development of the jamming simulator.

Assessment

- The combined contractor and government developmental test team has been successful in identifying problems prior to entry into operational testing. The program manager's decision to add an additional thermal vacuum test substantially reduced risk by identifying potential problems earlier in the integration process.
- AFOTEC, through its space operational test and evaluation model, has identified increased opportunities for early involvement to inform acquisition and operational decision makers on the progress of the program.
- The operational testers are developing a modeling and simulation strategy to assess nulling antenna performance in order to supplement operational testing.
- Immature ground control software, insufficient sparing, and immature logistic support concepts pose risks to a successful OUE in 3QFY10. Additionally, the transportable interim Command and Control vehicles are not designed to meet the High Altitude Electromagnetic Pulse requirement and Department of Transportation wide-load requirements.
- Delays in the satellite vehicle development have enabled the Service terminal programs to better align with the AEHF program. This provides an opportunity to conduct pre-launch interoperability testing of the Family of Advanced Beyond Line-of-Sight Terminals, Minimum Essential Emergency Communications Network Terminals, and Minute Man Essential Emergency Communications Network Program Terminals.
- The Air Force is analyzing an alternative strategy for testing the anti-jam capability of AEHF. The AEHF IOT&E will be inadequate without an anti-jam test capability.

Recommendations

- Status of Previous Recommendations. The Air Force has made satisfactory progress to all previous DOT&E recommendations.
- FY09 Recommendations. The Air Force should:
  1. Conduct interoperability testing of all available terminal variants during planned integrated and dedicated operational test events. If necessary, additional test events should be inserted into the test schedule to integrate terminals as they become available.
  2. Assess the interim command and control facilities against all operational requirements to fully inform operational decision makers regarding both the capabilities and the limitations of these interim facilities.
  3. Provide a new strategy for operational testing of the AEHF anti-jam capability in the pending TEMP revision.

ALR-69A Radar Warning Receiver (RWR)

Executive Summary

- On March 18, 2009, an Acquisition Decision Memorandum (ADM) was issued that authorized 37 additional systems as part of the second phase of low-rate initial production (LRIP II). On August 18, 2009, the Air Force Milestone Decision Authority (MDA) approved an LRIP II ceiling change increasing the quantity to 44 systems.
- The Air Force is continuing dedicated developmental and operational testing, with a full-rate production decision planned for June 2011.
- 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.

1 - Legacy ALR-69 Components 3 - Radar Receiver
2 - Primary ALR-69 Components 4 - Countermeasure Signal Processor

System

- The ALR-69A is a Radar Warning Receiver (RWR) that detects, identifies, and locates threat electronic signals.
- The Core ALR-69A RWR is designed to improve 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 are to 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 attack 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 and was assessed during an Advanced Concept Technology Demonstration effort, which completed 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, Space and Airborne Systems, Goleta, California

Activity

- The Air Force designated Air Mobility Command's C-130H as the lead aircraft for ALR-69A integration.
- On March 18, 2009, an ADM was issued that authorized 37 systems as part of LRIP II. On August 18, 2009, the Air

Force MDA approved an LRIP II ceiling change increasing the quantity to 44 systems.

- DOT&E approved a Test and Evaluation Master Plan update on May 8, 2009.
- Raytheon delivered new Software Load 1.09 in August 2009 for developmental testing. Dedicated flight tests resumed with this new software in September 2009.
- The Air Force will continue dedicated developmental and operational testing, with a full-rate production decision planned for June 2011.

Assessment

- The ALR-69A continues to show improved operation in dense and dynamic flight test environments; however, system maturity is still less than expected at this point in the program.
- Government flights in FY08 revealed several limitations and deficiencies in the radar warning display system. The new software load delivered by Raytheon in August 2009 incorporates several deficiency report fixes intended to show improvements over FY08 testing.

Recommendations

- Status of Previous Recommendations. The Air Force is adequately addressing the one FY08 recommendation.
- FY09 Recommendations. None.

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

Executive Summary

- The B-2 Radar Modernization Program (RMP) completed IOT&E for Mode Set 1 in December 2008. Mode Set 1 consists of conventional mission and weapons delivery capabilities. Mode Set 2 incorporates nuclear mission capabilities. Mode Set 2 FOT&E is scheduled to begin in November 2009.
- RMP Mode Set 1 is effective with some limitations in the weather avoidance mode.
- B-2s configured with RMP are as survivable as aircraft configured with the legacy radar, and RMP system suitability is no worse than that of the legacy radar system though some technical publications were incomplete.
- The B-2 On Board Test System (OBTS) requires follow-on testing to confirm that the system meets the user defined requirements.

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 radar antenna and transmitter 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.
- The B-2 RMP delivers capability in two separate radar Mode Sets. Mode Set 1 consists of conventional mission and weapons delivery capabilities. Mode Set 2 incorporates nuclear mission capabilities.

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 Contractor

- Northrop Grumman, Los Angeles, California

Activity

- The Air Force Operational Test and Evaluation Center (AFOTEC) conducted B-2 RMP Mode Set 1 IOT&E from October through December 2008 in accordance with the DOT&E-approved Test and Evaluation Master Plan and IOT&E Plan.
- Air Combat Command conducted a B-2 Force Development Evaluation (FDE) assessing B-2 RMP Mode Set 1 performance from April through September 2009.
- The Air Force completed developmental testing of B-2 RMP Mode Set 2 capabilities in FY09.
- The September 2009 DOT&E B-2 Radar Modernization Program Mode Set One Operational Test and Evaluation Report assessed B-2 RMP Mode Set 1 operational effectiveness, suitability, and survivability.

Assessment

- AFOTEC IOT&E results demonstrated that B-2 RMP Mode Set 1 is operationally effective, suitable, and survivable with some limitations.

- RMP effectiveness in air-to-ground mapping, targeting, and weapons accuracy and in air-to-air aircraft rendezvous was at least as good as the legacy system.
- RMP detection and display of weather phenomena in the weather avoidance mode was inconsistent with the actual weather location relative to the aircraft; weather phenomena such as thunderstorms were approximately five miles closer to the aircraft in range than cockpit-displayed RMP detections. Operational aircrews must increase desired weather avoidance distances by five miles to compensate for this discrepancy. DOT&E assesses that this limitation will not preclude the B-2 from accomplishing its conventional operational missions.
- There is reasonable confidence that RMP system suitability is no worse than that of the legacy radar system. Incomplete aircrew and maintenance technical publications required work around actions to ready RMP aircraft for flight missions, but this shortfall did not adversely affect RMP maintainability.
- The B-2 RMP OBTS is designed to provide 100 percent detection of radar system hardware or software faults. There was one hardware failure occurrence during FDE where OBTS did not detect the failed radar hardware module. Follow-on operational testing or assessment of OBTS performance in B-2 operational units is required to confirm that OBTS capability meets the user-defined requirements.
- Flight testing and aircraft signature analysis demonstrated that the RMP system is as survivable as the legacy radar system. The RMP caused no degradation of B-2 aircraft signatures, probability of intercept, or the Defensive Management System.

Recommendations

- Status of Previous Recommendations. There are no outstanding recommendations.
- FY09 Recommendations.
  1. The Air Force should ensure that B-2 aircrews are fully trained on RMP Mode Set 1 weather avoidance mode limitations, and establish operational procedures that enable mission accomplishment given the weather avoidance mode display discrepancies.
  2. The Air Force should complete, verify, and validate the applicable RMP aircrew and maintenance technical publications to support RMP sortie generation and mission execution.
  3. The Air Force should evaluate RMP OBTS performance through follow-on operational testing or assessment of system performance in B-2 operational units to confirm system capability meets the user-defined requirements.

Battle Control System – Fixed (BCS-F)

Executive Summary

- The Air Force is conducting developmental and operational testing on the Battle Control System – Fixed (BCS-F) Increment 3, Release 3.1 at all U.S. air defense sites.
- BCS-F Increment 3, Release 3.1 (referred to as "Increment 3.1") is intended to integrate the National Capital Region (NCR) Sentinel radars and provide air defense operators with a new tactical situational display.
- Initial operational testing is scheduled to be complete in February 2010.
- A complete assessment of Increment 3.1 performance will not be available until all testing is complete.

System

- The BCS-F is a tactical air battle management command and control system that provides the North American Aerospace Defense Command (NORAD) air defense sectors, as well as the Hawaii and Alaska regional air operation centers with common commercial off-the-shelf hardware based on an open architecture software configuration.
- BCS-F Increment 2 replaced the legacy AN/FYQ-93. The BCS-F Increment 3.1 upgrade will provide a new air defense operating system that integrates the NCR Sentinel radars and eventually will replace the NORAD Contingency Suite (NCS) at the two continental U.S. sectors. The DoD employed the NCS system following 9/11 to allow the integration of continental United States interior radar data and to meet the expanded mission requirements of Homeland Defense.
- The Increment 3.1 upgrade will transition to a Linux operating system and use the Raytheon-Solipsys Tactical Display Framework.
- BCS-F is employed by the U.S. and Canada.

Mission

- BCS-F provides NORAD and Pacific Command commanders with the capability to execute command and control and air battle management in support of air sovereignty and air defense missions for Homeland Defense.
- Air defense operators employ BCS-F to conduct surveillance, identification, and control of U.S. sovereign airspace and control air defense assets, including fighters, to intercept and identify potential air threats to U.S. airspace.

Prime Contractor

- Thales-Raytheon, Fullerton, California

Activity

- The Air Force initiated operational testing in July 2009 and plans to complete initial testing on the CONUS sites by February 2010, with follow-on testing at the Alaska and Hawaii sites to be completed in March 2010.
- The Air Force completed the validation, verification, and accreditation of the Simulation Scenario Generator (SSG). The SSG provides simulated data for radar plots and real-time operator simulated command interfaces for operational testing.
- DOT&E approved the BCS-F Increment 3.1 Test and Evaluation Master Plan (TEMP) and the Increment 3.1 Force Development Evaluation test plan for entry into initial operational testing.
- The Air Force began development for the Increment 3, Release 3.2 upgrade based on the 2003 Operational Requirements Document (ORD) and emerging warfighter needs.
- The Air Force is developing a new operational requirement document to reflect future user's requirements for an Increment 4 upgrade.

Assessment

- Collection and analysis of data is ongoing in accordance with the DOT&E-approved test plan. A complete assessment of Increment 3.1 performance will not be available until all test data has been collected and analyzed.

- The program must conduct some developmental and operational testing at the operational sites due to limitations of its test-bed, the System Support Facility (SSF), and the uniqueness of each air defense site.
- The legacy ORD does not accurately reflect current and future warfighter needs.

Recommendations

- Status of Previous Recommendations. The Air Force satisfied the FY08 recommendation of accrediting the SSG and is making progress on the remaining two FY08 recommendations.
- FY09 Recommendations. The Air Force should:
  1. Update the current ORD or accelerate development of a new operational requirement document to accurately reflect current and future user requirements.
  2. Upgrade the SSF to support more robust BCS-F developmental and operational testing capability in order to minimize the impact of overall testing on the operational sites.
  3. Submit a TEMP for the follow-on BCS-F Increment 3.2.

C-5 Avionics Modernization Program (AMP) and Reliability Enhancement and Re-engining Program (RERP)

Executive Summary

- Operational testing began October 1, 2009, in accordance with the DOT&E-approved test plan.
- The Air Force needs to present an adequately funded plan to develop C-5 Reliability Enhancement and Re-engining Program (RERP) deferred capabilities and correct identified deficiencies.

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 Avionics Modernization Program (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 Aeronautics Company, Marietta, Georgia

Activity

- C-5 RERP production software version 3.4 completed developmental flight testing in September 2008.
- DOT&E approved the C-5 fleet-wide Test and Evaluation Master Plan, mandated by the Milestone C Acquisition Decision Memorandum, in September 2009.
- The Developmental Test and Evaluation effort was completed and the first aircraft was delivered to the Air Force in February 2009 for Familiarization and Demonstration prior to IOT&E.
- The Program Offices continue to pursue parallel efforts to upgrade software and hardware for both the RERP and the AMP.
- Initial testing on the C-5 AMP identified more than 150 deficiencies. Testing of the second upgrade will address 31 deficiencies. Additional deficiency corrections will be addressed in future block upgrades. Developmental flight testing is currently scheduled for early 2010.
- A second RERP Integrated System Evaluation was completed in December 2008 over the Pacific Ocean that included seven days outside of the Continental United States.
- The C-5 RERP production software version 3.4, that incorporated maintenance fixes from the first upgrade, was installed in July 2009. As a risk reduction measure prior to IOT&E, a Pacific Ocean mission was flown to Alice Springs, Australia, that included an equator and international dateline crossing.
- Live Fire conducted production wing dry bay fire leading and trailing edge ballistic testing during FY09. The testing was not completed because of extensive fire damage to the test asset. The Program Office is currently in the process of obtaining another production wing to complete this testing by December 2009.
- The vulnerability modeling and simulation effort has been completed by the contractor, and the report has been delivered

to the Program Office. This report will be delivered to DOT&E by January 2010 and the results will be incorporated into the combined Operational and Live Fire Test Beyond Low-Rate Initial Production report.
- IOT&E began October 1, 2009, in accordance with the DOT&E-approved test plan.

Assessment
- The C-5 RERP is entering operational test with known, potentially significant deficiencies and deferred capabilities in the following areas:
  - Survivability enhancements (tests of the C-5M large aircraft infrared countermeasures and C-5M performance differences)
  - Training systems and devices
  - Auto throttles
  - Environmental control system
  - Thrust reversers
  - Built-in test system
  - Communication, navigation, and surveillance/air traffic management capabilities
  - Information assurance
- The extent of deferred capabilities and deficiencies impact on C-5 RERP operations will be evaluated during the IOT&E. The Air Force will provide mitigation plans at the scheduled interim program review in December 2009.
- Live Fire test results show that the wing leading and trailing edge fire suppression system was not effective in suppressing fires induced by all threats tested.

Recommendations
- Status of Previous Recommendations. The Air Force has made satisfactory progress on all but one of the previous recommendations.
- FY09 Recommendations.
  1. The Air Force should enhance the wing leading and trailing edge fire suppression system performance.
  2. The Air Force needs to present an adequately funded plan to develop C-5 RERP deferred capabilities and correct identified deficiencies.

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 improve 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.
- Ongoing/planned improvements include the following:
  - Core Integrated Processor 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

- The Boeing Company, Integrated Defense Systems, Long Beach, California

Activity

- The Air Mobility Command/Test and Evaluation Squadron determined that the TCAS Overlay procedure was not effective for formation flight of two or more aircraft in IMC.
- The Air Force cancelled the operational test of the FFS in August 2008 due to a software discrepancy. The Air Force Fight Test Center is working the problem and conducted further developmental testing of the FFS in April 2009. Analysis is ongoing.

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 Air Force has not certified that the FFS is ready to proceed to operational testing. Further analysis is required.

Recommendations

- Status of Previous Recommendations. The Air Force is addressing previous recommendations.
- FY09 Recommendations. None.

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

Executive Summary
- The C130 AMP Integrated Diagnostics System (IDS) and Integrated Maintenance Information System (IMIS) are not fully developed. The lack of a robust IDS and IMIS increases aircraft downtime and adversely impacts sortie generation rate. The Air Force is planning to evaluate system capability in FY10.
- A Milestone C Defense Acquisition Board (DAB) Review was held December 3, 2008, with a requirement to refine the low-rate initial production (LRIP)/production acquisition strategy and costs prior to the final Milestone C DAB.
- Developmental T&E is ongoing beyond the planned completion date of May 2009, and the Air Force Operational Test and Evaluation Center (AFOTEC) completed an update to the first Operational Assessment (OA) in November 2008. The OA update is intended to support the Milestone C DAB.
- The Air Force completed two Integrated System Evaluations to evaluate the Avionics Modernization Program (AMP) modification performance and reliability in the polar region, European airspace, and the Pacific region.

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 crew 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
- The Boeing Company, Integrated Defense Systems, Wichita, Kansas

Activity
- A Milestone C DAB Review was held December 3, 2008, with a requirement to refine the LRIP/production acquisition strategy and costs prior to final Milestone C DAB.
- The third AMP aircraft (AMP 3), based on the C-130H version 3, joined the test fleet at Edwards AFB, California, on January 24, 2009. The AMP 2 aircraft completed flight testing and arrived at Boeing San Antonio, Texas, for modification to make it production representative. The AMP 1 aircraft is out of flight test and in San Antonio, Texas, for retrofit.
- In developmental testing, the integrated test team completed approximately 91 percent of 2,800 test points. The AMP aircraft have flown with production hardware since August 2008 and have successfully completed systems-level electomagnetic compatibility testing, chemical and biological testing, and environmental testing.
- AFOTEC completed an update to the first OA in November 2008 to support the Milestone C DAB. A second OA was scheduled for September and October 2009 in

support of the In-Process Review anticipated in March 2010. However, AFOTEC has postponed the second OA until a final decision is made concerning program funding in the FY10 budget and beyond.
- The Air Force completed two Integrated System Evaluations to evaluate the AMP modification in the polar region, European airspace, and the Pacific and International Dateline region.
- Testing for the IDS and IMIS and interfaces is anticipated to begin November 2009.
- Developmental testing has been delayed and is now anticipated to be complete in FY10. The remaining developmental test events will be used to evaluate a software update that improves defensive systems, Station Keeping Equipment, and the flight management system.

Assessment

- The operational test will include a minimum of four production-representative aircraft with at least two of those being LRIP aircraft. This supports testing of the formation flight requirement.
- 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 limit the effectiveness of the C-130 AMP aircraft and crews to perform the combat delivery mission.
- The current program schedule does not appear to provide sufficient time to adequately assess the IDS and IMIS.
- The mission computer software is adversely affecting reliability and performance, but problems with the software are being addressed.

Recommendations

- Status of Previous Recommendations. The Air Force has not addressed two of the three FY08 recommendations; however, the Air Force has implemented a program to track and predict the C-130 AMP progression toward the reliability requirement for Mean Time Between Failure of 12.4 hours.
- FY09 Recommendation.
  1. The Air Force should allocate adequate time in the program schedule to test the complete IDS and IMIS prior to the start of IOT&E.

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 is not meeting user suitability requirements due to maintainability issues.
- The Air Force is correcting some IOT&E deficiencies and adding new capabilities in the Block Upgrade 7.0. The Air Force scheduled the OT&E for 2011.
- DOT&E completed the C-130J Vulnerability Assessment report.

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 that include the following:
  - 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 Aeronautics Company, Marietta, Georgia

Activity
- The Air Force Flight Test Center (AFFTC) satisfactorily completed testing on the Secure Enroute Communications Package – Intelligence in 1QFY09 and recommended its release for fleet operations.
- AFFTC completed testing on the SKE Software Enhancement formation positioning system at Little Rock AFB, Arkansas, and Edwards AFB, California, in 3QFY09 with C-130J aircraft flying in formation with legacy C-130H model aircraft. The Air Force Operational Test and Evaluation Center (AFOTEC) will conduct FOT&E on the Formation Positioning System in January 2010.
- The Air Force completed system-level OT&E of the Modular Airborne Fire Fighting System on a C-130J model aircraft. The 146th Airlift Wing at Channel Islands, California, released the system for operational use in 2QFY09.
- The Air Force is correcting some IOT&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 to encompass the Block Upgrade 7.0 and Formation Flight System testing.
- DOT&E completed the C-130J Vulnerability Assessment report. The report summarizes the results of the Air Force C-130J vulnerability reduction program.

Assessment

- The Block Upgrade 6.0 did not correct the SKE anomalies previously observed during Phase 2 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 is not effective in formation airdrop operations in Instrument Meteorological Conditions. The system cannot be evaluated to assess the full capability of the modification until AFOTEC completes FOT&E on the SKE Software Enhancement scheduled for January 2010.
- The Data Transfer and Diagnostic System is designed to replace the integrated diagnostics system interface and Portable Maintenance Aid, which contributed to not meeting suitability (maintainability) requirements in Phase 2 OT&E. The system is slated for contractor and governmental testing in 3QFY10. The assessment of limited suitability is unchanged.
- 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 radar warning receiver completed developmental and operational testing in FY08. Results from FOT&E demonstrated the ALR-56M on the C-130J was effective and suitable. The ALR-56M enhances the C-130J mission capability, but the overall partial mission capable rating documented in the Air Force Phase 2 OT&E Report is unchanged.
- Live Fire testing showed the following:
  - Dry bay fire suppression systems did not suppress threat induced fires from one of the threats tested.
  - The composite propeller blade vulnerability to threats tested is low.
  - The C-130J vulnerability to man-portable air defense systems is low.
  - The C-130J is vulnerable to hydrodynamic ram (structural loads caused by threat projectile detonation within fuel inside fuel tanks) from threat projectile impact.
  - The engine nacelle fire extinguishing system is highly effective against the threats tested.

Recommendations

- Status of Previous Recommendations. The Air Force has taken adequate action on the previous recommendations.
- FY09 Recommendations. None.

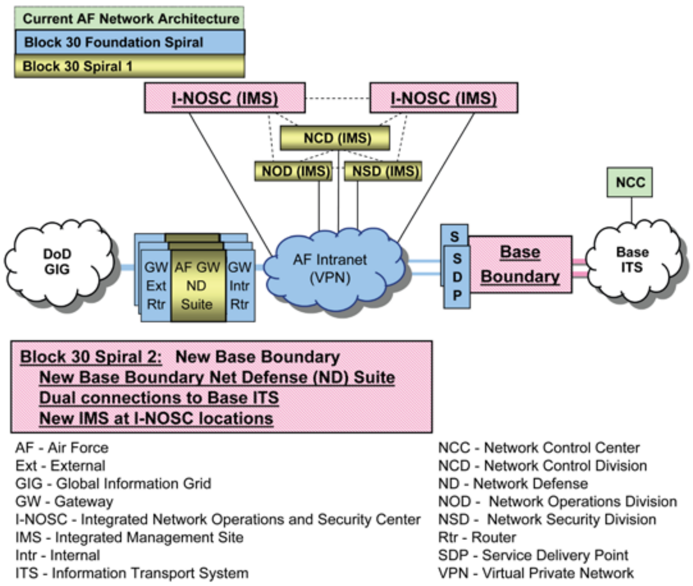
Combat Information Transport System (CITS)

Executive Summary

- The Combat Information Transport System (CITS) portfolio is a family of programs 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 also necessary to successfully implement programs performing centralized network management and defense.
- The Air Force Acquisition Executive, with concurrence from the Assistant Secretary of Defense for Networks and Information Integration, approved plans on June 6, 2009, to improve the effectiveness of the CITS acquisition. The plans divide the program into two Acquisition Category (ACAT) 1A programs (Air Force Intranet (AFNet) and Information Transport System), several ACAT III programs (including the Vulnerability Lifecycle Management System (VLMS)), and other non-acquisition elements such as simple technology upgrades.
- Although the Program Management Office originally scheduled the operational test of VLMS version 1.5 for March 2009, continuing issues with VLMS operations have postponed the start of testing several times. DOT&E approved the Air Force Operational Test and Evaluation Center (AFOTEC) VLMS Operational Utility Evaluation (OUE) plan on August 3, 2009.
- AFOTEC planned to conduct an operational test with AFNet Increment 1 in August 2009. AFNet Increment 1 remained in contractor qualification testing due to the identification of many problems. Operational testing is expected to occur no earlier than March 2010.
- To meet emerging needs, the Program Management Office and Air Force Communications Agency continue to add new programs to the CITS portfolio despite the delays in completing the existing programs.

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 portfolio is a family of programs 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 portfolio consists of three programs, with other programs in early stages of planning:
  1. Information Transport System (ITS) Increment 2 (formerly Second Generation Wireless Local Area Network). ITS Increment 2 provides COTS-based wireless capabilities to users at over 100 Air Force sites worldwide. The system 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. The Mobility Management System supports centralized network management of access points and other infrastructure components associated with ITS Increment 2.
  2. VLMS. VLMS implements DoD-mandated network security tools using a centralized Air Force enterprise-level management structure. VLMS supports centralized remediation and patching of software security vulnerabilities.
  3. AFNet Increment 1 (formerly 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. AFNet Increment 1 consists of 16 gateways worldwide, through which all traffic enters and leaves the Air Force network; it also incorporates centralized network management, monitoring, and defense-in-depth security of all network assets.



Mission

Commanders, operators, and planners will use CITS programs 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 and logical boundaries; and to support multi-level operations.

Prime Contractors

- General Dynamics Information Technology, Oklahoma City, Oklahoma
- Northrop Grumman Corporation, San Antonio, Texas

Activity

- The Air Force Acquisition Executive, with concurrence from the Assistant Secretary of Defense for Networks and Information Integration, approved plans on June 6, 2009, to restructure the CITS acquisition program into two ACAT 1A programs (AFNet and ITS), several ACAT III programs (including VLMS Spiral 1.5), and other elements as simple procurements or technology updates.
- AFOTEC is the operational test agency for CITS and will conduct an OUE for VLMS Spiral 1.5 and an OUE for AFNet Increment 1 in FY10.
- AFOTEC planned to conduct an operational test with AFNet Increment 1 in August 2009. However, contractor qualification testing identified numerous problems. Operational testing is expected to occur no earlier than March 2010.
- The 46th Test Squadron conducted a series of Qualification Test and Evaluation (QT&E) events on VLMS Spiral 1.5 in FY09 at each of the Integrated Network Operations and Security Centers. QT&E tests will continue until the system (hardware, software, processes, procedures, and personnel) meet the entrance criteria established for the AFOTEC VLMS 1.5 OUE.

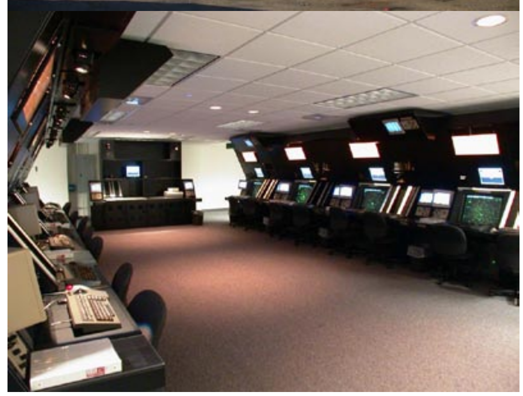
Assessment

- Significant changes in Air Force Network Operations organizational structure and personnel roles are required to implement both VLMS and AFNet Increment 1. In line with DOT&E's recommendation last year, the operational user has become very active in the development of Key System Attributes, Air Force Network Standard Operating Procedures (AFNETSOPS), and Technical Orders. However, the fielding of CITS COTS products continues to outpace the ability of the user community to develop the necessary documentation and to have the right personnel in place to operate the products.
- The Program Management Office has yet to provide the test community with an executable, integrated program schedule for each product.
- The Program Management Office and Air Force Network Integration Center (AFNIC) continue to add new programs to the CITS portfolio despite the significant delays in completing existing programs.

Recommendations

- Status of Previous Recommendations. The Program Management Office, Air Force Acquisition Executive Office, and AFNIC adequately addressed the previous recommendations.
- FY09 Recommendations.
  1. The Air Force Acquisition Office should place a priority on staffing the CITS Program Management Office with additional trained acquisition personnel to support the expanded portfolio.
  2. The CITS Program Management Office should develop master schedules for all CITS programs to facilitate critical path analysis and better test planning.
  3. The CITS Program Management Office should increase oversight of contractor qualification testing and ensure not only the hardware and software are delivered, but that the other essential fielding elements (training, personnel, operational concepts, etc.) meet the timelines to support developmental and operational testing.

DoD National Airspace System (NAS)



Executive Summary

- The Air Force conducted FOT&E to evaluate correction of previously identified DoD National Airspace System (NAS) deficiencies and system performance compared to revised requirements. Based on FOT&E results, the DoD NAS is operationally effective and suitable for current mission requirements.
- The DoD NAS is meeting expected reliability and availability rates, although the level of effort required to maintain the DoD NAS radar component does not meet Operational Requirement Document (ORD) requirements in some areas. Test results indicate that assigned maintenance personnel and resources are sufficient to support current operational requirements.
- The DoD NAS has not fully implemented all recommended DoD information assurance controls.
- Follow-on operational testing is required to assess planned system enhancements intended to address deferred or emerging operational capability requirements.

System

- The DoD NAS is a joint program with the Federal Aviation Administration (FAA) to upgrade Air Traffic Control (ATC) automation equipment and supporting radar and communications systems at designated continental United States and outside continental United States FAA and military installations.
- The DoD NAS is comprised of the DoD Advanced Automation System, Digital Airport Surveillance Radar, and Voice Communication Switching System. These systems provide modernized capabilities and improve interoperability between DoD and FAA ATC facilities.

Mission

- Military air traffic controllers use the DoD NAS to direct ATC operations in DoD-controlled airspace. Specific mission tasks include radar identification and tracking, air-to-ground voice communication, aircraft separation, and air traffic sequencing.
- DoD and FAA ATC facilities use the DoD NAS to accomplish a seamless transition of aircraft between military and FAA controlled airspace.

Prime Contractors

- Raytheon Network Centric Systems, Marlboro, Massachusetts
- Litton-Denro Inc., Gaithersburg, Maryland

Activity

- The Air Force Operational Test and Evaluation Center led a multi-Service DoD NAS FOT&E in accordance with the DOT&E-approved test plan. The FOT&E re-evaluated effectiveness and suitability shortfalls identified during the 2004 Multi-Service Operation Test and Evaluation (MOT&E) III. The FOT&E also evaluated new and revised operational requirements established in the DoD NAS ORD III, published in 2005.
- Contractor and government testing is in progress to assess additional system improvements intended to address deferred or emerging operational requirements. These system improvements include the Advanced Signal Data Processer (ASDP), the Automated Protocol Exchange (APEX) foreign nation interface system, and Mode S radar transponder capabilities.

Assessment

- The DoD NAS is operationally effective. FOT&E results verified correction of previously identified deficiencies related to traffic conflict alerts, minimum safe altitude warnings, radar clutter, information assurance controls, and weather displays. Demonstrated operational site characterization and optimization procedures are effective.

- The DoD NAS is operationally suitable. Improved system reliability and availability rates met stated operational requirements. Technical data, training, manpower, and logistics also improved and met mission requirements. The DoD NAS is meeting expected reliability and availability rates. Although the level of effort required to maintain the DoD NAS radar component does not meet ORD requirements in some areas, test results indicate that assigned maintenance personnel and resources are sufficient to support current operational requirements.
- Suitability conclusions reflect analysis of data from multiple Air Force operational sites. Data provided for Navy operating locations was not sufficient for a complete suitability evaluation. The Army did not provide NAS suitability data. The Air Force system configurations are representative of DoD-wide systems, but any Navy and Army-specific maintenance process differences are not fully reflected in FOT&E data.
- The DoD NAS has improved information assurance controls and procedures since the 2004 MOT&E III. However, FOT&E results indicate that the DoD NAS has not fully implemented 25 of 68 recommended DoD information protection and intrusion detection controls prescribed since the last DoD NAS information assurance certification. Failure to implement information assurance controls increases operational security risks.

Recommendations

- Status of Previous Recommendations. The Air Force addressed two of the three FY05 recommendations and partially addressed a third recommendation regarding additional operational testing.
- FY09 Recommendations.
  1. The Air Force should conduct follow-on operational testing to assess the ASDP, APEX, and Mode S system enhancements intended to address deferred or emerging operational capability requirements.
  2. The Services should coordinate with the FAA to review current information assurance controls and implement any required changes. The program should conduct follow-on testing to verify the effectiveness of information protection and intrusion detection improvements.

F-22A – Advanced Tactical Fighter

Executive Summary

- F-22A test efforts included developmental flight testing and operational test planning necessary to support Increment 3.1 Enhanced Global Strike FOT&E scheduled to begin in November 2010.
- F-22A Low Observables Stability Over Time testing completed the fourth year of a five-year operational test to assess the validity of the F-22A low observable Signature Assessment System tool, the durability and stability of the F-22A low observable system over time, and the low observables maintainability concept of operations.
- Results reported by the Air Force for the third year of F-22A Low Observable Stability Over Time (LOSOT) test indicate continued challenges in F-22A maintainability associated with the aircraft low observables capabilities.
- Low observables maintainability trends suggest the Air Force may experience significant challenges in meeting a number of operational suitability at maturity threshold requirements specified in the current F-22 operational requirements and capabilities production documents.

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, the AIM-9M infrared-guided missile, and the M61A1 20 mm gun.

- F-22A air-to-ground precision strike capability consists of two 1,000-pound Joint Direct Attack Munitions.
- The F-22A program delivers capability in increments. The Air Force F-22A Increment 3.1 will deliver enhanced air-to-ground mission capability to include incorporation of Small Diameter Bomb Increment One in 2011.

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 Aeronautics Company, Fort Worth, Texas

Activity

- F-22A testing was conducted in accordance with the DOT&E-approved Test and Evaluation Master Plan.
- F-22A test efforts in FY09 included developmental flight testing and operational test planning necessary to support Increment 3.1 Enhanced Global Strike FOT&E scheduled to begin in November 2010.
- The Air Force Air Combat Command (ACC) concluded the fourth year of the five-year test and reported on findings from the third year of testing. This evaluation is an ongoing five-year Force Development Evaluation assessing the validity of the F-22A low observable Signature Assessment System (SAS), durability and stability of the F-22A low observable system over time, and the low observables maintainability concept of operations. ACC conducted testing under the provisions of the DOT&E-approved test plan.

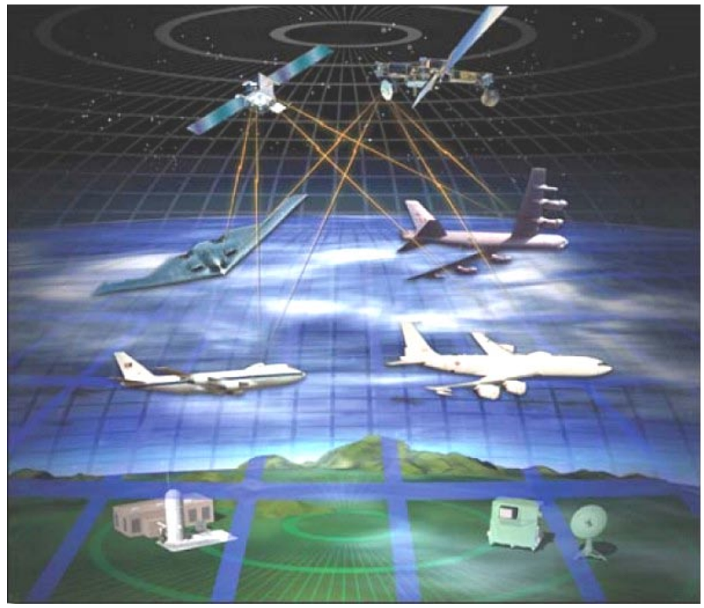
Assessment

- The program is progressing to meet planned Increment 3.1 FOT&E scheduled for November 2010 through May 2011.
- In FY07 DOT&E assessed that inspection and repair of low observables had a considerable impact on F-22A maintainability. FY07 test results demonstrated that maintaining the low observable signature required a significant level of F-22A maintenance effort. These FY07 test results further indicated that restoration of the low observable signature required long durations to cure materials often resulting in extended periods of time during which aircraft are not available for operational missions.
- Though a complete assessment of trends will not be realized until the entire body of LOSOT test data is collected and analyzed, ACC reporting of third year interim findings indicate ongoing challenges in F-22A low observables maintainability. ACC interim findings noted:
  - The F-22A SAS appears to be adequate for low observables maintenance documentation. However, SAS accuracy is dependent upon the expertise and accuracy of individual maintenance personnel in documenting signature discrepancies and inputting data into the automated system.
  - The current SAS software and hardware should be upgraded to speed data entry procedures and decrease system processing time to increase productivity.
  - Maintaining SAS data integrity requires regular audits and database checks performed by experienced low observables maintenance personnel.
  - Continuation training for low observables maintenance personnel is required for the proper documentation of aircraft damage discrepancies, recognition of differences between similar types of low observables damages, and identification of correct logistical control numbers when using SAS.
  - LOSOT testing should be continued after completion of the current five year test in FOT&E to include F-22A Block 30 aircraft.
- DOT&E agrees with the ACC FY09 F-22A LOSOT interim findings. The findings are consistent with F-22 operational fleet trends and DOT&E FY07 observations. Low observables maintainability is an ongoing challenge and continues to account for a significant proportion of the man hours per flight hour required to maintain the F-22. This impacts both aircraft operational availability and mission capable rates.
- The F-22A will reach 100,000 fleet flight hour system maturity in the 2010 to 2011 time period. Given the maintainability metrics achieved in operational testing to date, the Air Force may experience significant challenges in meeting a number of at maturity operational suitability thresholds specified in the current F-22 operational requirements and capabilities production documents.

Recommendations

- Status of Previous Recommendations. The Air Force continues to address all previous recommendations.
- FY09 Recommendation.
  1. The Air Force should plan to conduct further follow-on test and evaluation of F-22A low observables capabilities after the completion of the current five-year LOSOT test to continue to assess the validity of the F-22A low observable SAS, durability and stability of the F-22A low observable system over time, and to assess the low observables maintainability concept of operations.

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



Executive Summary

- The Air Force Operational Test and Evaluation Center (AFOTEC) conducted an Operational Assessment (OA-1) of the Family of Advanced Beyond Line-of-Sight Terminals (FAB-T) during contractor testing. The OA examined an engineering development model (EDM) terminal operating in the contractor's System Integration Laboratory (SIL). Due to software and integration issues, the assessment was limited to a demonstration that the FAB-T EDM could successfully log on to an operational Military Strategic, Tactical, and Relay (Milstar) satellite.
- AFOTEC conducted a second Operational Assessment (OA-2) in the 4QFY09. Developmental flight tests aboard the testbed aircraft in advance of OA-2 have shown the EDM terminal to be capable of over-the-air communication with other FAB-T terminals through the Milstar satellite.

System

- FAB-T is an evolutionary acquisition program intended to provide a family of beyond line-of-sight satellite communications (SATCOM) and line-of-sight terminals.
- FAB-T consists of ground and aircraft qualified terminals with the capability to move large amounts of information to and from ground installations and airborne platforms.
- Depending on the terminal configuration, capabilities may include transmission and reception of voice, data, imagery, and video as well as broadcast reception over protected and wideband satellites and line-of-sight systems.
- The FAB-T Program Office will develop Increment 1 terminals capable of providing air and ground communications using the Extremely High Frequency (EHF) and Advanced Extremely High Frequency (AEHF) waveforms. Increment 1 Airborne Wideband Terminals are planned for the B-2, B-52, and RC-135 aircraft. The Command Post Terminal (CPT) will upgrade the existing fixed and transportable terminals employed with the ground and airborne (E-4 and E-6B) command posts.
- The FAB-T program plans multiple hardware and software releases (referred to as 'Blocks') within Increment 1. Block 6 terminals will be Low Data Rate capable and backward compatible with the legacy Milstar satellites. Block 6 terminals are developmental terminals and will not be fielded. The plan is to field Increment 1 terminals in a Block 8 configuration that will be fully capable of operating with the AEHF satellites in addition to being backward compatible with Milstar.
- Future capabilities of FAB-T include interoperability with Ultra High Frequency Follow on – Enhanced/EHF Enhanced and Enhanced Polar System satellites.

Mission

The entire chain of command including the President, the Secretary of Defense, Combatant Commanders, and support component forces will use FAB-T for worldwide, secure, survivable transmission and reception of voice, data, imagery, and video as well as broadcast reception over protected and wideband SATCOM systems to support the full range of military operations including nuclear warfare and all aspects of conventional warfare.

Prime Contractor

- The Boeing Company, Command, Control & Communication Networks, Huntington Beach, California

Activity

- AFOTEC conducted OA-1 September through November 2008 to inform the National Security Space Acquisition Policy 03-01 Key Decision Point C. AFOTEC conducted the assessment in conjunction with contractor functional qualification testing.

- AFOTEC conducted OA-2 in 4QFY09 to inform the Advanced Wideband Terminal Low-Rate Initial Production (LRIP) decision scheduled for 2QFY10.
- AFOTEC is planning OA-3 for mid-FY11 to inform the CPT LRIP decision scheduled for 4QFY11. AFOTEC will conduct an IOT&E in FY12 to inform the FAB-T Increment 1 full-rate production decision scheduled for 1QFY13.
- Reliability growth testing commenced in August 2009, at a sub-contractor SIL. The program manager will use environmental chambers to replicate the stresses the terminal will experience in an operational aircraft environment.
- The integrated test team is updating the Test and Evaluation Master Plan to provide greater detail on future test events in preparation for the Advanced Wideband Terminal LRIP decision; to strengthen the testing in the threat environment; and to incorporate the plan for reliability growth testing.

Assessment

- AFOTEC was unable to assess progress towards operational effectiveness or operational suitability through OA-1. Contractor SIL tests showed the Block 6 EDM terminal is capable of logging onto an on-orbit Milstar satellite; however, other software and system integration issues precluded completion of the planned OA activities in the time allocated.
- The developmental flight tests aboard the test bed aircraft in advance of OA-2 have shown the Block 6 EDM terminal to be capable of over-the-air communication with other FAB-T terminals through the Milstar satellite.
- The schedule for the delivery of the FAB-T CPT does not support the Air Force need for command and control of AEHF. The Massachusetts Institute of Technology Lincoln Laboratory is developing an interim terminal to command and control AEHF until FAB-T CPTs are ready.
- The program is schedule driven; leading to an aggressive test schedule, with little reserve for correction of any significant deficiencies discovered during integration tests.
- The program manager reduced reliability growth testing to keep the development schedule on track. The re-planned reliability growth testing is insufficient to develop confidence in the results. The reliability growth program plan for post-LRIP has not been defined and may result in supportability risks to the program.

Recommendations

- Status of Previous Recommendations. This is the first annual report for the program.
- FY09 Recommendations. The Air Force should:
  1. Ensure sufficient resources and test events are planned in order to realistically stress the system under conditions that replicate actual combat to the maximum extent feasible.
  2. Include FAB-T terminals in AEHF system tests as early as possible in order to identify any potential design deficiencies and to demonstrate interoperability with both satellite and ground systems.
  3. Develop and implement a comprehensive reliability growth plan to ensure the FAB-T terminal meets the mission needs for high availability with affordable costs.

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

Executive Summary

- Significant delays to all Global Hawk blocks occurred in FY09. Slow test progress, low air vehicle reliability, growing concurrency of production acceptance testing and developmental flight testing, and a serious incident during flight test all contributed to very little progress.
- The Air Force declared a schedule breach for Block 20/30 IOT&E, Block 40 IOT&E, and the full-rate production readiness review in February 2009. Though the Service intended to resolve issues by April, a new program schedule was not available by the end of the fiscal year.
- The IOT&E for Block 20 and Block 30 systems will not occur before early FY11, a three year total delay from the baseline developed during the 2006 re-plan. IOT&E will not be complete until after nearly all of these systems have been procured. The Block 40 system IOT&E delay is at least two years, extending into FY13, despite deferral of two of four sensor operations.
- OSD and the Joint Staff added requirements to the Global Hawk program by requiring the integration of the Battlefield Airborne Communications Node on Block 20 systems, a new requirement created through the joint urgent operational needs process.

System

- Global Hawk is a long-range surveillance and reconnaissance system.
- The Global Hawk system includes:
  - An Unmanned Aerial Vehicle 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 including 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 to directly support a ground unit.

Prime Contractor

- Northrop Grumman, Unmanned Systems Division, Rancho Bernardo, California

Activity

Block 20

- The Combined Test Force accomplished 40 percent of the test point goal planned in the developmental test and evaluation of the Block 20 imagery intelligence capability with the Enhanced Integrated Sensor Suite payload. In February 2009, the Service Acquisition Executive declared that the program baseline schedule threshold dates for the Block 20 IOT&E could not be met. Primary causes were:
  - Low air vehicle reliability, approximately 15 percent of the contracted value for mean time between critical failure
  - Concurrent production acceptance flight test needs exceeded the Combined Test Force capacity
- The Air Force completed comprehensive reviews of the size and efficiency of both developmental and production acceptance testing. The test force implemented specific efficiencies and reduced content of the test plans.
- In May 2009, one Block 20 system experienced a serious spoiler actuator and software malfunction requiring an emergency landing, which eventually disabled the aircraft. Service authorities suspended all Block 20 and Block 30 flight test operations until a safety investigation could be complete. Following the investigation, in accordance with the Air Force's approved return-to-flight plan, the Combined Test Force began testing a replacement spoiler actuator in mid-September. The Service resumed the developmental flight test program in October 2009.
- In response to a recent joint urgent operational need statement, the Air Force identified two Block 20 air vehicles for integration of the Battlefield Airborne Communications Node. The Service intends to begin testing in spring of 2010.

Block 30

- A Block 30 system equipped with the Airborne Signals Intelligence Payload (ASIP) was able to progress through approximately 30 percent of Global Hawk developmental flight test plans before the May 2009 spoiler incident suspended flight test operations. The test team completed signals intelligence sensor calibration and most of the engineering evaluation flights for the sensor; however, only one short duration mission (less than 12 hours) was completed in the multi-intelligence environment (both signals and imagery intelligence sensors operating).
- Developmental and operational testing of the ASIP sensor on the U-2 aircraft continued supporting fielding of three developmental units by the Air Force.

Block 40

- Using the Proteus surrogate flight test bed, the Multi-Platform Radar Technology Insertion Program (MP-RTIP) completed the Radar System Level Performance Verification test phase for two "core" modes: Synthetic Aperture Radar (SAR) imagery and Ground Moving Target Indicator (GMTI) tracking. Only limited testing of the two other required modes (concurrent SAR/GMTI and high-range resolution) occurred after the Joint Staff and the Defense Acquisition Executive encouraged the Air Force to consider deferral. These modes have not completed contractor development.
- Since the Joint Staff's Joint Capabilities Board recommended prioritization of core modes in FY08, there has been no formal relief of the requirement for all modes and no plan for completing the modes at a later date.
- The program is orchestrating mode prioritization to avoid production of Block 40 systems without any capability. The Service has procured three of 15 systems.
- The Air Force's strategy was to complete verification of all sensor modes on the surrogate test bed by August 2008, enabling Block 40 developmental flight test to begin in early 2009. Delays due to the sensor calibration issue reported last year and working off system deficiencies in surrogate flight test, including dealing with poor system stability, resulted in no Block 40 flight testing occurring in FY09.

Assessment

Block 20

- Test progress has been extremely slow due to poor system performance and production acceptance activities becoming concurrent with a high test tempo. Combined with the suspension of operations for four months due to the accident, this results in a minimum of an 18-month slip to the previously approved threshold IOT&E timeframe (from late FY09 to early FY11). Service plans to temporarily move portions of production acceptance testing to the training unit at Beale AFB, California, will reduce the load on the Combined Test Force but will only marginally improve the pace of developmental flight testing. The Service staffed and resourced the Combined Test Force to conduct testing of each block in sequence, without the significant additional effort required to concurrently complete production acceptance testing. Given the reality of concurrent tasks on the test force today, contemporary efforts to obtain additional trained personnel and ground elements that would be needed to dramatically improve test productivity for Block 20 and Block 30 systems are late and are not likely to have the desired affect soon.
- As concluded by the Air Force, it is ill-advised to further reduce the content of developmental testing in order to recover schedule. To verify the required system capability and prepare for a mission level operational evaluation before fielding, the Service should complete the planned testing.
- Air vehicle reliability is the most significant operational deficiency for all Global Hawk systems (all blocks and payloads) as long as high endurance mission capability (28 hours) is desirable. The remaining developmental testing should provide data to confirm fixes already identified by the program and determine the potential for improvement. Additional investment may be required.

- Low reliability of Global Hawk demonstrated to date in developmental flight testing would make early operational fielding problematic.

Block 30

- Developmental flight test of Block 30 aircraft equipped with the ASIP sensor and the Enhanced Integrated Sensor Suite is also significantly behind schedule. Block 30 multi-intelligence IOT&E, which will be concurrent with the Block 20 IOT&E, will also experience a minimum of an 18-month slip. These concurrent evaluations will not be complete before the next planned Global Hawk Block 30 system production decision in 2QFY10.
- Integrated testing conducted so far indicates the ASIP sensor meets most specification thresholds, but the testing is very limited in some signal types and sample size. Full understanding of the multi-intelligence operational capability of Global Hawk Block 30 is not yet available.
- Testing of the ASIP sensor on the U-2 aircraft enhanced the development of the sensor for Global Hawk by generating software improvements that increased geo-location accuracy for both platforms.

Block 40

- Even though core modes recently completed verification testing on the surrogate test bed, developmental flight test of the Block 40 system will progress slowly until Block 20/30 IOT&E, and Block 20 Battlefield Airborne Communications Node flight test near completion in late FY10. The combined effect of the calibration design failure reported last year, resolution of discoveries during surrogate flight test, and work to determine root causes of poor system software stability will slip operational testing of Block 40 systems until FY13 – a 30-month delay. The potential exists that the contractor will deliver up to eight of the 15 planned Block 40 systems before a Block 40 system is ready for an operational evaluation. The program continues to re-plan Block 40 developmental flight test and has not determined final content.
- It is possible that prioritization of MP-RTIP "core modes" (i.e. SAR and GMTI) may enable the use of incremental development and test strategies culminating in the development and testing of all required modes. However, it continues to be unclear whether or not the Block 40 core mode-only system can accomplish required battle management missions. Additional investment is also needed in ground system development and manpower to complete the Service command nodes used to exploit Block 40 collections.
- Air Force Operational Test and Evaluation Center (AFOTEC) updated the operational assessment of the MP-RTIP sensor SAR and GMTI modes on the surrogate test bed and reported the results in August 2009. The AFOTEC results indicated the following:
  - The sensor is likely to meet requirements by IOT&E for SAR imagery quality and capability to generate GMTI tracks.
  - Poor stability of the software that controls sensor functions will create a significant adverse impact on mission performance.

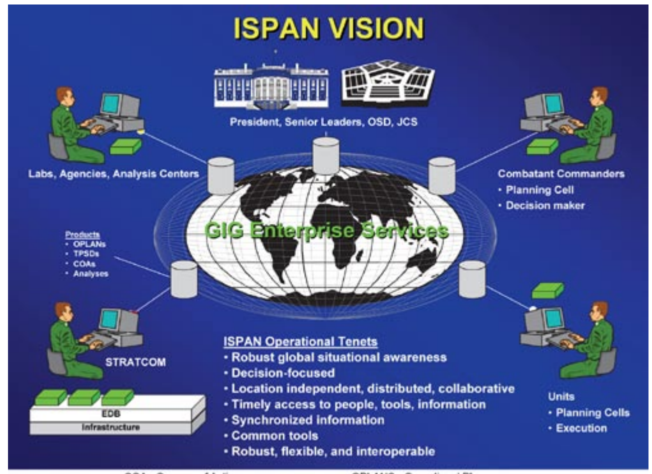
Recommendations

- Status of Previous Recommendations. The Air Force made progress on six of the 15 recommendations from previous annual reports. The remaining previous recommendations are valid and deserve resolution.
- FY09 Recommendations. The program should address the following:
  1. As developmental testing continues in FY10, program management should place special emphasis on measuring reliability, availability, and maintainability of all Global Hawk systems in an operationally realistic manner.
  2. Develop and fund a reliability growth plan specific to each block, the ASIP sensor, and the MP-RTIP sensor.
  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. Achieve stability goals for the Block 40 sensor software and track progress towards maintaining suitable sensor stability through the remaining flight test.
  5. Complete the Block 20 imagery intelligence and Block 30 multi-intelligence developmental flight testing as planned and resolve the readiness to test issues identified by AFOTEC in the operational assessments.
  6. Resolve the plan for the remaining Block 40 sensor modes and mission capability (retain battle management, or delete it). Update and validate requirements and acquisition documentation so that adequate test planning and resourcing is possible.
  7. Complete and submit for DOT&E approval: a) Global Hawk Block 40 Test and Evaluation Master Plan (TEMP), b) ASIP Capstone TEMP and Global Hawk Annex, c) MP-RTIP Capstone TEMP and Global Hawk Annex.

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) 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 (OA) were resolved. A number of Information Assurance (IA) vulnerabilities were found during the OT. DOT&E recommended that the IA vulnerabilities be corrected or mitigated to the satisfaction of the Designated Accrediting Authority (DAA) prior to fielding. The DAA reviewed the program manager-provided mitigation plan and issued an Authority to Operate in January 2009. The Assistant Secretary of Defense for Networks and Information Integration granted a full deployment decision in April 2009.



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

System

- ISPAN is an operational planning and analysis network modernization program for USSTRATCOM. 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 Global Adaptive Planning Collaborative Integration Environment (GAP CIE).
- 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.
- GAP CIE provides a web-enabled, net-centric collaborative environment for a contingency and crisis action planning system at the Combatant Commander (COCOM) and strategic level. The capability will allow users from multiple COCOM staffs, subordinate commands, as well as other agencies, to collaborate online while providing planning and analyses to senior decision-makers. Block 1 achieved Initial Operational Capability in January 2009. Increment 2 will provide additional capabilities in two spiral releases.

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 crisis action planning scenarios and time critical decisions regarding force employment.

Prime Contractors

- Lockheed Martin, Papillion, Nebraska
- BAE Systems, Bellevue, Nebraska
- Northrop Grumman, Bellevue, Nebraska
- Science Applications International Corporation, San Diego, California

Activity

- USSTRATCOM and AFOTEC conducted an ISPAN Block 1 OT, which included the GAP CIE and MPAS, September 3-25, 2008, at USSTRATCOM, Offutt AFB, Nebraska, and the Combined Air Operations Center, Barksdale AFB, Louisiana.
- At the time of the OT, the ISPAN Block 1 Capabilities Production Document (CPD) was in final Joint Requirements Oversight Council (JROC) staffing. DOT&E recommended AFOTEC conduct the OT, as planned, to capitalize on a

scheduled STRATCOM exercise and avoid a potentially lengthy program delay.
- The JROC approved the ISPAN Block 1 CPD in January 2009. DOT&E concluded that the Block 1 OT was sufficient to satisfy the IOT&E requirement based upon a review of the approved CPD.
- The Commander, Joint Functional Component Command for Global Strike, declared the ISPAN Block 1 Initial Operational Capability in January 2009.
- ASD NII granted a full deployment decision in April 2009.

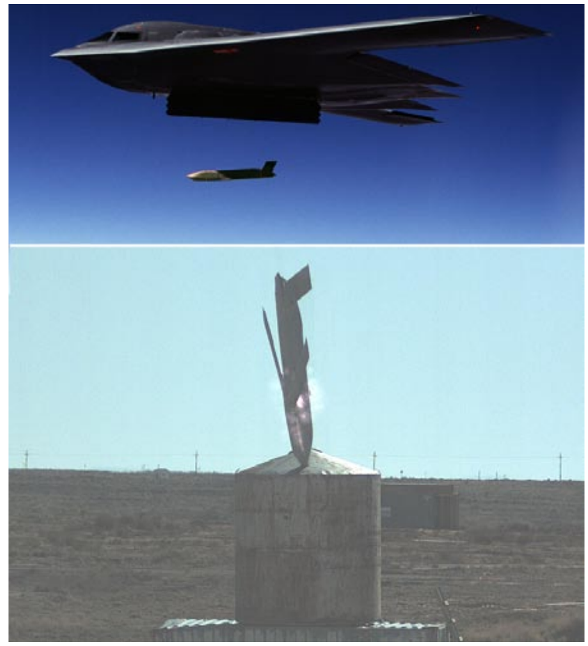
Assessment

DOT&E confirmed that the problems found during the ISPAN Spiral 3 OA were adequately addressed in ISPAN Block 1 OT. The system matured significantly following the OA and users were able to fully accomplish their mission objectives. Operational testing uncovered a number of potentially significant IA vulnerabilities. DOT&E recommended that the IA vulnerabilities be corrected or mitigated to the satisfaction of the DAA prior to fielding. The DAA reviewed the mitigation plan and issued an interim authority to operate in February 2009.

Recommendations

- Status of Previous Recommendations. USSTRATCOM and the Program Office have effectively addressed previous recommendations.
- FY09 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 Lot 5 production missiles. Six of 10 missile firings were successful.
- The Air Force executed one Joint Air-to-Surface Standoff Missile (JASSM)-Extended Range (ER) live fire shot on August 18, 2009. The weapon employment was at a nominal JASSM-ER range; the missile accurately pinpointed and subsequently destroyed the target.
- After incorporation of fixes on Lot 5 missiles, the Air Force executed a production Reliability Acceptance Program on 17 Lot 7 missiles, 15 of which were successful. The Lot 8 production contract hinges on a successful Lot 7 test.
- The Air Force should renew the pursuit of the Electronic Safe and Arm Fuze (ESAF), ensuring the availability of a second fuzing option.

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 ESAF is intended to be a more reliable fuze with the same capabilities as the baseline fuze. Continued development is unfunded.
- 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 Anti-Surface Warfare (ASuW) adds the capability to attack maritime targets using two way data-link for in-flight retargeting. Requirements development is ongoing. This effort is unfunded.

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 pre-launch retargeting 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 ASuW should have added flexibility and greater retargeting capabilities in executing JASSM missions.

Prime Contractor

- Lockheed Martin, Missile and Fire Control, Orlando, Florida

Activity

JASSM Baseline

- As a by-product of the Nunn-McCurdy certification, the Air Force continued screening previous system and test information to identify deficiencies affecting reliability. The program adopted the OSD Systems Engineering Plan and DOT&E Test and Evaluation Master Plan (TEMP) strategies to stress production missiles in captive carry environments and ground tests in order to identify failure modes.

- The Air Force implemented corrections in Lot 5 missiles; however, the results from flight testing did not meet requirements, with only six of 10 successful missile firings, and a 0.60 reliability point estimate.
- Due to the less than satisfactory results in Lot 5 testing, OSD mandated a 16-shot Lot 7 reliability acceptance test late in FY09, a necessary condition for the Lot 8 production contract award. Fifteen of 17 missile test launches were successful. One missile failed to detonate and another was not released due to a malfunction within the launch B-1 aircraft.

JASSM ESAF

- The Air Force executed an instrumented sled test on February 18, 2009, to gather data on the fuze structural environment. The Air Force halted the program to re-assess ESAF requirements and program strategy.

JASSM-ER

- The Air Force executed one JASSM-ER live fire shot on August 18, 2009, in accordance with the DOT&E-approved JASSM-ER TEMP; the missile accurately pinpointed and subsequently destroyed the target at a nominal JASSM-ER range.

Assessment

- Despite improvements in workmanship and production processes, Lot 5 testing resulted in a 0.60 reliability point estimate, well below the 0.80 requirement. After further missile modifications, the Lot 7 testing resulted in 15 of 17 missiles successfully employed; one missile failure resulting in a 0.94 missile reliability (80 percent confidence level) and one mission failure for an overall mission reliability of 0.88.
- DOT&E is concerned with the Air Force's decision to halt the ESAF program. The ESAF program will replace the current electromechanical fuze, which relies on moving parts prone to reliability issues. Four of the 26 missiles launched in FY09 experienced fuze reliability issues indicating the need for a more reliable fuze.
- The August 18, 2009, JASSM-ER shot indicates that the JASSM-ER is meeting early requirements. However, more test flights are necessary to adequately characterize system performance.

Recommendations

- Status of Previous Recommendations. The Air Force is addressing the two FY08 recommendations on reliability and program management.
- FY09 Recommendations. The Air Force should:
  1. Continue to characterize the reliability of baseline missile production lots, incorporating reliability and program management improvements.
  2. Renew the pursuit of the ESAF, ensuring the availability of a second fuzing option, pursuing technological advancement in fuzing, and increasing reliability in the JASSM program.

Large Aircraft Infrared Countermeasures (LAIRCM)

Executive Summary

- The Large Aircraft Infrared Countermeasures (LAIRCM) Phase I system is fielded and is operationally effective and suitable and enhances aircraft survivability.
- The new Air Force Acquisition Strategy for the Guardian Laser Turret Assembly (GLTA) eliminated the Air Force's milestone decisions for the GLTA upgrade, allowing entry into full production without milestone decision points.
- The revised Air Force acquisition strategy will exceed 20 percent of the total planned procurement quantities before the Air Force conducts the LAIRCM Phase II IOT&E in 4QFY10. This strategy accepts risk in reliability, availability, and maintainability since these have not been proven with the current design.
- DOT&E concurs with the Air Force Operational Test and Evaluation Center's (AFOTEC) Operational Assessment (OA) report that the Next Generation Missile Warning System (NexGen MWS) demonstrated capabilities are adequate to support making a low-rate initial production (LRIP) decision.

System

The LAIRCM system is a defensive system for large transport and rotary wing aircraft that combines a Missile Warning System (MWS) and infrared laser jammer countermeasure systems.

- LAIRCM Phase I is fielded.
  - Key components include the AAR-54 ultraviolet MWS, countermeasures processor, and Small Laser Transmitter Assembly (SLTA) infrared laser jammer.
  - Platforms with LAIRCM Phase I include C-5, C-17, C-37, C-40, C-130H, MC-130W, and CV-22.
- LAIRCM Phase II is a spiral upgrade designed to provide higher performance warning compared to the Phase I MWS and improved reliability in the jammer subsystem.
  - The new two-color infrared MWS is called the NexGen MWS.

  - The new jammer is the GLTA.
  - The GLTA has already been installed and integration testing has been completed on the C-17, C-40, AC-130H, and C-5 aircraft.
  - The Air Force plans to integrate the GLTA on AC-130U, MC-130H, EC-130J, CV-22, and C-130J aircraft.

Mission

Combatant Commanders use LAIRCM to provide automatic protection for large transport or rotary wing aircraft against shoulder-fired, vehicle-launched, and other infrared guided missiles. Commanders will use such protection during normal take-off and landing, assault landings, tactical descents, air drops, low-level flight, and aerial refueling.

Prime Contractor

- Northrop Grumman, Electronic Systems, Defensive Systems Division, Rolling Meadows, Illinois

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 FY09.

LAIRCM Phase II

- LAIRCM Phase II has completed the System Development and Demonstration phase.
- The Air Force selected Northrop Grumman to provide the NexGen two-color infrared MWS and awarded a LRIP contract in 1QFY09.
- The Air Force completed additional integration testing of LAIRCM Phase II on the C-40 in April 2009 to verify correction of previously found deficiencies.
- The Air Force is planning to complete the developmental testing of LAIRCM Phase II on the C-17 in 1QFY10.
- AFOTEC is planning to conduct the IOT&E of LAIRCM Phase II in 4QFY10.
- The Air Force also completed flight testing of the new block-cycle update Operational Flight Program 14 software to

be used by all platforms with either the Phase I or the Phase II system.

- The LAIRCM Program Office is implementing several hardware and software changes designed to improve the reliability of the laser and both the SLTA and GLTA. These changes are intended to support the current operational tempo of transport aircraft with LAIRCM and to reduce depot maintenance demands.
- The new Air Force Acquisition Strategy for GLTA eliminated the Air Force's milestone decisions for the GLTA upgrade, allowing entry into full production without milestone decision points.
- The Air Force conducted LAIRCM developmental and integration testing in FY09 in accordance with the current DOT&E-approved TEMP.

Assessment

LAIRCM Phase I

- The 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.

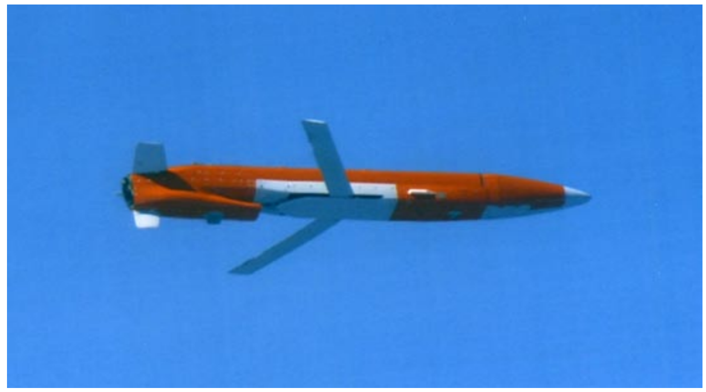
LAIRCM Phase II

- DOT&E concurs with the AFOTEC OA report that the NexGen MWS demonstrated capabilities are adequate to support making a LRIP decision.
- The LAIRCM Reliability Integrated Product Team (R-IPT) has made significant progress in assimilating reliability and maintainability data from all LAIRCM platforms worldwide. The R-IPT produces detailed monthly reliability, maintainability, and failure rate metrics in order to guide funding for product upgrades.
- The revised Air Force acquisition strategy will exceed 20 percent of the total planned procurement quantities before the Air Force conducts the LAIRCM Phase II IOT&E in 4QFY10. This strategy accepts risk in reliability, availability, and maintainability since these have not been proven with the current design. In order to mitigate this risk, the program will provision for a Reliability Improvement Program and document the details of the reliability plan in a Test and Evaluation Master Plan (TEMP) update.
- The LAIRCM Program Office has not updated the January 2007 DOT&E-approved TEMP to reflect the program's revised Acquisition Strategy.

Recommendations

- Status of Previous Recommendations. The Air Force addressed one of the three previous recommendations.
- FY09 Recommendation.
  1. The Air Force should provide a revised TEMP that incorporates changes to the LAIRCM Acquisition Strategy, details a Reliability Improvement Program, and defines the effectiveness and suitability testing to support the 4QFY10 LAIRCM Phase II IOT&E.

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



Executive Summary

- The Air Force Operational Test and Evaluation Center (AFOTEC) began a Miniature Air Launched Decoy (MALD) IOT&E in July 2009 to support a full-rate production decision in FY11.
- MALD-Jammer (J) continued Technology Development of the jammer payload in FY09.
- A MALD-J Capability Development Document (CDD) and Test and Evaluation Master Plan (TEMP) will be required to support a Milestone B decision in FY10.

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 an early warning or acquisition radar's ability to establish a track on strike aircraft while maintaining the ability to fulfill the MALD decoy mission.
- The Air Force plans to procure the second lot (150 of 1,500) production MALD in FY09 to support Initial Operational Capability in 2011.
- The F-16 C/D and B-52 are the lead aircraft to employ MALD and MALD-J.

Mission

- Combatant Commanders will 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 battlespace 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 enemy early warning and acquisition radar detection of friendly aircraft or munitions.

Prime Contractors

- Raytheon Missile Systems, Tucson, Arizona
- Raytheon Space and Airborne Systems, El Segundo, California
- Raytheon Electronic Warfare Systems, Goleta, California

Activity

MALD

- The Air Force completed the MALD mission planning concept of employment for both the F-16 and B-52.
- DOT&E approved the AFOTEC MALD operational test concept in February 2009 and MALD operational test plan in April 2009.
- AFOTEC began MALD IOT&E in June 2009. Testing included evaluation of navigation accuracy in a denied-GPS environment using hardware-in-the-loop tests at the Guided Weapons Evaluation Facility at Eglin AFB, Florida; reliability and performance flight tests conducted at Eglin AFB over water ranges and at the Nevada Test and Training Range (NTTR); and a modeling and simulation assessment of MALD in a complex, multiple threat environment at the Simulation and Analysis Facility at Wright-Patterson AFB, Ohio.
- The Air Force began a MALD reliability assessment program in FY09 that will randomly select MALD vehicles from Lot 1 to fly test missions in order to confirm reliability and availability.

MALD-J

- MALD-J continued Technology Development of the jammer payload with associated jammer mission updates to the Joint Mission Planning Software to support a Milestone B decision in FY10.
- MALD-J technology development included system interoperability tests in the Joint Preflight Integration of Munitions and Electronic Systems anechoic chamber at Eglin AFB; ground pole tests at China Lake Echo Range, California, to characterize effects of two MALD-Js operating

in close proximity; and captive carry flight tests using a Saberliner at Eglin AFB and NTTR for payload development.
- The Air Force drafted a MALD-J CDD and MALD-J Milestone B TEMP anticipating completion of both documents in FY10.

Assessment
- The Air Force's primary open-air electronic warfare range, the NTTR, is extremely limited in overland flight profiles available for MALD and MALD-J, and does not authorize simultaneous flights of more than two MALD or MALD-J vehicles. These limitations challenge the Air Force's ability to adequately assess MALD and MALD-J in a realistic open-air mission environment and will require greater use of modeling and simulation to characterize the impact on the protected forces.
- MALD testing and performance are progressing. Air Force development of modeling and simulation is also progressing with an AFOTEC modeling and simulation plan to assess MALD in a many-on-many (multiple decoy versus multiple threat system) scenario as part of the IOT&E.
- MALD-J modeling and simulation will require more complex threat system models than MALD to enable jammer effectiveness modeling and support many-on-many simulation in the jamming environment.
- Modeling and simulation will require a proactive and disciplined verification, validation, and accreditation process for both MALD and MALD-J.
- The draft MALD-J CDD states the reason for developing an unmanned stand-in jammer is to protect friendly combat air forces by gaining battlespace access. In support of this purpose, the Air Force has made significant progress in developing measures to characterize the MALD-J impact on the protected force.
- 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 concept of operations and employment for integrated MALD and MALD-J operations to ensure mission planning for both systems can be coordinated with the mission planning of the protected forces. This clear concept of operations and employment must also address battlespace compatibility between MALD and MALD-J and the protected forces.

Recommendations
- Status of Previous Recommendations. The Air Force satisfactorily addressed one of the three FY08 recommendations. The remaining two recommendations are being adequately managed.
- FY09 Recommendations. The Air Force should:
  1. Develop an integrated MALD and MALD-J concept of operations and concept of employment for mission planning that clearly describes how both weapon systems will be synchronized with the protected forces. Both products should address battlespace compatibility.
  2. Continue to develop a Key Performance Parameter or Key System Attribute to characterize the MALD-J's effect on the protected forces.
  3. Increase test priority by increasing the Air Force Precedence Code for MALD-J (currently 2-06) to support the joint requirement to provide stand-in jamming capability by the end of FY12.

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

Executive Summary

- The Air Force completed operational testing of the F-16 version 4.2+ Mission Planning Environment (MPE) (Increment III lead host platform), the F-15 MPE version 2.0, the RC-135 MPE version 2.0, and the F-16 MPE version 4.3+. Each of the MPEs featured tailored planning capabilities for their respective host platforms and their precision-guided weapons.
- DOT&E issued a Beyond Low-Rate Initial Production (BLRIP) Report on the F-16 version 4.2+ MPE stating that it was operationally effective but not operationally suitable.
- Definition of the test strategy for Air Force Mission Planning System (MPS) Increment IV is ongoing. Increment IV will feature new or updated MPEs for 15 separate Air Force host platforms. DOT&E is focusing the operational test effort to evaluate the impact of the Increment IV MPEs on the end-to-end mission for the Air Force and the host platform.
- The Air Force is leading Service efforts to develop the new common core Joint Mission Planning System (JMPS) 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 MPEs.

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.
- An 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 is added for the specific aircraft type (e.g., F-15E). Other Common Components 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 conduct detailed mission planning to support the full spectrum of missions ranging from simple training to complex combat scenarios. Aircrews 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, San Diego, California

Activity

Increment III

- The Air Combat Command's 28th Test and Evaluation Squadron completed the operational test of the F-15 MPE version 2.0 in March 2009.
- Air Force Operational Test and Evaluation Center (AFOTEC) completed the operational test of the Air Force MPS Increment III RC-135 MPE version 2.0 in May 2009, and published their IOT&E report on August 19, 2009.
- The Detachment 2, AFOTEC completed the operational test of the Air Force MPS Increment III F-16 MPE version 4.2+ in November 2008.
- DOT&E published a BLRIP Report to Congress for the operational test of Air Force MPS Increment III, F-16 MPE version 4.2+ in July 2009.

- All testing was conducted in accordance with DOT&E-approved Test and Evaluation Master Plans and operational test plans.
- DOT&E approved the test plans for Air Force MPS F-16 MPE version 4.3+ and version 5.1.

Increment IV

- DOT&E and the Air Force have defined the initial and follow-on operational test strategy for the Air Force MPS Increment IV for the first two Spirals of the Tanker, Airlift, Special Mission (TASM) MPE.

Assessment

Increment III

- The 28th Test and Evaluation Squadron evaluated the Air Force MPS F-15 MPE version 2.0 as operationally effective and operationally suitable. While the MPE offers many more new planning capabilities than the predecessor F-15 MPE version 1.3.4, the system suffered fewer critical failures and the time to complete F-15E mission planning was reduced by over 20 percent. DOT&E concurs with the evaluation result.
- DOT&E assessed the RC-135 MPE version 2.0 as operationally effective, but not operationally suitable. Significant problems were encountered during system set-up, including four failed installation attempts, problems connecting to the network domain, and the RC-135 MPE failing to launch after installation. This resulted in 29 of 34 total hours of system downtime during the test and an Operational Availability rate of 82.9%, which did not meet established user criteria of 95%.
- In the F-16 MPE 4.2+ BLRIP report to Congress, DOT&E evaluated that testing was adequate to demonstrate that the F-16 MPE version 4.2+ was operationally effective, but not operationally suitable. The system satisfied the intent of all four Key Performance Parameters: time to plan a mission; route creation and manipulation; data exchanges; and data transfer operations. However, system effectiveness was limited by deficiencies related to user-system interface and other minor deficiencies. Although the MPE met the requirements for reliability and operational availability there were significant deficiencies related to system installation, logistics supportability, and system administration and loss of planning data due to computer system crashes.
- The 28th Test and Evaluation Squadron is scheduled to conduct the operational test of the Air Force MPS F-16 MPE version 4.3+ and version 5.1 in November 2009 at Eglin AFB.

Increment IV

- Initial Operational Testing and Evaluation JMPS Increment IV TASM MPE will occur at Spiral 1 and will be conducted by AFOTEC. Spiral 1A will include more complex planning involvement from the Air Mobility Command Tanker Airlift Command Center in Scott AFB, Texas. Due to the complex nature and large scope of Spiral 1A testing, AFOTEC must plan personnel and funding to be involved in this FOT&E.

Recommendations

- Status of Previous Recommendations. The Air Force satisfactorily addressed all of the FY08 recommendations.
- FY09 Recommendation.
  1. The Air Force should update the draft Air Force MPS Increment IV Test and Evaluation Master Plan to reflect the DOT&E and AFOTEC defined operational test strategy for the C-17 MPE Spirals 1 and 1A while also documenting the strategy for additional focus on early and continuous reliability growth and information assurance vulnerability testing.

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

Executive Summary

- The MQ-9A program transitioned to Acquisition Category (ACAT) 1D status in January 2009.
- DOT&E submitted the MQ-9A Operational Test and Evaluation report to Congress in March 2009.
- DOT&E evaluated the MQ-9A as operationally effective in the killer role and operationally suitable.
- DOT&E could not assess the effectiveness of the MQ-9A in the hunter role due to immature synthetic aperture radar (SAR) integration.
- The Air Force is employing the MQ-9A in Operation Enduring Freedom.
- The MQ-9A effectively delivered Hellfire missiles and 500-pound laser-guided munitions in combat.
- Because the MQ-9A system has not completed any Information Assurance (IA) testing, IA vulnerabilities and deficiencies are unknown.

System

- The MQ-9A 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.
- The MQ-9A 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-9A shares command and control characteristics with the MQ-1 Predator.
- The MQ-9A 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-9A 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-9A units can also conduct aerial intelligence gathering, reconnaissance, surveillance, and target acquisition for other airborne platforms.

Prime Contractor

- General Atomics Aeronautical Systems Inc., San Diego, California

Activity

- The MQ-9A program transitioned to ACAT 1D status in January 2009.
- DOT&E submitted the MQ-9A Operational Test and Evaluation report to Congress in March 2009.
- DOT&E evaluated the MQ-9A as operationally effective in the killer role and operationally suitable.
- DOT&E could not assess the effectiveness of the MQ-9A in the hunter role due to immature SAR integration.
- The Air Force continued significant government-led developmental testing through FY09, which included incremental operational flight program improvements, weapons integration of Hellfire and Joint Direct Attack Munition (JDAM), high capacity starter generator electrical system, Electromagnetic Interference/Electromagnetic Compatibility, and Lynx SAR 3-D targeting.
- The Air Force completed the developmental test of JDAM and Joint Programmable Fuze in preparation for the JDAM Force Development Evaluation planned to begin in October 2009.
- The Department of Homeland Security Predator B and Army MQ-1C programs conducted a limited climatic test

in March 2009 at the McKinley Climatic Laboratory at Eglin AFB, Florida. The Final Test Report for the Limited Qualification System-Level Climatic Test of the Extended Range Multi-Purpose Unmanned Aircraft System was published in November 2009. The Program Office is reviewing these test results to determine if similarities between the two platforms will allow the Air Force to use these test data and determine potential MQ-9A system cold weather operations issues

Assessment

- The MQ-9A continues to lack an all-weather Hunter-Killer capability due to its SAR control system integration. The SAR is the only onboard sensor with the ability to locate and track targets through clouds and provide the all weather Hunter-Killer capability. However, functional control of the SAR is not yet integrated into the senor operator station requiring a third operator in the Ground Control Station (GCS) controlling the radar. In addition, the SAR cannot yet generate target coordinates with sufficient accuracy for JDAM targeting, which is the only precision guided weapon that can be deployed in all weather conditions.
- The MQ-9A demonstrated expanded combat capability with the developmental testing of JDAM integration.
- Because the MQ-9A system has not completed any IA testing, IA vulnerabilities and deficiencies are unknown.
- Based on the observed system integration deficiencies and technical immaturity of the SAR during IOT&E, the MQ-9A system will require FOT&E to fully assess the hunter role and Net-Ready Key Performance Parameters (KPP) and characterize its effectiveness.

Recommendations

- Status of Previous Recommendations. The Air Force did not address the two FY08 recommendations:
  - Develop an updated TEMP reflecting the current Acquisition Strategy with detail for the FOT&E activities required to fully asses the effectiveness and suitability of IOT&E deficiencies, incremental improvements, and intelligence, surveillance, and reconnaissance capabilities
  - Implement a robust reliability improvement program in order to address identified reliability shortfalls.
- FY09 Recommendation.
  1. The Air Force should complete the recommendations in the MQ-9A Operational Test and Evaluation report submitted to Congress in March 2009, including:
     - Conduct a formal FOT&E on the 14 deferred Increment 1 capabilities, SAR radar integration, and weapon's upgrades.
     - Ensure the integration of the SAR into the GCS allowing effective aircrew use in its intended concept of operations.
     - Implement pilot interfaces to minimize the risk of mishaps in the landing environment.
     - Verify the correction of deficiencies identified as Category 1 discrepancy reports.
     - Reevaluate and consider a more realistic Mean Time Between Critical Failure metric commensurate with similar weapons systems.
     - Conduct operational testing in other than desert-like climates to include maritime, cold weather, and chemical/biological agent conditions.
     - Complete successful Joint Interoperability Test Command certification satisfying the Net Ready KPP.

NAVSTAR Global Positioning System (GPS)

Executive Summary

- The Air Force launched the seventh NAVSTAR GPS Block IIR-M (Modernized) satellite in March 2009 and the eighth, and final, IIR-M satellite in August 2009. However, prototype M-code capable Military GPS User Equipment (MGUE) will not be available to conduct basic developmental testing of Block IIR-M unique capabilities until at least 2014.
- Contractor development problems delayed the delivery of the GPS Architecture Evolution Plan (AEP) Version 5.5 until November 2009.
- The GPS Integrated Test Team successfully drafted an Enterprise-level Test and Evaluation Master Plan (TEMP). The lack of an approved Initial Capabilities Document or Capability Development Document for the user segment precludes the TEMP from addressing the full scope of testing.

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 2QFY10)
  - 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 Space Systems, Sunnyvale, California
- Block IIF: The Boeing Company, Integrated Defense Systems, Seal Beach, California

Activity

- The Air Force launched the seventh NAVSTAR GPS Block IIR-M (Modernized) satellite in March 2009. The vehicle has not yet been declared "healthy" for use by civil and military users, due to problems with an experimental payload intended to demonstrate a new civilian frequency signal. The Air Force launched the eighth, and final, IIR-M satellite in August 2009. The Air Force Space Command completed the on-orbit checkout of the space vehicle and declared it "healthy."

- Contractor development problems delayed the delivery of the GPS AEP Version 5.5 until November 2009.
- As directed by OSD, 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 Operational Control Segment; the next generation Operational Control Segment; Selective Availability / Anti-Spoof Module (SAASM) capable MGUE.

Assessment

- The seventh Block IIR-M satellite launched in March 2009 and the eighth satellite launched in August 2009; however, prototype MGUE will not be available to conduct basic developmental testing of Block IIR-M unique capabilities until at least 2014. This problem affects both developmental and operational testing. The Services should plan resources to have production-representative M-code capable MGUE in place for adequate operational testing scheduled for 2015. These satellites will be on orbit for at least five years before the user community will be able to exploit their full capability.
- The test planning for all segments of GPS (space, control, and user) improved in 2009. The Integrated Test Team now includes members from all Services, OSD, Federal Aviation Administration, and industry. Planning must focus on end-to-end testing of the space and control segments with GPS receivers (including ground equipment) that are capable of receiving and processing the new modernized signals and are hosted on representative platforms (i.e., ships, aircraft, land, and space vehicles), in realistic operational environments.
- The synchronization of the development of the space, control, and user segments continues to be a concern. The GPS Integrated Test Team drafted an Enterprise-level TEMP. However, the lack of an approved Initial Capabilities Document or Capability Development Document for the user segment precludes the TEMP from addressing the full scope of testing.
- Air Force Space Command is developing a Concept of Operations and a software mission planning tool for new GPS capabilities including the SAASM and over-the-air-rekey functions. Based upon current progress, the mission planning tool may not be available for the Multi-Service Operational Test and Evaluation (MOT&E) in FY10. Without these tools, there will be significant limitations on the operational realism of the MOT&E.
- The Control Segment relies on input from external sources to maintain GPS performance. However, information assurance testing of these interfaces has been significantly constrained.

Recommendations

- Status of Previous Recommendations. There were no recommendations in FY06 or FY07. While the Air Force continues to make progress on previous FY05 DOT&E recommendations, four out of the five recommendations still remain valid.
- FY09 Recommendations. The Air Force should:
  1. Establish agreements to ensure comprehensive information assurance testing of all external interfaces that support GPS operations and performance.
  2. Synchronize the development of the Mission Planning Tool with the three segments of GPS to provide end-to-end SAASM and modernized capabilities for OT&E.

Small Diameter Bomb (SDB)

Executive Summary

- The release of Joint Munitions Effectiveness Manual Weaponeering Software (JWS) 2.0 corrected deficiencies in Small Diameter Bomb (SDB) lethality estimates.
- The SDB II program completed risk reduction testing activity during FY09.
- The Air Force started SDB I replacement fuze testing in September 2009.

System

- The SDB is a 250-pound air-launched weapon using deployable wings to achieve standoff range. F-15E aircraft employ SDBs from the BRU-61/A four-weapon carriage assembly.
- 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.
- SDB Increment I combines GPS and internal inertial navigation system guidance to achieve precise guidance accuracy.
- The SDB I warhead is a penetrator design with additional blast and fragmentation capability. The weapon can be set to initiate on impact or a preset height above the intended target. Fuze function delays can be pre-set to either of these two options.
- SDB Increment II combines Millimeter-Wave radar, infrared, and laser guidance sensors in a terminal seeker in addition to a GPS and inertial navigation system to achieve precise guidance accuracy in all weather.

Mission

- Combatant Commanders use SDB I 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.
- Combatant Commanders will use SDB II to attack moving targets in adverse weather at standoff ranges. SDB II can also be used against moving or stationary targets using its Normal Attack mode (radar/infrared sensors) or Semi-Active Laser mode and fixed targets with its Coordinated Attack mode.
- 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 Contractors

- SDB I: The Boeing Company, Integrated Defense Systems, St. Louis, Missouri
- SDB II: Source selection 3QFY10 between Raytheon Missile Systems, Tucson, Arizona, and The Boeing Company, Integrated Defense Systems, St. Louis, Missouri

Activity

- The Air Force is continuing a major effort to improve JWS small warhead weaponeering accuracy, with over 200 SDB I and SDB II warheads and bare-charge equivalents employed in static tests against realistic targets since December 2006. JWS 2.0, released in March 2009, incorporated these results and will continue to evolve.
- Sled testing and live flight testing on a new fuze for SDB I is ongoing and will be complete in FY10. Objectives are to demonstrate enhanced fuze reliability and retain previous levels of weapon performance.
- The Program Office completed SDB II risk reduction test activity in FY09 with final data reduction and analysis expected prior to Milestone B and entry into Engineering and Manufacturing Development. Contractors conducted developmental testing including free flight demonstration, captive carriage of All-Up-Rounds on F-15Es, and seeker

testing from the component level. Each contractor's warhead also underwent lethality testing.
- The Air Force Operational Test and Evaluation Center conducted an Early Operational Assessment (EOA) to assess system progress toward operational effectiveness and suitability. An EOA report will support the Milestone B decision.
- With an approved Acquisition Strategy for SDB II, the Program Office plans to release a Request for Proposals in preparation for Milestone B. An active Integrated Test Team process resulted in notable progress toward producing a Test and Evaluation Master Plan (TEMP).

Assessment
- The release of JWS 2.0 notably improved SDB lethality based on warhead testing. JWS 2.0 incorporates both new data and major changes in methodology.
- The EOA will provide a basis for assessment of SDB II progress to date.
- Program funding and scope decisions are needed to allow completion of a Milestone B TEMP and progression past Milestone B. Efforts should continue to keep testing event driven.

Recommendations
- Status of Previous Recommendations. The Air Force completed the FY08 recommendation.
- FY09 Recommendations.
  1. The SDB I Program Office should complete ongoing fuze testing and report on the results.
  2. The SDB II Program Office should finalize the TEMP prior to Milestone B.

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

Executive Summary
- The Air Force Operational Test and Evaluation Center (AFOTEC) completed a two-part Operational Utility Evaluation (OUE) of the Highly Elliptical Orbit (HEO)-1 and HEO-2 payloads of the Space-Based Infrared System, High Component (SIBRS-HIGH) Increment 2. AFOTEC published the HEO OUE final report in August 2009. The OUE was adequate to determine that the SBIRS HEO capability is effective and suitable.
- Both HEO payloads are now operational. U.S. Strategic Command (USSTRATCOM/J65) Integrated Tactical Warning / Attack Assessment system and technical intelligence data have been certified for both HEO payloads.
- The Air Force still does not have an approved long term solution for the SBIRS ground architecture or operational requirements to support development of an integrated test strategy for the ground system.

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 geostationary (GEO) orbit. 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 Space Systems, Sunnyvale, California

Activity
- AFOTEC completed a two-part OUE of the HEO-1 and HEO-2 payloads on July 22, 2009. The AFOTEC Commander released the HEO OUE final report in August 2009. The OUE results informed USSTRATCOM/J65 Integrated Tactical Warning/Attack Assessment certification for missile warning, missile defense, and battlespace awareness, as well as National Geospatial-Intelligence Agency's certification for technical intelligence data. Both HEO payloads are now operational.
- Deficiencies in the Flight Software Subsystem (FSS) development continue to delay the SBIRS GEO program. The current projected launch date for GEO-1 is September 2010, contingent on successful FSS dry run completion in early 2010.
- The SBIRS Program Office and AFOTEC have begun writing a Test and Evaluation Master Plan (TEMP) annex to support testing of GEO-1. The TEMP annex is expected to be completed in FY10.

Assessment
- The SBIRS Increment 1 system, operating with the current DSP satellites and two HEO payloads, continues to

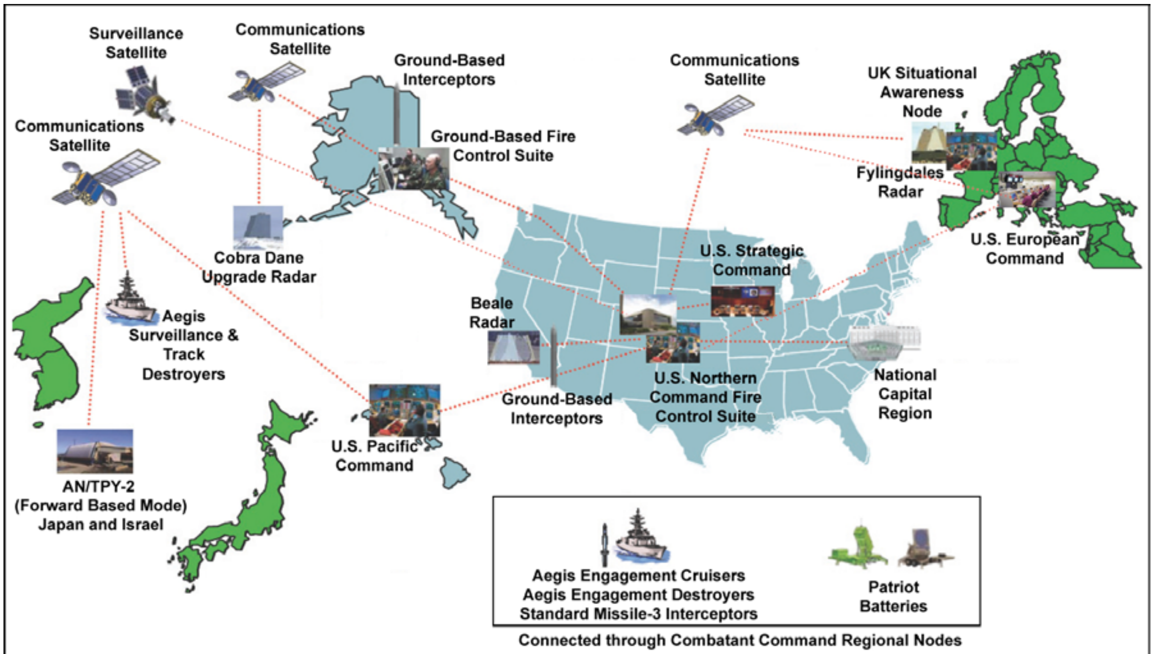
demonstrate improved performance over the legacy DSP system.
- The AFOTEC OUE was conducted in accordance with the DOT&E-approved TEMP and operational test plans. Testing was adequate to determine that the SBIRS HEO system is effective and suitable. However, testing identified areas of concern in missile defense, technical intelligence, and information assurance.
- HEO data did not degrade existing missile warning capabilities.
- SBIRS demonstrated the ability to collect accurate technical intelligence data. However, significant operator intervention and maintenance is required to execute many of the technical intelligence functions. In addition, many key software processes were found to be unstable, requiring frequent rebooting and higher levels of operator training than expected.
- The overall information assurance posture was assessed to have potentially significant vulnerabilities to an internal threat. The Air Force has implemented a Plan of Action and Milestones to resolve or substantially mitigate these deficiencies.
- The Air Force still does not have an approved long term solution for the SBIRS ground architecture or operational requirements to support development of an integrated test strategy for the ground system.
- While the original December 2009 launch date put the test planning for GEO-1 under significant time pressure, program delays have provided additional time to complete the GEO-1 TEMP annex.
- The Air Force has made significant progress identifying modeling and simulation requirements; however, refined Concepts of Operation and operational requirements for each SBIRS increment are still needed.
- AFOTEC aggressively applied an integrated test methodology to HEO OUE, including combining the planned AFOTEC OUE duration with the Air Force Space Command Trial Period. DOT&E expects that GEO testing will be conducted in a similar fashion.

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. One of the two FY07 recommendations and both FY08 recommendations remain valid.
- FY09 Recommendations. None

Ballistic Missile Defense Systems

Ballistic Missile Defense Systems

Ballistic Missile Defense System (BMDS)



Currently Fielded Ballistic Missile Defense System

Executive Summary

- Following an extensive and comprehensive review involving all stakeholders – the Missile Defense Agency (MDA), the independent testers, and the warfighters – the MDA revamped its Integrated Master Test Plan (IMTP) to focus on collecting the data needed to accredit the models and simulations for assessing the performance and effectiveness of the Ballistic Missile Defense System (BMDS).
- The Ground-based Midcourse Defense (GMD) element conducted one system-level flight test during FY09.
- Aegis Ballistic Missile Defense (Aegis BMD) conducted three system-level flight tests during FY09 and early FY10, one of which resulted in a failed intercept attempt.
- Terminal High-Altitude Area Defense (THAAD) conducted one successful system-level flight test in FY09.
- Patriot conducted two flight tests against ballistic missile targets, one of which failed to intercept the target. (Patriot is reported on separately in this document as an Army program.)
- Command, Control, Battle Management, and Communications (C2BMC) continues to add and update functionality while providing Situational Awareness to the warfighter. While C2BMC battle management is still in early development, it does provide basic control of two separately operated AN/TPY-2 (Forward-Based Mode, or FBM) radars.

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 BMD
  - C2BMC
  - GMD
  - Patriot

  Sensors
  - Aegis BMD AN/SPY-1 Radar
  - Cobra Dane Radar
  - Upgraded Early Warning Radars (UEWRs) – Beale and Fylingdales
  - AN/TPY-2 (FBM) radar (formerly Forward-Based X-band Transportable radar, or FBX-T)
  - Space-Based Infrared System / Defense Support Program (SBIRS/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.

- Advanced technology additions to the BMDS may include the following:
  - Airborne Laser (ABL)
  - 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 assets, 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, U.S. Northern Command, U.S. European 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 has transferred Patriot to the Army; it is reported as an Army program.

Prime Contractor - Integrator

- The Boeing Company, Integrated Defense Systems, Missile Defense Systems, Huntsville, Alabama

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Activity

- The MDA adopted a fundamentally different approach in developing the latest Integrated Master Test Plan (IMTP). The MDA Director and DOT&E jointly approved the 2009 IMTP revision, which for the first time encompasses the entire Future Years Defense Program. The plan uses a critical factors analysis (also referred to as Critical Engagement Conditions, or CECs) to drive test design, planning, and execution. The new test program focuses on collecting data that will be used to validate and accredit BMDS system- and element-level models and simulations. These models and simulations will ultimately be used to assess the performance and effectiveness of the BMDS throughout its operational battlespace. In addition, the IMTP also contains tests to satisfy other data needs through the use of Empirical Measurement Events (EMEs). The EMEs provide additional test data necessary to assess BMDS effectiveness and increase confidence in system performance. The IMTP also includes periodic dedicated operational test events, designated as warfighter-developed Epoch tests, which will be managed by the BMDS Operational Test Agency Team.
- During the IMTP revision process, the MDA identified 100 CECs/EMEs for which flight and ground testing will collect data to validate the models and simulations. Of the 100 CECs/EMEs, the MDA identified seven system-level CECs and two system-level EMEs for which flight and ground testing will collect data to validate the system-level models and simulations.
- GMD executed the Flight Test Ground-based Interceptor (FTG)-05 event in December 2008, which resulted in an intercept of the target. FTG-05 was the first time the GMD fire control facility in Fort Greely, Alaska, commanded an interceptor launch from Vandenberg AFB, California. UEWR-Beale, SBX, Aegis BMD, AN/TPY-2 (FBM), and C2BMC all participated in this test event.
- The MDA executed the system-level event, Ground Test Distributed (GTD)-03, in March 2009 using fielded components and communications.
- In FY09 and early FY10, the Aegis BMD program conducted three system-level intercept missions: Japanese Flight Test Standard Missile (JFTM)-2 in November 2008, Flight Test Standard Missile-3 (FTM)-17 in July 2009, and JFTM-3 in October 2009. In JFTM-2, the SM-3 Block IA interceptor failed to intercept the target.
- THAAD performed one system-level flight test, Flight Test THAAD Interceptor (FTT)-10a, which occurred in March 2009. FTT-10a followed the September 2008 event, FTT-10, which was not completed due to a target failure. FTT-10a resulted in an intercept of the target, demonstrated THAAD's salvo capability, and included a cue from Aegis BMD to THAAD. THAAD also performed safety, mobility, electromagnetic effects, and natural environments ground testing.
- Patriot conducted two flight tests against ballistic missile targets: Flight Test 7-2 in March 2009, which resulted in a target miss due to an interceptor failure and flight test P6.5-4 in April 2009, which resulted in a target intercept. Flight Test 7-2 was the first intercept attempt using the new Missile Segment Enhancement interceptor.
- C2BMC participated in a variety of ground-tests, flight-tests, and wargames, including GTD-03, Fast Contingency Analysis and Activation Team (Fast CAAT) East-Bravo, FTT-10a, FTG-05, Vigilant Shield 09, and Assured Response 09a.

Assessment

- The elements that comprise the present and future BMDS are at different levels of testing and maturity.
  - Prior to the latest Post Deployment Build 6.5 software release, Patriot provided mature and moderately

well-understood capabilities against much of its theater-level missile threat set. This assessment is based on the number and complexity of test and evaluation events in which Patriot participated (both flight and ground testing) as well as combat operations during Operation Iraqi Freedom. Modifications and upgrades to Patriot designed to correct some deficiencies and introduce enhanced capabilities have undergone developmental testing, but have yet to be operationally tested. The Army Test and Evaluation Command will conduct a Limited User Test for the PDB 6.5 capability in the 1-2QFY10.
  - At the BMDS system level, the Aegis BMD provides a moderately well characterized capability against a majority of its theater-level missile threat set and its operational battlespace. At the unit level, the currently fielded configuration, Aegis 3.6, was previously found to be operationally effective and suitable.
  - THAAD testing indicates that it will provide a significant increase in capability against short-range threats when it is incorporated into the BMDS in FY10. The MDA plans to test additional significant capabilities after the Materiel Release of the first THAAD fire units in the fall of 2010.
  - To date, GMD has demonstrated a limited capability against a simple threat. While GMD flight testing to date is not sufficient to provide statistical confidence in its performance, post-flight reconstruction of flight test events has provided substantial evidence to support the validation process. The revised IMTP contains the additional flight tests necessary to collect the data to validate models and simulations. The successful completion of this task will increase confidence in the ability of these models and simulations to accurately assess system capability. Ground testing continues to demonstrate increasing GMD integration.
- The inherent BMDS defensive capability against theater threats increased during the last fiscal year. DOT&E anticipates continued increases in this capability over time. The inherent BMDS defensive capability against strategic threats also increased; however, it remains limited.
- Warfighters actively participate in all system-level BMDS testing as well as nearly all element testing. They perform operational roles, at individual elements through major combatant command levels, using operational tactics, techniques, and procedures.
- During the past year, GMD interceptor design changes and parts obsolescence have resulted in hardware and software differences between fielded and flight tested interceptors. Such differences complicate assessments of the fielded GMD element.
- C2BMC continues to add new functionality and improve existing functionality. It contributes to the warfighter's Situational Awareness and currently provides basic management of two separately operated, forward-deployed AN/TPY-2 (FBM) radars. While communications and Situational Awareness have improved, challenges remain. To date, C2BMC has not matured sufficiently to provide an integrated, layered battle management capability against any class of threat missiles.

Recommendations

- Status of Previous Recommendations. The MDA satisfactorily addressed three of the previous five outstanding recommendations. The two remaining recommendations are still valid.
- FY09 Recommendations. The MDA should:
  1. Establish a process to monitor and review the execution of the approved IMTP. This process should also include oversight of interim changes and formal updates to ensure compliance with the intent of the approving stakeholders – the MDA, the operational testers, and the warfighters.
  2. Revise the IMTP to incorporate the operationally realistic testing needed to support the phased, adaptive approach to providing missile defense for Europe.

Command, Control, Battle Management, and Communications (C2BMC) System

Executive Summary

- The Missile Defense Agency (MDA) implemented a new comprehensive approach to test design focused on data collection to verify, validate, and accredit models and simulations for system performance analysis. The MDA identified seven Command, Control, Battle Management, and Communications (C2BMC)-specific Critical Engagement Conditions (CECs) needed to accredit C2BMC models.
- C2BMC capabilities and interactions with other elements, particularly the Terminal High-Altitude Area Defense (THAAD) and the AN/TPY-2 (Forward-Based Mode (FBM)) radar in Shariki, Japan, expanded in FY09, adding a regional communications teleport at Ramstein AFB, Germany, and a control and communications interface for an AN/TPY-2 (FBM) radar in Israel.
- C2BMC repeatedly demonstrated the ability to control a single AN/TPY-2 (FBM) radar; to receive and forward tracks from other element radars such as the Aegis AN/SPY-1 and the AN/TPY-2 (Terminal Mode); and to interact with the Ground-based Midcourse Defense (GMD) element through the GMD Fire Control (GFC).
- The MDA continues to track and correct C2BMC software anomalies and improve data presentation.
- Although C2BMC is still primarily a Situational Awareness tool and a rudimentary planning tool, the MDA is starting to implement near real-time planning functions, battle management, and sensor network tools.

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 AFB, Colorado; Cheyenne Mountain, Colorado; Fort Greely, Alaska; U.S. Strategic, Northern, European, 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 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 two AN/TPY-2 (FBM) radars located at Shariki, Japan, and in Israel.

- 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.
- The next two significant upgrades will add new capabilities to the C2BMC:
  - Spiral 6.4: Initial implementation of the Global Engagement Manager is intended to manage multiple radars in the same area of responsibility.
  - Spiral 8.2: Although not fully defined by the MDA, the intent is to improve and expand the initial Spiral 6.4 capabilities with the addition of initial sensor-weapon system pairing and engagement direction, as well as the implementation of the common X-band interface as the next step toward integrated sensor management.

Mission

U.S. Strategic, Northern, European, 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

- Lockheed Martin Information Systems and Global Services, Gaithersburg, Maryland

Activity

- In FY09, C2BMC supported the U.S. response to North Korean missile operations. The C2BMC met all operational mission objectives.
- The U.S. European Command (EUCOM) declared the command and control capability, communications systems, and interface to the AN/TPY-2 (FBM) radar to be operational in 1QFY09. The MDA and EUCOM assessed AN/TPY-2 and C2BMC performance during Fast Contingency Analysis and Activation Team exercises optimizing radar search fences and assessing focused search plans, demonstrating regional track management and forwarding of AN/TPY-2 track cues to Aegis BMD.
- During the process to revise the Integrated Master Test Plan (IMTP) and approach to test design, the MDA identified seven CECs, for which flight and ground testing will collect data to validate and accredit the C2BMC models and simulations. Six CECs relate to Spiral 6.4 and one CEC relates to Spiral 8.2.
- In FY09, C2BMC participated in three ground tests (integrated hardware-in-the-loop tests and distributed tests that used operational hardware and software) and four flight tests. C2BMC continues to demonstrate the ability to provide Situational Awareness by receiving and displaying data from a variety of sensors, as well as demonstrating AN/TPY-2 (FBM) track forwarding and radar management functions.
- Software Spiral 6.2 is operational at all Combatant Commands and Fort Greely, Alaska. The MDA is currently integrating and testing the base version of software Spiral 6.4 at the Missile Defense Integration and Operations Center (MDIOC) at Schriever AFB, Colorado. The MDA expects to field Spiral 6.4 by the end of FY10. Hardware upgrade installation in preparation for Spiral 6.4 fielding continues at the AN/TPY-2 (FBM) site in Shariki, Japan.
- During Flight Test GMD Interceptor (FTG)-05 in December 2008, C2BMC again demonstrated its role in connecting several BMDS elements: C2BMC cued AN/TPY-2 (FBM) to perform a focused search plan, received and forwarded AN/TPY-2 (FBM) tracks to the GFC and Aegis BMD, and received tracks from Aegis BMD.
- The MDA conducted the focused Ground Test Other (GTX)-03c in November and December 2008 and demonstrated a simulated Aegis BMD engagement using the AN/TPY-2 (FBM) target track forwarded by C2BMC.
- During Flight Test THAAD Interceptor (FTT)-10a in March 2009, C2BMC received tracks from and provided Situational Awareness to both Aegis BMD and THAAD.
- The Space-Based Infrared/Defense Support Program (SBIRS/DSP) provided launch data to C2BMC during the Ground Test Distributed (GTD)-03 in February and March 2009. C2BMC also demonstrated connectivity with GFC.
- GTX-03e, which took place in July 2009, tested C2BMC Situational Awareness functionality as well as interactions with SBIRS/DSP and GFC. C2BMC displayed track information from multiple sensors and successfully controlled the AN/TPY-2 (FBM) radar.
- In FY09, C2BMC participated in two wargames, Vigilant Shield 09 and Assured Response 09a, and trained operators for Juniper Cobra 10.

Assessment

- Spiral 6.4 initial integration and test is under way. The MDA plans three implementations of this software spiral incorporating incremental increases in Spiral 6.4 capabilities. Spiral 6.4 introduces the Global Engagement Manager at U.S. Pacific Command. It will tie together two AN/TPY-2 (FBM) sensors allowing for automated sensor management, track downselect/forwarding, and operator track-level management. Generation of a single system track from multiple sensor source tracks is a critical BMDS level need. C2BMC is still developing the functionality to provide a single system track. The Ground Test campaign (GT)-04 will provide a system test for C2BMC Spiral 6.4.
- C2BMC is a critical component of the BMDS. C2BMC interactions with theater and strategic elements continued to increase and improve in FY09. It now includes connectivity with SBIRS/DSP, Aegis BMD, THAAD, and GFC, and connectivity with and control of two separately operated AN/TPY-2 (FBM) radars.
- All Combatant Command and National Command Authority C2BMC suites are now being manned and operated by warfighters. Logistical support is provided by each command's organic maintenance concept. Only the unique C2BMC software applications are still being maintained by the MDA, which continues to evolve C2BMC capability.
- C2BMC has limited battle management capabilities allowing warfighters at C2BMC consoles to direct the AN/TPY-2 (FBM) radar to execute focused search plans or respond to precision cues.
- Expanding C2BMC interoperability across the BMDS elements will necessitate more extensive testing to support development of tactics, techniques, and procedures.

Recommendations

- Status of Previous Recommendations. The MDA addressed seven of the previous eight recommendations. The MDA continues to make progress on the one outstanding FY06 recommendation to include assessments of information assurance during BMDS-centric C2BMC testing.
- FY09 Recommendation.
  1. The MDA should revise the IMTP to incorporate testing of the C2BMC capabilities and linkages needed to implement the phased, adaptive approach to providing missile defense for Europe.

Aegis Ballistic Missile Defense (Aegis BMD)

Executive Summary

- Aegis Ballistic Missile Defense (BMD) intercepted three short-range non-separating targets during FY09 flight tests and U.S. Navy Fleet exercises. During a Japanese flight test mission in early FY10, it also intercepted a medium-range separating target. Intercept missions included both midcourse and terminal phase engagements.
- During the first of two Japanese flight test missions, a Standard Missile-3 (SM-3) Block IA interceptor failed to intercept a medium-range target although the shipboard weapon system performed as designed.
- Aegis BMD demonstrated the ability to perform a simultaneous engagement of a short-range ballistic missile target in the terminal phase of flight and an anti-ship cruise missile.
- Aegis BMD demonstrated the ability to send a cue to the Terminal High-Altitude Area Defense (THAAD) system during a THAAD intercept mission.
- Aegis BMD demonstrated the ability to receive a cue from THAAD during an Arrow Weapon System Mission.
- The U.S. Navy conducted two Fleet live firing exercises using Aegis BMD in FY09, which further tested command and control infrastructure and Aegis BMD functionality in an operational setting.
- Fast Contingency Analysis and Activation Team (CAAT) East-Bravo demonstrated the potential of Aegis BMD to contribute to the defense of Israel.

System

- Aegis BMD is a 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 long-range surveillance and track (LRS&T) of ballistic missiles of all ranges.
  - A modified Aegis Vertical Launcher System stores and fires the SM-3 Block IA and modified SM-2 Block IV interceptors.
  - The SM-3 Block IA design delivers a maneuverable kinetic warhead to an intercept point in the upper atmosphere or in space for midcourse engagements.
  - Modified SM-2 Block IV interceptors provide the capability to engage short-range ballistic missile targets in the terminal phase of flight.

- Aegis BMD is capable of autonomous missile defense operations and can send or receive cues to or from other Ballistic Missile Defense System (BMDS) sensors through tactical data links.

Mission

The Navy can accomplish three missions using Aegis BMD:

- Provide forward-deployed radar capabilities to enhance defense against ballistic missile threats of all ranges
- Provide all short- to long-range ballistic missile threat data to the Command, Control, Battle Management, and Communications (C2BMC) system for dissemination to Combatant Commanders' headquarters to ensure situational awareness
- Defend deployed forces and allies from short- and medium range theater ballistic missiles

Prime Contractors

- Lockheed Martin Maritime Systems & Sensors, Moorestown, New Jersey
- Raytheon Missile Systems, Tucson, Arizona

Activity

- The Missile Defense Agency (MDA) completed a comprehensive review of test requirements for the entire BMDS in FY09. As part of that process, the MDA identified nine Critical Engagement Conditions (CECs) and 11 Empirical Measurement Events (EMEs) for which specific Aegis BMD flight and ground tests are necessary to collect data to validate and accredit the Aegis BMD models and simulations. The 2009 Integrated Master Test Plan (IMTP) revision incorporates these test events. Modifications to the IMTP and its provisions for testing Aegis BMD as a result of the recent plans for a phased, adaptive approach to providing missile defense for Europe are under development.
- In FY09, the Aegis BMD program continued to assess engagement capabilities for midcourse and terminal defense missions during an FOT&E phase of testing. This follows the completed combined Developmental Test/Operational Test phase of testing that supported the transition of the Aegis BMD 3.6 system to the Navy in October 2008.
- The Aegis BMD program conducted five intercept missions: Fleet Exercise "Pacific Blitz," Japanese Flight Test Mission (JFTM)-2, Fleet Exercise "Stellar Daggers," Flight Test Mission (FTM)-17 (also known as "Stellar Avenger"), and JFTM-3. The two Fleet exercises, while operationally realistic, did not employ BMDS system-level capabilities. Therefore, they are not included in the BMDS system-level assessment.
  - In November 2008 during "Pacific Blitz," two Aegis BMD destroyers engaged two short-range ballistic missile targets using SM-3 Block I interceptors which were at the end of their service life. One engagement was successful, but the other failed due to loss of seeker cryo-cooling. The developer hypothesizes that the leak occurred due to an early-on missile manufacturing process of the SM-3 Block I. SM-3 Block IA missiles in the current inventory use improved buildup procedures and are not expected to have similar problems. "Pacific Blitz" was the first U.S. Navy proficiency firing to employ the SM-3 against a ballistic missile target.
  - In November 2008 during JFTM-2, a Japanese Aegis BMD destroyer successfully detected, tracked, and prosecuted an engagement of a medium range separating target. However, the SM-3 Block IA missile failed to hit the target. Investigation as to the cause of the SM-3 Block IA failure is ongoing.
  - In March 2009 during "Stellar Daggers," an Aegis BMD destroyer performed a simultaneous engagement of a short-range ballistic missile target in the terminal phase of flight (with a modified SM-2 Block IV interceptor) and a cruise missile target (with an SM-2 Block IIIA interceptor). Earlier, Aegis BMD attempted a terminal phase engagement, but the target failed to reach the desired altitude and range. Aegis BMD terminated the engagement, as designed, because the target did not qualify for engagement. "Stellar Daggers" was conducted as FOT&E and was the final test of the Aegis BMD 3.6.1 Sea-Based Terminal capability.
  - In July 2009 during FTM-17 "Stellar Avenger," an Aegis BMD destroyer conducted a midcourse phase engagement of a short-range ballistic missile target using an SM-3 Block IA interceptor. Concurrently, a separate Aegis BMD cruiser conducted the first simulated SM-3 Block IB engagement using a developmental Aegis BMD 4.0.1 software load.
  - In October 2009 during JFTM-3, a Japanese Aegis BMD destroyer using an SM-3 Block IA interceptor successfully intercepted a medium range separating target.
- In FY09, Aegis BMD participated in several BMDS system flight and ground tests to assess Aegis BMD functionality and interoperability with the BMDS.
  - Ground Test Other (GTX)-03c in November and December 2008 used hardware-in-the-loop simulations to demonstrate the ability to engage an intermediate-range ballistic missile target using the SM-3 launch-on-remote capability with an AN/TPY-2 radar in Forward-Based Mode (FBM). The test also assessed launch-on-remote capability with another Aegis BMD ship employed as the forward sensor.
  - Flight Test Ground-based Interceptor (FTG)-05 in December 2008 demonstrated Aegis LRS&T functionality in support of the GMD intercept test. Another Aegis ship, positioned down range beyond the target impact area, demonstrated a simulated launch on AN/TPY-2 (FBM) engagement of an intermediate range target.
  - Ground Test Distributed (GTD)-03 in March 2009 demonstrated BMDS operational functionality, connectivity, and interoperability. GTD-03 used simulators on three Aegis BMD ships (dockside) and at the Space and Naval Warfare Systems Center (SPAWAR) in San Diego, California. GTD-03 assessed launch-on-remote functionality with both the AN/TPY-2 and AN/SPY-1 radars as the forward-based sensors.
  - Flight Test THAAD Interceptor (FTT)-10a in March 2009 demonstrated the ability of Aegis BMD to send a cue to THAAD over operational communication links.
  - "Caravan 2" in July 2009, an Israeli Arrow Weapon System test, included a simulated engagement of a medium-range target by Aegis BMD, supported by a cue from AN/TPY-2 (Terminal Mode, or TM) and an examination of the interoperability between Aegis BMD and the Arrow system.
  - Flight Test Other (FTX)-06 Event 1 in July 2009, a tracking exercise, assessed functionality of the new Aegis BMD 4.0.1 software on an Aegis BMD cruiser. Aegis BMD also conducted a simulated engagement.
  - Ground Test Other (GTX)-03e in July 2009 used hardware-in-the-loop simulations to test the interaction between BMDS elements, sensors, and command and control interfaces. GTX-03e evaluated Aegis BMD ability

  to track and support BMDS engagements of updated threat representations.
  - Fast CAAT East-Bravo, conducted April to June 2009, was a European theater-centric, hardware-in-the-loop and distributed ground test that provided a system-level assessment of theater data paths.

Assessment

- In FY09 and early FY10, Aegis BMD flight testing continued to demonstrate the capability to engage short-range non-separating and medium-range separating ballistic missile targets in the midcourse and terminal phases of flight. The terminal phase engagement during "Stellar Daggers" provided additional data for a more thorough assessment of the sea-based terminal engagement capability with modified SM-2 Block IV interceptors.
- Intercept tests have demonstrated the efficacy of the SM-3 Block IA interceptor for some midcourse engagement missions. While flight testing to date has not exercised the highest pulse mode of the SM-3 kinetic warhead divert system, the program has executed seven ground tests to verify full pulse operation. These ground tests, combined with validated modeling and simulation results, give moderate confidence that the full range of pulse modes function correctly.
- The zero-pulse mode of the SM-3 third stage rocket motor also has not been tested in a live intercept event. Zero-pulse functionality is applicable to only a small portion of the overall engagement battlespace, and is nearly impossible to demonstrate safely during flight testing. Results from digital simulations and ground testing are encouraging, and provide limited confidence in the rocket motor's zero-pulse functionality.
- FY09 included two SM-3 failures during "Pacific Blitz" and JFTM-2. Aegis BMD has attributed the "Pacific Blitz" failure to manufacturing procedures applicable to the Block I missile that do not apply to current Block IA interceptors. Aegis BMD continues to investigate the cause of the JFTM-2 Block IA interceptor failure.
- Aegis BMD demonstrated LRS&T functionality during FTG-05.
- FTT-10a demonstrated Aegis BMD's ability to cue THAAD while Aegis BMD and THAAD inter-element data transfer over tactical links continues to mature. Aegis BMD has not yet tested launch-on-remote capability in a live intercept mission, though such a mission is planned for FTM-15 in FY10.
- Command and control and theater engagement capabilities were demonstrated in an operationally-realistic environment during U.S. Navy Fleet exercises.
- Fast CAAT East-Bravo demonstrated the potential of Aegis BMD to contribute to the defense of Israel.

Recommendations

- Status of Previous Recommendations. The program addressed all of the six recommendations from FY08.
- FY09 Recommendation.
  1. The MDA should revise the IMTP to incorporate operationally realistic testing of Aegis BMD to support the phased, adaptive approach to providing missile defense for Europe.

Ground-Based Midcourse Defense (GMD)

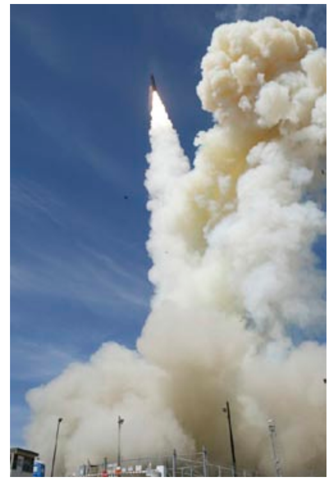
Executive Summary

- The Missile Defense Agency (MDA) restructured the Ground-based Midcourse Defense (GMD) test program to focus on acquisition of data needed for validation and accreditation of GMD models and simulations, which are necessary for evaluation of GMD effectiveness and suitability. The restructured program extended GMD flight tests through FY20.
- The MDA conducted Flight Test GMD Interceptor (FTG)-05, an intercept flight test, in December 2008. FTG-05 demonstrated all threat engagement functions within an uncomplicated, threat-representative test scenario, against an uncomplicated, threat-representative target. The target missile experienced a malfunction that precluded achievement of all planned test objectives. Although the interceptor also experienced a malfunction, it did not impact achievement of test objectives. The MDA developed an interceptor hardware change to mitigate the risk of a similar GMD interceptor malfunction.
- Ground tests supported characterization of GMD performance and development of warfighter operational tactics, techniques, and procedures. Test results suggested the GMD provided a capability to defend the United States against the limited, emerging, uncomplicated, long-range, ballistic missile threats. Lack of sufficient data for comprehensive model and simulation validation and accreditation continued to preclude a full end-to-end performance evaluation.
- Continuing evolution of the interceptor design has resulted in multiple interceptor configurations among the fielded interceptors and test assets. These configuration differences complicate assessment of interceptor operational effectiveness and 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 AFB, California, and Fylingdales, United Kingdom
- Ground-based Interceptor (GBI) missiles at Fort Greely, Alaska, and Vandenberg AFB, California



- GMD Fire Control (GFC) nodes reside at the Missile Defense Integration and Operations Center, Schriever AFB, Colorado; and Fort Greely, Alaska. The GFC includes In-Flight Interceptor Communications System Data Terminals at Vandenberg AFB, California; Fort Greely, Alaska; and Shemya Island, Alaska.
- External interfaces include Aegis Ballistic Missile Defense (Aegis BMD); Cheyenne Mountain Directorate, Colorado; Command, Control, Battle Management, and Communications (C2BMC), Peterson AFB, Colorado; Space-Based Infrared System/Defense Support Program (SBIRS/DSP), Buckley AFB, Colorado; and AN/TPY-2 (Forward-Based Mission (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

- The Boeing Company, Integrated Defense Systems, Missile Defense Systems, Huntsville, Alabama
- Orbital Sciences Corporation, Chandler, Arizona
- Raytheon Missile Systems, Tucson, Arizona

Activity

- As part of the process to revise the Integrated Master Test Plan (IMTP) and restructure the BMDS test program, the MDA identified seven Critical Engagement Conditions (CECs) and seven Empirical Engagement Events (EMEs) for which flight and ground testing will collect data to validate the GMD models and simulations. The restructured GMD test baseline not only defined tests for FY10-15, but also specified additional needed flight tests through FY20.

- The MDA conducted FTG-05 in December 2008 to test and evaluate GMD performance against a long-range ballistic missile target using target tracking data from multiple BMDS sensors. The MDA launched a long-range, threat-representative target missile from Kodiak, Alaska, toward a broad ocean area west of California. BMDS operational sensors (AN/TPY-2 (FBM), Aegis AN/SPY-1, Sea-Based X-band Radar (SBX), and UEWR-Beale) acquired and tracked the target missile and transmitted data to the operational GFC, which generated a weapon task plan. An operational crew of the 49th Missile Defense Battalion at Fort Greely, Alaska, remotely directed the launch of a GMD interceptor from a test silo at Vandenberg AFB, California. The GMD interceptor intercepted the target missile's simulated warhead.
- The MDA and the BMDS Operational Test Agency (OTA) Team conducted one major ground test and one focused, limited-scenario ground test during FY09:
  - Ground Test Distributed-03 (GTD-03) in February and March 2009 was an integrated ground test using the fielded components and communications to test functionality, interoperability, and performance of the GMD and BMDS. Simulated threat scenarios stimulated the fielded components. Warfighters from the Army's 100th Missile Defense Brigade and 49th Missile Defense Battalion performed their planned wartime duties in a realistic exercise of the fielded BMDS capability.
  - Focused Ground Test-03e (GTX-03e) in July 2009 was an integrated ground test formally requested by U.S. Northern Command and U.S. Pacific Command to characterize fielded BMDS element capabilities, including the GMD, and warfighter operational tactics, techniques, and procedures. Simulated threat and non-threat scenarios stimulated BMDS hardware-in-the-loop element and component representations to test functionality, interoperability, and performance of the fielded capability. Warfighters, deployed from the Army's 100th Missile Defense Brigade to the GMD hardware-in-the-loop laboratory in Huntsville, Alabama, exercised their operational procedures.
- In response to emerging contingencies, the MDA conducted a series of ground tests to assess the capability of the currently configured GMD system against potential threats to the United States and Pacific Rim allies. These tests:
  - Utilized multiple GMD and BMDS hardware-in-the-loop laboratories
  - Deployed warfighters to operate the hardware-in-the-loop laboratories, which provided additional training opportunities and venues to exercise operational tactics, techniques, and procedures
  - Included participation by the BMDS OTA Team, gaining valuable insights into the capabilities and limitations of the currently deployed system

Assessment

- The new GMD baseline test program directed needed focus on data collection for resolution of identified CECs and EMEs. These data are necessary to validate GMD models and simulations, which are essential for evaluation of operational effectiveness and suitability. The plan incorporates periods of stable system configuration to enable data acquisition and operational testing.
- FTG-05 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; execution of warfighter tactics, techniques, and procedures; interceptor performance; and target intercept. The engagement and engagement conditions represented an uncomplicated threat and threat environment. FTG-05 exercised adequate flight test operational realism. A target subsystem malfunction precluded achievement of all the planned test objectives. An interceptor malfunction, although not affecting achievement of test objectives, resulted in a hardware change to mitigate the risk of a similar GMD interceptor malfunction.
- Ground tests GTD-03 and GTX-03e were adequate for characterization of GMD behavior and provided insight into GMD functionality, interoperability, and performance. These tests provided the most accurate representation of the BMDS and GMD for the characterization of performance and for the development and exercise of warfighter operational procedures. Test results suggested GMD provided a capability to defend the United States against limited numbers of long-range ballistic missiles with uncomplicated, emerging threat warheads. The tests identified specific defended regions that posed greater difficulty to defend. Full end-to-end performance evaluation was not possible since specific models and simulations either lacked applicable data, or the applicable data did not meet the acceptability criteria for accreditation as jointly established between the MDA and the BMDS OTA Team.
- Interceptor design evolution complicated assessment of interceptor operational effectiveness and suitability. Continued interceptor configuration changes driven by component obsolescence and problems discovered in flight test have resulted in interceptor-to-interceptor differences among both fielded interceptors and flight test assets.
- Acquisition of suitability data continued to improve. Further refinements of the BMDS Joint Reliability and Maintainability Evaluation Team database are necessary to support evaluation of reliability, availability, and maintainability. Incomplete data requirements for the GMD interceptor and command and launch equipment limit database utility. In addition, the database lacks software maturity metrics for all components.
- The MDA evaluation of survivability is limited. As part of the annual IMTP update process, the MDA is defining the scope of required survivability testing, survivability assessment objectives, measures of performance, and data requirements.

Recommendations

- Status of Previous Recommendations. The MDA has satisfactorily addressed eight of the previous nine GMD recommendations. Although the MDA has made progress, one recommendation to review lethality simulation accreditation remains outstanding.
- FY09 Recommendation.
  1. The MDA should review the IMTP for resource and schedule impacts to the GMD program resulting from changes needed to support the test program for phased, adaptive approach to providing missile defense for Europe.

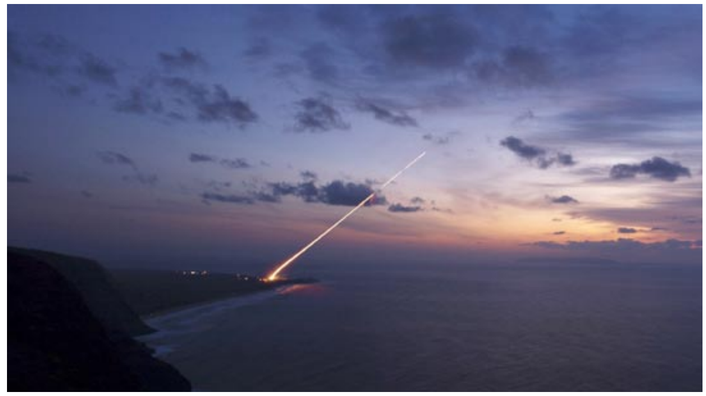
Terminal High-Altitude Area Defense (THAAD)

Executive Summary

- The Terminal High-Altitude Area Defense (THAAD) system performed one flight test in FY09. Flight Test THAAD Interceptor (FTT)-10a was a salvo engagement of two THAAD interceptors against a single separating target. Aegis Ballistic Missile Defense (BMD) provided a cue to THAAD as part of the successful engagement.
- Target preparation issues delayed further flight testing until FY10. The timeline for target preparation and qualification testing did not include sufficient time to troubleshoot test failures and implement required redesigns without impacting flight test schedules.
- THAAD made significant progress in executing the Government Ground Test Program, a critical component of the Army Materiel Release process.
- After completing its lethality testing on the high-speed test track at Holloman AFB, New Mexico, in FY08, THAAD conducted seven reduced-scale light-gas-gun tests to characterize the missile's lethality against missile payloads in FY09.
- The Missile Defense Agency (MDA) intends to transition the first two fire units to the Army in FY10 and FY11. Significant additional capabilities will be tested after the Materiel Release decision in FY10.

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 short-range, medium-range, and intermediate-range theater ballistic missile threats to troops, military assets, and allied territories using hit-to-kill technology. Commanders will 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 Missile and Fire Control, Dallas, Texas
- Lockheed Martin Space Systems Company, Sunnyvale, California
- Raytheon Integrated Defense Systems, Tewksbury, Massachusetts

Activity

- As part of the process to revise the Integrated Master Test Plan and to restructure the test program, the MDA identified eight Critical Engagement Conditions (CECs) and 15 Empirical Measurement Events (EMEs) for which flight and ground testing will collect data to validate the THAAD models and simulations.
- FTT-10a occurred in March 2009. This test was a salvo of two THAAD interceptors against a single separating target. The MDA "cold conditioned" the first THAAD interceptor before the test to simulate operations in a cold environment. The test was a combined developmental and operational test, with minimal contractor involvement. FTT-10a was also a BMDS-level test, with Aegis BMD providing a cue to THAAD as part of the engagement. The Command, Control, Battle Management, and Communications (C2BMC) and Patriot also participated.
- The THAAD Government Ground Test Qualification Program was very active in FY09:
  - The radar, launcher, and TFCC completed safety and mobility testing (except for the Prime Power Unit).

- Electromagnetic-environmental-effects testing began for the missile, launcher, and TFCC.
- The THAAD missile completed fast cook off and 40 foot drop insensitive munitions testing.
- The full THAAD system began natural environments testing at the McKinley Climatic Laboratory at Eglin AFB, Florida.
- Following new equipment training, the Soldiers conducted a maintainability demonstration.

• THAAD conducted seven 40-percent-scale light-gas-gun lethality tests using high-fidelity surrogate payloads between March and September 2009.
• THAAD participated in Ground Test Distributed-03 (GTD-03) in March 2009 using hardware-in-the-loop to demonstrate interoperability with other BMDS components.
• THAAD also participated in the "Caravan 2" U.S. Flight Test-3 in July 2009. An AN/TPY-2 (TM) radar tracked the target, and TFCC forwarded tracks to C2BMC.

Assessment

• THAAD made significant progress in FY09, with the first demonstration of a salvo intercept and cueing from Aegis BMD during a successful live engagement in FTT-10a.
• The program also expanded operational realism during FTT-10a, which was a combined developmental and operational test. Soldiers operated the equipment and used operational tactics, techniques, and procedures. There was minimal contractor support. The test 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.
• The THAAD light-gas-gun tests provided data on the missile's lethality against two types of threat missile payloads, which the MDA will use to support the lethality evaluation and to validate lethality modeling and simulations. The MDA must analyze and understand the significance of some test results that did not match pre-test predictions. Less than optimum test results combined with deficiencies in lethality models may affect the final lethality assessment.
• Target availability continues to challenge the THAAD program schedule. During qualification and integration testing, targets for two upcoming flight tests experienced problems forcing delays in the flight test dates. One target required redesign and retesting of the Avionics Power Assembly. Another target experienced radio frequency interference requiring redesign and retesting of the L-band transmitter.
• The MDA plans additional THAAD testing after the Materiel Release Review Board scheduled for 4QFY10. Specifically, it plans to conduct flight testing against longer-range targets. The expanded capabilities inherent in the THAAD design will not be confirmed by testing before delivery of the two fire units to the warfighter.

Recommendations

• Status of Previous Recommendations. The MDA satisfactorily addressed the one previous recommendation.
• FY09 Recommendation.
  1. The THAAD program should review the results of the completed lethality light-gas gun and sled testing to assure the data it collected adequately supports the completion of the current LFT&E program.

Sensors

Executive Summary

- In December 2008, the Missile Defense Agency (MDA) conducted the Flight Test Ground-based Interceptor (FTG)-05 event employing the AN/TPY-2 (Forward-Based Mode (FBM)) radar, the Aegis Ballistic Missile Defense (BMD) AN/SPY-1 radar, the Sea-Based X-band (SBX) radar, and the Upgraded Early Warning Radar-Beale (UEWR-Beale). These sensors provided data that contributed to the intercept of the target.
- The Ballistic Missile Defense System (BMDS) Operational Test Agency (OTA) has not validated or accredited any high fidelity performance models and simulations for assessing the performance of BMDS sensors.
- The AN/TPY-2 (FBM) participated in the Israeli Arrow System Test-13 (AST-13) flight test and successfully supported a series of ground tests that demonstrated forward-based discrimination capabilities and integration with the Block 3.5 Arrow Weapon System.

System

The BMDS sensors are the following:

- Aegis BMD radars: Aegis AN/SPY-1 radars modified to provide surveillance and tracking of long-range ballistic missiles.

Aegis BMD

- AN/TPY-2 (FBM) (formerly 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 the transition to the midcourse phase of flight. There are two radars operationally deployed, one to Shariki, Japan, and the other to Israel.

AN/TPY-2

- Cobra Dane Upgrade (CDU) radar: An L band, fixed site, fixed orientation, phased array radar located at Shemya, Alaska.

Cobra Dane

- Space-Based Infrared System/Defense Support Program (SBIRS/DSP): An infrared satellite constellation and ground stations (primary and backup) that provide the BMDS with the initial notification of a ballistic missile launch and defended area determination.

SBIRS/DSP

- SBX radar: An X-band 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.

SBX

- Upgraded Early Warning Radars (UEWRs): Ultra High Frequency fixed site, fixed orientation, phased array radars located at Beale AFB, California (two radar sides or "faces," 240-degree azimuth field of view), and Fylingdales, England (three "faces," 360-degree azimuth field of view). Thule Air Base, Greenland (two "faces," 240-degree azimuth field of view) will be added to the BMDS in FY10.

UEWR

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 data for Situational Awareness and battle management to the BMDS Command, Control, Battle Management, and Communications (C2BMC) element
- Provide track data to 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, Moorestown, New Jersey
- AN/TPY-2: Raytheon Integrated Defense Systems, Tewksbury, Massachusetts

- CDU: The Boeing Company, Integrated Defense Systems, Missile Defense Systems, Huntsville, Alabama
- SBIRS: Lockheed Martin Space Systems Company, Sunnyvale, California
- SBX: The Boeing Company, Integrated Defense Systems, Missile Defense Systems, Huntsville, Alabama
- UEWRs: Beale AFB and Fylingdales - The Boeing Company, Integrated Defense Systems, Missile Defense Systems, Huntsville, Alabama; Thule - Raytheon Missile Defense Center, Woburn, Massachusetts

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Activity

- As part of the process to revise the Integrated Master Test Plan (IMTP) and restructure the test program, the MDA identified 16 Critical Engagement Conditions (CECs) and six Empirical Measurement Events (EMEs) for which flight and ground testing will collect data to validate the sensor models and simulations.
- CDU: During the past year, CDU participated in several ground test events, culminating in the system-level exercise, Ground Test Distributed (GTD)-03, in March 2009.
- SBX: SBX collected track and discrimination data on the target during the FTG-05 flight test in December 2008. A target sub-system malfunction precluded completion of specific test objectives. SBX participated in ground test events including the focused ground test GTX-03e in July 2009 and the system-level GTD-03 event in March 2009.
- UEWR: UEWR-Beale participated in the FTG-05 flight test. The UEWRs (Beale and Fylingdales) also participated in several MDA system-level ground test events, notably GTD-03 in March 2009.
- AN/TPY-2 (FBM): AN/TPY-2 (FBM) radar #1 observed the FTG-05 target in December 2008 from its test location in Juneau, Alaska. The MDA deployed AN/TPY-2 (FBM) radar #3 to Israel. In Israel, it participated in the AST-13 flight test by providing track data on the target through C2BMC to the Block 3.5 Arrow Weapon System. This radar also successfully supported a series of ground tests which demonstrated forward-based discrimination capabilities and integration with the Block 3.5 Arrow Weapon System.
- The radar also participated in several ground test events, notably the March 2009 GTD-03 event and the GTX-03e event in July 2009. The AN/TPY-2 (FBM) test asset at Vandenberg AFB, California, has begun using targets of opportunity (Glory Trip-199 and -195) to assess the next software capability release.
- Aegis BMD AN/SPY-1: Aegis BMD AN/SPY-1 participated in multiple live tracking exercises, ground tests, and operational tasking during FY09. Its ground test participation culminated in the system-level GTD-03 event.
- SBIRS/DSP: SBIRS/DSP participated in several ground tests culminating in the distributed ground test GTD-03 in March 2009. A full discussion of the Air Force SBIRS program is provided under a separate entry.
- The MDA conducted System Post Flight Reconstructions (SPFR) for GTX-03b (FTX-03 SPFR), FTG-05 SPFR, and FTT-10a SPFR to support of anchoring SBX, AN/TPY-2, and UEWR radar models.

Assessment

- CDU: Due to its location and field of view, CDU has not participated in BMDS intercept flight test events. Performance estimates for the current configuration of CDU have been limited to the ground test results and targets of opportunity. These estimates rely on models and simulations that are not yet validated and accredited for use in assessing performance. To collect the required data, the MDA will fly another target through the CDU field of view. This flight test event is currently scheduled during 4QFY10.
- SBX: During FTG-05, SBX supported the intercept as part of an ensemble of sensors including AN/TPY-2 (FBM), Aegis BMD, and UEWR-Beale. SBX has not supported a live intercept as the sole primary sensor. SBX performance estimates are currently based on unaccredited models and simulations. Significant work remains to collect the applicable data necessary to validate modeling of SBX performance in the post intercept debris environment.
- UEWRs: UEWR-Beale participated in FTG-05, and UEWRs at both Beale and Fylingdales participated in GTD-03. UEWR-Beale and -Fylingdales performance estimates are based on unaccredited models and simulations
- AN/TPY-2 (FBM): The AN/TPY-2 (FBM) radar deployed to Shariki, Japan, saw significant operational tasking in FY09. During Israeli flight test AST-13, the AN/TPY-2 (FBM) radar #3 acquired the target and passed radar cue data to the Arrow Weapon System allowing it to successfully acquire and track the target. The radar also successfully supported a series of ground tests which demonstrated forward-based discrimination capabilities and integration with Israel's Block 3.5 Arrow Weapon System. Although significant operational data have been collected, performance estimates for the AN/TPY-2 (FBM) are based on unaccredited models and simulations.
- Aegis BMD AN/SPY-1: Aegis BMD AN/SPY-1 continues to support BMDS testing and operational taskings. The MDA continues to evaluate Aegis BMD AN/SPY-1 interoperability with other elements and the BMDS. The MDA has not yet conducted a GMD flight test that used AN/SPY-1 radar data in real-time as the primary data source for developing a GMD weapon task plan. During FTG-05, Aegis BMD supported the intercept as part of an ensemble of sensors including AN/TPY-2 (FBM), SBX, and UEWR-Beale.
- SBIRS/DSP: SBIRS/DSP continues to improve its ability to support the BMDS with timely and accurate launch data and predictive impact data. A more detailed assessment of SBIRS

performance is contained in the Air Force SBIRS program entry.
- Overall: Since the completion of their respective upgrade or development programs, the MDA has gained significant operational experience with each of these sensors. The most important area of concern is the development of consistent, validated environmental and post-intercept debris models to assess integrated system performance.

Recommendations

- Status of Previous Recommendations. The MDA satisfactorily addressed the final two outstanding recommendations.
- FY09 Recommendation.
  1. The MDA should, in concert with the combatant commanders, develop concepts of operations for any new sensors to be used as part of the phased adaptive approach to providing missile defense to Europe.

Technology Programs

Executive Summary

- The Missile Defense Agency (MDA) made progress this past year on its four major technology programs.
- The Airborne Laser (ABL) continued the ground and flight testing necessary to supports its first lethal demonstration against a threat-representative ballistic missile. This lethal demonstration is scheduled for January 2010.
- The Kinetic Energy Interceptor (KEI) continued development and test of the Stage 1 and 2 rocket motors in FY09, completing additional static fire tests, progressing on qualification testing of avionics and other components, and undergoing initial integration testing for the first KEI flight test. The MDA halted KEI activities in May 2009 in anticipation of program cancellation.
- The MDA continued developing the Multiple Kill Vehicle (MKV) program under two contracts in parallel. In FY09, one of the two MKV systems completed a hover test of its propulsion system. The MDA halted MKV activities in May 2009 in anticipation of program cancellation.
- The MDA launched the two Space Tracking and Surveillance System (STSS) satellites in September 2009. Both satellites are currently engaged in initial on orbit satellite check-out activities with completion planned in FY10. The purpose of these satellites is to demonstrate key missile defense sensor risk reduction operation concepts in support of a future missile defense operational satellite constellation.

Systems

The Airborne Laser (ABL) is a prototype missile defense weapon system consisting of the following:

ABL

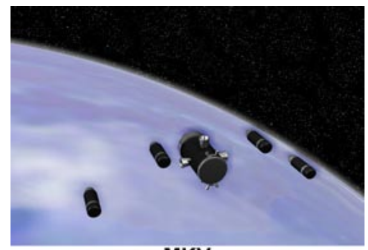
- A modified Boeing 747-400F commercial aircraft
- An infrared surveillance system
- A megawatt-class chemical oxygen-iodine laser
- A turret on the aircraft nose to point the laser beam
- Two illuminator lasers on a bench in the fuselage
- Optical benches with highly sensitive cameras, sensors, and mirrors
- Hardware and software for battle management, command, control, communications, computers, and intelligence
- Ground support equipment for storing, mixing, transporting, and loading laser chemicals

KEI

The Kinetic Energy Interceptor (KEI) concept began as a boost phase missile defense system (including a launcher, missile, and fire control unit). In FY07, the concept changed to a developmental booster with the following key features:

- High acceleration and high burnout-velocity booster rocket
- Designed for either a fixed or mobile, land, or sea-based system
- Design will allow for adding a separately developed kill vehicle

The Multiple Kill Vehicle (MKV) concept employs many small kinetic kill vehicles to be carried aboard a single interceptor.



MKV

- The MDA has pursued two developmental concepts: one by Lockheed Martin (MKV-L) and the other by Raytheon (MKV-R).
- MKV-L consists of a carrier vehicle and a number of attached kill vehicles. Key features of the carrier vehicle include kill vehicle restraints and dispense mechanisms, endgame management and command and control suites, and infrared and visible sensors.
- MKV-R does not use a carrier vehicle. Small kill vehicles are deployed directly from the interceptor rocket. Each kill vehicle can communicate with all other kill vehicles, and can act as the engagement coordinator.

The Space Tracking and Surveillance System (STSS) is a research and development system consisting of:

STSS

- 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)

Missions

ABL – Prior to the MDA downgrading the ABL program to test bed status, the Combatant Commanders intended to 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. Operational commanders were planning to 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 or motor case 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 Ballistic Missile Defense Systems (BMDS) and theater assets.

KEI – Prior to cancellation, the MDA intended to use the KEI booster as part of 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
- Boost alternate kill vehicles toward the interception point

MKV – Prior to cancellation, the MDA intended to use the MKV as the primary kill mechanism for the Ground-Based Interceptor and KEI-booster interceptor deployed in the BMDS, to mitigate the target discrimination problem by destroying all major objects in the field of view using many small kill vehicles.

STSS – U.S. Strategic Command will use the STSS, a space-based sensor element of the 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, intercept data handover to other BMDS sensors and interceptors, and fire control

Prime Contractors
- ABL: The Boeing Company, Integrated Defense Systems, Missile Defense Systems, Huntsville, Alabama
- KEI: Northrop Grumman, Huntsville, Alabama
- MKV: Raytheon Missile Systems, Tucson, Arizona; and Lockheed Martin Corporation, Sunnyvale, California
- STSS: Northrop Grumman, Redondo Beach, California

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 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.

Airborne Laser
- Knowledge Point #6: Conduct First Light into the Laser Calorimeter on the aircraft during ground tests. The MDA completed this knowledge point in FY08.
- Knowledge Point #7: Conduct First Light through the Beam Control/Fire Control Subsystem during aircraft ground tests. The MDA completed this knowledge point in FY09.
- Knowledge Point #8: Engagement with a low-power boosted diagnostic target. The MDA completed this knowledge point in FY09.
- Knowledge Point #9: Demonstrate High-Energy Laser performance in flight. The MDA plans to complete this Knowledge Point in early FY10.
- Knowledge Point #10: Engagement with a high power boosted diagnostic target. The MDA plans to complete this Knowledge Point in early FY10.
- Knowledge Point #11: ABL lethal demonstration to negate a threat-representative ballistic missile during the boost phase. The MDA made substantial progress towards the lethality demonstration with multiple in-flight tracking events using airborne diagnostic and missile targets. However, the lethal demonstration has been delayed to January 2010.

Kinetic Energy Interceptor
- Knowledge Point #2: Demonstrate High Acceleration Booster. KEI testing in FY09 supported progress toward Knowledge Point #2. The MDA originally scheduled this knowledge point for completion after a booster verification flight test in fall 2009, but the MDA removed the flight test from the schedule in May 2009, in anticipation of program cancellation.
  - The MDA conducted Stage 1 and 2 static fire testing in October and November 2008.
  - Qualification testing of booster avionics and structures continued through early FY09.
  - The MDA delivered a preliminary version of the missile consisting of inert stages to Vandenberg AFB, California. The MDA used the inert missile in preparation activities for the first flight test.

Multiple Kill Vehicle
- In December 2008, MKV-L completed a hover test, during which the MKV-L's propulsion system demonstrated maneuverability while tracking a simulated target.
- 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. Prior to program cancellation, the MDA had scheduled the knowledge point for completion by FY09.
- MKV Knowledge Point #1c through 4b: Prior to program cancellation, the MDA had scheduled these knowledge points for completion between FY10 and FY15.

Space Tracking and Surveillance System
- Knowledge Point #2: Space Vehicle Integration. This knowledge point was completed with the launch of the two STSS satellites in September 2009.

- Knowledge Point #3: Confirm Constellation Performance Affordability. The MDA had planned to complete this knowledge point by FY08, but, with the launch delays, the completion date has slipped to FY10.
- Transition Knowledge Point: With the two STSS satellites now on orbit, the MDA will conduct two 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. The first flight test, Flight Test STSS (FTS)-01, scheduled for 3QFY10, will test the ability of STSS to detect, acquire, and track a theater threat. FTS-02 will test the ability of STSS to detect, acquire, and track a strategic ballistic missile.

Recommendations

- Status of Previous Recommendations. There were no previous recommendations.
- FY09 Recommendations. None.

Live Fire Test & Evaluation Program

Live Fire Test & Evaluation Program

Live Fire Test and Evaluation Program

EXECUTIVE SUMMARY

U.S. Code Title 10, Section 2366, requires realistic survivability testing of major conventional air, land, and sea platforms and realistic lethality testing of major munitions and missile systems. Title 10, Section 139, states that the Director, Operational Test and Evaluation (DOT&E) shall monitor and review the Live Fire testing activities of the DoD provided for in Section 2366, and 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 Live Fire Test and Evaluation (LFT&E) report.

In FY09, DOT&E executed oversight for survivability and lethality of 128 acquisition programs. Of those 128 programs, 20 programs operated under the waiver provision as permitted by Section 2366. Title 10, Section 2366 requires DOT&E to report on a program's LFT&E results prior to proceeding to full-rate production. LFT&E published the following reports in FY09: EA-18G Airborne Electronic Attack Aircraft, Guided Multiple Launch Rocket System – Unitary, Logistics Vehicle System Replacement, and MH-60S Block 3A Armed Helicopter Weapon System.

In addition to satisfying acquisition program oversight requirements (Title 10, Section 2366), the LFT&E program funds and exercises technical oversight of investment programs that provide joint munitions effectiveness data; develop advanced technologies and analytical methods to increase aircraft survivability; conduct vulnerability test and evaluation of fielded air, land, and sea platforms; and, conduct munitions lethality testing. LFT&E investment programs also support quick-reaction efforts aimed at addressing emerging warfighter needs. Specifically, LFT&E investment programs enabled DOT&E to respond to these warfighter needs in FY09 as follows:

- **Joint Technical Coordinating Group for Munitions Effectiveness (JTCG/ME)** The JTCG/ME publishes weapon effectiveness manuals, collateral damage estimation tables, methods, and automated tools that enable the 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 the critical task of producing 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).
- **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 maintained a senior uniformed presence with Multi-National Corps-Iraq C3 Air at Camp Victory in Baghdad. In support of OEF, JCAT established an Afghanistan detachment in Kandahar. JCAT uses data gathered from combat, threat exploitation, and Live Fire testing to provide combat commanders information that influences mission planning and tactics.
- **Joint Live Fire (JLF).** The Office of the Secretary of Defense established the JLF program in 1984. JLF tests and evaluates fielded U.S. systems against realistic threats. The program places emphasis on addressing urgent needs of deployed forces, testing against emerging threats, and testing legacy systems and identifying areas for improvement. DOT&E funds, establishes goals and priorities, and oversees the efforts of the JLF program.
  - During FY09, JLF continued its support to the Joint Improvised Explosive Device Defeat Organization (JIEDDO) and to the Army's Program Executive Office (PEO) – Soldier. In partnership with JIEDDO, JLF continues to characterize improvised explosive munitions in environments and emplacements that represent actual combat conditions. Test results provide combat commanders immediate feedback on their vulnerabilities and aid in the development of techniques to improve survivability. In partnership with the Army's PEO - Soldier, JLF funded critical combat helmet pad suspension system testing with the objective of identifying viable candidates for a next generation of helmet pads. This work is critical to the survivability of our warfighters and has also been an area of high interest to the Congress.

JOINT TECHNICAL COORDINATING GROUP FOR MUNITIONS EFFECTIVENESS (JTCG/ME)

The Joint Logistics Commanders chartered the Joint Technical Coordinating Group for Munitions Effectiveness (JTCG/ME) in 1968 to ensure development of consistent, credible effectiveness estimates for conventional munitions across the DoD. The primary application is weaponeering, the detailed technical planning of a weapon strike that occurs at multiple levels in the operational chain of command before actual combat. The JTCG/ME produces, distributes, and regularly updates Joint Munitions Effectiveness Manuals (JMEMs). JMEMs provide computerized operational tools and data for rapid evaluation of alternative weapons and their delivery against specific targets. In many cases collateral damage estimates generated by these tools are part of the decision criteria for strikes approved at the highest levels of the U.S. Government.

In FY09, the JTCG/ME developed and released two updated JMEMs. The first was the JMEM Weaponeering System (JWS) v2.0 (1,400 copies to 900 accounts). JWS v2.0 represents a combination of the formerly separate JMEM/Air-to-Surface Weaponeering System and JMEM/Surface-to-Surface Weapons Effectiveness products. It includes target vulnerability information for approximately 1,500 targets; descriptive information, data, and graphics; computer programs and methods needed to accomplish weaponeering; step-by-step guides to weaponeering, and Help files. JWS v2.0 provides the capability to evaluate the effectiveness of various air to surface and surface to-surface weapons against a variety of target types. The results are available in real-time or in the form of quick, pre-calculated data. The JTCG/ME sponsored training on the v2.0 software to over 300 users at over a dozen key continental U.S. (CONUS) and outside-CONUS operational sites. In addition, the JTCG/ME continued to provided direct support to Central Command and the Joint Staff "No-Strike and The Collateral Damage Estimation Methodology" process. The JTCG/ME provided data updates concurrent with deployment of rapidly fielded weapon systems supporting operations in OIF and OEF.

The second product released by JTCG/ME was the Joint Anti-Air Combat Effectiveness (J-ACE) System v4.0 that contains the Joint Anti-Air Model. J-ACE can read Eglin test range information data files and incorporates new Threat Modeling and Analysis Program models for enemy air-to-air missiles and surface-to-air missiles. The models also perform logic checks for maximum off bore sight launch angle limits. Additionally, J-ACE v4.0 contains new AIM-9M/X and AIM-120C effectiveness data and architectural and graphical user interface improvements. This JMEM is used by fighter pilots to develop air superiority tactics and by Strategic Command for global strike mission planning.

The JTCG/ME continued JMEM development efforts to support Information Operations. Specifically these efforts, performed in coordination with the United States Strategic Command and various Government Agencies, resulted in enhancement to the Computer Network Attack Risk and Effectiveness Analyzer and various Psychological Operations tools. Information Operations training was conducted at numerous locations. Initiatives related to JMEM development for other non-traditional effects (e.g., non-lethal, High Energy Laser, High Power Microwave) continue. In conjunction with the Joint Non-lethal Weapons Directorate at Quantico, Virginia, the JTCG/ME produced a beta version of the first-ever Joint Non-lethal Assessment Tool.

JOINT AIRCRAFT SURVIVABILITY PROGRAM (JASP)

The mission of the JASP is to increase the effectiveness of DoD aircraft by developing technology to reduce the susceptibility and vulnerability of aircraft. JASP provides inter-Service exchange of information regarding the survivability of aeronautical systems in combat environments. Working with joint and Service staffs, other government agencies, and industry, the JASP identifies opportunities to develop new capabilities and works to assure they are pursued jointly by the Services.

JASP is sponsored and funded by DOT&E and chartered by the Naval Air Systems Command, Army Aviation and Missile Command, and Air Force Aeronautical Systems Center. DOT&E establishes objectives and priorities for the JASP and exercises oversight of the program.

In FY09, the JASP worked with OUSD(AT&L) to conduct a congressionally-directed Study on Rotorcraft Survivability (Section 1043, 2009 National Defense Authorization Act). The multi-disciplinary study team led by the JASP determined rotorcraft loss rates and causal factors, and recommended solutions for combat losses as well as losses due to mishaps. The study report was signed by OUSD(AT&L) on October 2, 2009, and delivered to Congress.

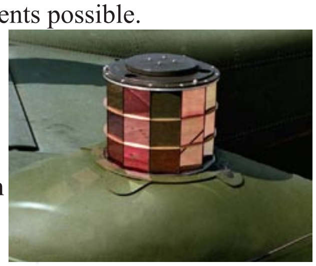
The JASP continued to work with the defense acquisition community, the Department of Homeland Security, the Federal Aviation Administration, the Transportation Security Administration, and the National Aeronautics and Space Administration to address critical issues regarding aircraft survivability. Accordingly, JASP funded 53 multi-year survivability projects for $9.8 Million and delivered 40 reports in FY09. The following summaries illustrate current JASP efforts in four focus areas; susceptibility reduction, vulnerability reduction, survivability assessment, and combat damage assessment.

SUSCEPTIBILITY REDUCTION

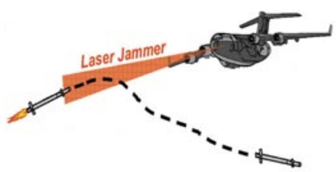
The JASP continues as a leader in DoD susceptibility reduction science and technology efforts. These efforts address urgent aircraft survivability needs emerging from OEF/OIF and improve aircraft survivability against future threats.

Below are example projects in each focus area.

Correlation of Seeker Test Van Data with Intelligence. Discrepancies discovered between flight test results and intelligence estimates have significant implications for survivability, tactics, and countermeasure deployment against infrared Man-Portable Air Defense Systems (MANPADS) threats. The JASP is investigating these discrepancies to provide the most accurate seeker effectiveness assessments possible.



Imaging Infrared Seeker Countermeasures. With JASP support, the Naval Research Laboratory continues to develop countermeasures against missiles with Imaging Infrared seekers. In FY09, several promising countermeasure techniques were developed using digital modeling and simulation. The project will complete in FY10 after the technique's effectiveness can be verified using hardware-in-the-loop simulation facilities.



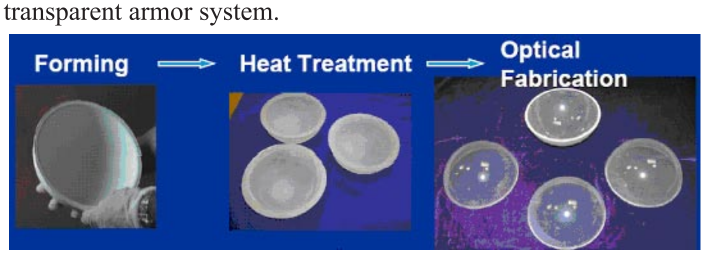
Advanced Techniques for Radio Frequency Countermeasures. In partnership with the U.S. Army Communications-Electronics Research, Development, and Engineering Center, Intelligence and Information Warfare Directorate, the JASP is supporting the development and testing of countermeasures technology and techniques to increase aircraft survivability and situational awareness for Army, Navy, and Air Force rotary-wing aircraft. This project assesses the ability of an onboard radar warning receiver to receive, process, and display each mode of a threat system. It also develops radio frequency countermeasure techniques and demonstrated their effectiveness against a state-of-the-art threat radar system. The first year of the project, FY09, was successful and the techniques developed during that effort are already being transitioned to the Services.

Passive Coherent Location (PCL) Countermeasures. PCL systems can use existing military and commercial transmitter signals (e.g., TV/radio broadcast signals, air traffic control radars, etc.) as target "illuminators of opportunity." Open sources around the world show an increasing interest in PCL as a way of passively tracking aircraft on the battlefield. In response, the JASP and the Office of Naval Research are funding efforts to develop and demonstrate techniques to deceive, obscure, and/or jam a surrogate PCL system without disrupting or interfering with commercial transmitters. These electronic attack (EA) techniques, if effective, provide a new EA capability to protect strike aircraft against these passive threats.

VULNERABILITY REDUCTION

The JASP maintained its role as the leader within the DoD for the development of aircraft vulnerability reduction technology. In FY09, the JASP continued to focus on developing lighter-weight opaque and transparent ballistic protection systems, fuel containment technologies for fuel system components, and fire protection technologies.

Development of Transparent Armor Systems. The Army Aviation Applied Technology Directorate, 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. The project matched indices of refraction between multi-component materials and quantified improvements over the baseline transparent armor system.

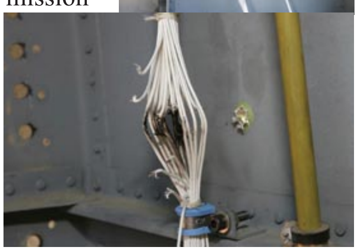


Joint Thermal Degradation of Composites. The 780th Test Squadron at Wright-Patterson Air Force Base (WPAFB), together with the Air Force Research Lab and the Naval Air Systems Command, continued quantifying the degradation of aircraft structural composite materials as a function of the thermal flux caused by short-lived fuel fires.

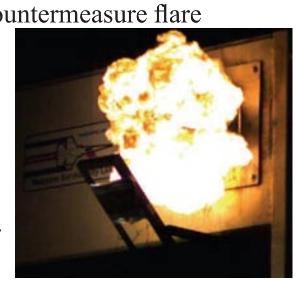
Wireless Fire Detector. The 780th Test Squadron at WPAFB continued work to develop a wireless fire detector for plug and play application in emerging and legacy aircraft. The goal of this effort is to produce a low-cost, lightweight, fast-acting and reliable fire protection system that is easy to retrofit into fielded aircraft.

Survivable Engine Control Algorithm Development (SECAD) Turboshaft Application. The Naval Air Warfare Center Weapons Division (NAWCWD) at China Lake, California, together with General Electric Aircraft Engines, completed applying the SECAD methodology to turboshaft engines in cooperation with the T-700 Project Office. Specifically, damage detection algorithms were developed for integration into the Full Authority Digital Electronic Control controls on the UH-60M helicopter and bench-tested on the real-time hardware-in-the-loop T-701E engine simulator.

Electrical Power Battle Damage. The project goal is to characterize electrical system response to battle damage with and without improved circuit breakers, and to confirm the improved system response through live fire testing. The Naval Air Warfare Center Aircraft Division at Patuxent River, Maryland, is improving the process of isolating the damage and rerouting power of the H-60 helicopter in order to preserve the aircraft's mission capability.



Joint Flare Dispenser Vulnerability Reduction. NAWCWD continued to investigate and test novel technologies to reduce the effects of ballistically induced flare initiation in internally installed countermeasure flare dispensers. The goal is to develop technology that is lightweight, low-cost, and capable of installation on currently fielded and future aircraft. Effectiveness is measured by the ability to reduce pressure and temperature in an adjoining dry bay of a representative airframe.



SURVIVABILITY ASSESSMENT

The JASP has led the effort in DoD to develop of aircraft survivability assessment methodologies.

Crew and Passenger Survivability (CAPS) Methodology. In FY09, the JASP initiated an effort to improve the survivability of crew and passengers in aircraft that cannot make a normal landing due to combat damage. The goal is to develop a methodology that predicts the probability and number of casualties, crash conditions at landing, and crash effects on passengers and crew.

The project began with a workshop in January 2009 to identify methodologies and data relevant to aircraft occupant casualties of all types. The workshop participants included representatives from each Service, as well as other government organizations including the National Transportation Safety Board, the National Highway Transportation Safety Agency, and NASA. The data and ideas from the workshop will be documented in a report and used to develop an initial CAPS methodology.

COMBAT DAMAGE ASSESSMENT

During FY09 the Joint Combat Assessment Team (JCAT) deployed Navy, Army, and Air Force personnel 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, Baghdad. JCAT expanded its operations into Afghanistan, deploying Army, Marine Corps, and Navy assessors to OEF. An initial full-time deployment was established with the Marine Corps at Camp Bastion.

JCAT support includes inspecting damaged or destroyed aircraft, acquiring available maintenance documentation, and conducting interviews with aircrew and intelligence personnel. Consultation is provided to weapons, tactics, and logistics personnel and comprehensive briefings are given 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 threat assessments. These efforts included 1,416 days of effort of which 1,274 days were forward deployed in Iraq and Afghanistan resulting in the completion of 50 aircraft evaluations and reports.

The Army component of JCAT developed Combat Battle Damage Collection and reporting requirements for Army Aviation. The Army JCAT intends to provide deployed warfighters with a reporting link accessible via the United States Army Aviation Center of Excellence web site. This link will expedite timely battle damage reporting and feeds the Combat Damage Incident Reporting System (CDIRS) hosted by the Survivability/Vulnerability Information Analysis Center (SURVIAC). The JCAT continues to work closely with SURVIAC to upgrade the CDIRS database and data reduction capabilities. This SURVIAC database is the repository for all U.S. aircraft battle damage events.

The JCAT provides professional training to the U.S. aviation community. JCAT Army members hosted the 2009 Threat Weapons and Effects Seminar at Eglin Air Force Base, Florida, with almost 200 survivability experts and Service personnel in attendance. Attendees included industry partners and 12 U.S. government agencies including all four U.S. military services, Department of State, Department of Homeland Security, Federal Aviation Administration, Department of Energy, Federal Bureau of Investigation, and the Bureau of Alcohol, Tobacco, Firearms and Explosives.

The JCAT provides a number of briefings in each of the Professional Military Education classes at Fort Rucker, Alabama.

The briefs include but are not limited to: capabilities briefs, intelligence updates, recent "shoot-down" briefs to discuss enemy tactics, techniques, and procedures, and the combat damage collection and reporting mentioned above. The attendees at these briefings range from individual crewmembers to the Vice Chief of Staff, U.S. Army. In FY09, JCAT Army conducted over 140 such briefs to over 4,000 Service members.

JCAT led the effort to prepare the DoD response to the congressionally-directed Study on Rotorcraft Survivability (Section 1043, 2009 National Defense Authorization Act). JCAT aircraft combat damage reporting in OIF and OEF was critical to understanding the combat survivability of DoD's rotorcraft fleet.

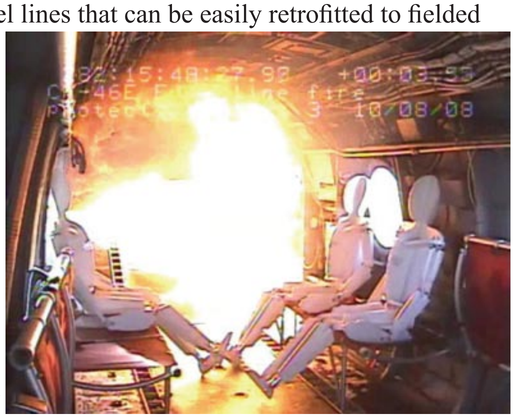
JOINT LIVE FIRE (JLF)

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.

AIRCRAFT SYSTEMS PROGRAM

U.S. helicopters continue to be subject to hostile fire. Owing to previous survivability enhancements, the majority of the aircraft that receive combat damage return to base, are quickly repaired, and return to flying status. However, some are lost, primarily due to missile (both guided and unguided) hits and small arms/heavy machine gun projectiles. Many times in-flight fires resulting from hostile fire bring aircraft down. The goal of the Aircraft Systems Program is to identify vulnerable areas in current aircraft platforms, understand damage mechanisms, and provide this information to survivability engineers. In FY09, JLF Aircraft Systems (JLF/AS) began several large multi-year projects to deal with the MANPADS threat and assess the vulnerability of rotary-wing aircraft to threat-induced fires. These are discussed below.

CH-46 Fuel Line Fire Protection. The mission of the CH-46 helicopter is to provide all-weather transport of combat troops, supplies, and equipment during amphibious and subsequent operations ashore. As early as 1966 in Vietnam, the CH-46 was shown to be vulnerable to small arms projectiles and fragments penetrating pressurized fuel lines, causing catastrophic fire. As late as 2007 in Iraq, a fuel line fire is thought to be a major contributing factor in the loss of aircraft and all passengers after a CH-46 was hit by a MANPADS. The objective of this project is to evaluate the effectiveness of fire-reduction technologies for pressurized fuel lines that can be easily retrofitted to fielded aircraft. Five different passive fire reduction and suppression technologies were evaluated alone and/or in combination. Candidate technologies included dry-bay foam, self-healing plastic sheets, and a low-cost, lightweight, commercial off-the-shelf (COTS) fire detection and extinguishing system known as the Firetrace Indirect Extinguishing system. Threats tested ranged from 7.62 mm armor piercing incendiary to 23 mm high explosive incendiary. The final report should be available through the Defense Technical Information Center by the end of 2009.



H-60 Dry Bay Compartment Fire Protection and Vulnerability Test. Results from the Joint Army/Navy H-60 helicopter ballistic vulnerability LFT&E program identified concerns in the transition section of the aircraft, above and behind the main fuel cells. The H-60 series of helicopters do not have fire detection and suppression systems for these regions. The objective of this test program is to provide additional insight into these vulnerabilities and to demonstrate a potential hardware solution. Testing used the results from the JLF-Air CH-46 fuel line testing project. Some additional testing specific to the transition section of this platform was conducted. The testing concentrated on a low-cost, lightweight, COTS fire detection and extinguishing system known as the Firetrace Indirect Extinguishing system. This system proved very successful in the CH-46 testing and illustrates a potential solution to reduce fire vulnerability. Post-test results will be provided to the U.S. Army Utility Helicopter Program Office, U.S. Navy PMA-299 MH-60R/S Multi-Mission Helicopter Program Office, and other organizations as appropriate. Testing completed in FY09 and the final test report will be released per JLF/AS guidelines during FY10.

F-404 Fuel Ingestion Characterization. The emphasis of this JLF/AS test project is to improve understanding of the fuel ingestion phenomenon, specifically, the dynamic internal engine pressures generated during a quick dump fuel ingestion event. A better understanding of this type of incident is needed to determine the magnitude of the overpressure events, and whether the overpressure is a localized or global event within the engine. This information is important for analyzing future engine vulnerabilities. There are two phases to this project, and each will evaluate a specific engine independently. The General

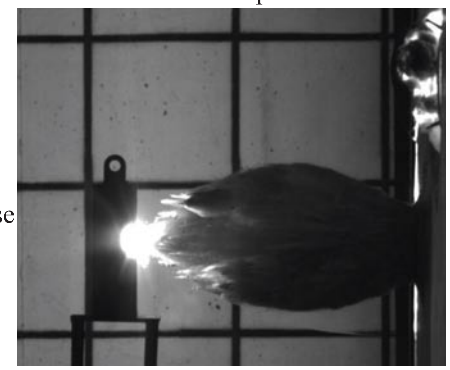
Electric F-404-GE-400 engine powers the F/A-18 A-D model aircraft and is the subject of Phase I. Phase II will evaluate the F-100-PW-100 engine, flown on the F-15 and F-16 aircraft. Phase I was used as a test specimen to collect time – pressure data, and to evaluate techniques to collect these data. The data will be passed on to Pratt & Whitney and the General Electric/Fighter Engine Team to aide in their evaluation of their engines under the Joint Strike Fighter Live Fire Test. Test planning and execution began at the end of FY08 with testing completed in FY09. The final report should be available through Defense Technical Information Center early in FY10.

Large Engine Man-Portable Air Defense Systems (MANPADS) Vulnerability. The Department of Homeland Security (DHS) has also shown a great deal of interest in the vulnerability of large engines to the MANPADS threat. JLF/AS and DHS have partnered to test this vulnerability, with DHS providing matching funds to execute this testing. JLF/AS will shoot two MANPADS into functional CF6-50 aircraft engines. The engines are representative of those found on the A300, B747, and KC-10 aircraft. The project can also be a starting point for the LFT&E vulnerability analysis on the future KC-X acquisition program. This large turbofan engine project is a follow-on to a previous JLF project (T-04-02) that involved inert and live-warhead MANPADS impacts on a non-rotating TF39, C-5 aircraft engine. NASA will also be involved in this project using a combination of wind tunnel models and modeling and simulation to estimate the damage effects on aircraft safety of flight. This is an excellent example of inter-agency cooperation and leveraging of funds, which will go a long way in understanding the threat effects of MANPADS missiles and filling capability shortfalls in the JASP and JLF/AS MANPADS Roadmap. Test planning and coordination began in FY09 and testing is scheduled to proceed through FY12.

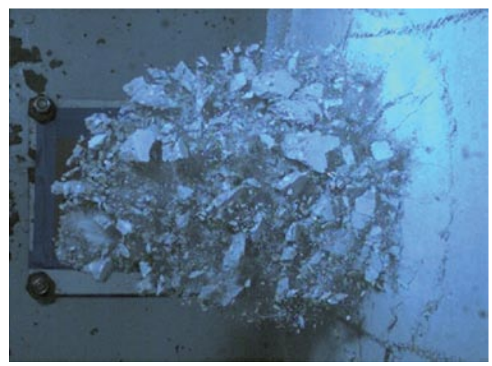
ARMOR/ANTI-ARMOR SYSTEMS PROGRAMS

The armor/anti-armor program seeks to fully characterize current threat weapons and munitions, providing critical empirical data to organizations such as the Joint Improvised Explosive Defeat Organization and the Joint Technical Coordinating Group for Munitions Effectiveness. The program also addresses combat helmet protection and survivability from weapons effects when traveling in tactical vehicles. The armor/anti-armor program continues to be instrumental in the understanding of weapons effects during Military Operations in Urban Terrain (MOUT) environments. Below are armor/anti-armor projects conducted during FY09.

Military Operations in Urban Terrain (MOUT) Weapon Effects of Emerging Threats Detonated Against Barriers. Testing of surrogate threats from the current theater of operations against several barrier configurations used by coalition forces for combat operation posts occurred in FY09. The tests investigated the mitigation/defeat of these threats through the use of high-performance concretes, air gaps, Hercules Engineering Solutions Consortium Bastions, and multiple barrier assemblies. The 2009 JLF MOUT program continued to investigate weapons effects using barriers made of high-performance concrete. A direct comparison of effects against this material and effects against conventional strength concrete are being performed for some of the threat/target pairings.

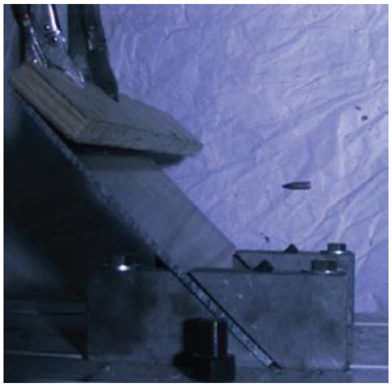


Testing to Collect Data in Support of Expanded Fast Air Target Encounter Penetration (FATEPEN) Modeling Capability. JLF completed testing to gather data to expand the capability of the engineering penetration and damage model FATEPEN. FATEPEN is used to model fragments generated from fragmenting warheads striking concrete targets. This testing is focused on refined debris collection for concrete targets reinforced at various locations. FATEPEN is utilized by both the JTCG/ME and JASP for the analysis of fragmenting warheads.



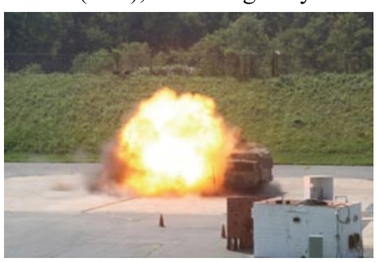
Venting Effects on Quasi-static Pressure. Current Vulnerability/Lethality models inaccurately predict the structural response of urban targets when subjected to munition attacks. One possible reason may be the inaccurate prediction of quasi-static pressure. The objective of this FY09 JLF program was to determine a relationship between structural venting and quasi-static pressure levels. To ensure the relationship was neither facility, nor charge weight dependent, two structures and multiple charge

sizes were used. The Air Force Research Laboratory performed evaluations at the Reusable Target at Eglin Air Force Base. The Army Research Laboratory performed evaluations at the two-room blast structure at Aberdeen Proving Ground. The data obtained will be used to improve current methods for predicting weapon effects during Military Operations in Urban Terrain.



Testing to Collect Data in Support of Projectile Penetration (ProjPen) Modeling Capability. JLF completed testing to gather data for small caliber projectiles striking multiple metallic plates. Testing focused on the residual properties of the projectiles. This testing will provide a greater understanding of projectile penetration through realistic targets. ProjPen is utilized by both the JTCG/ME and JASP for the analysis of small caliber projectiles.

External Blast - Full Vehicle Blast Data and Validation. Testing in FY09 was conducted to assess the vulnerability of towed and portable generators, a towed howitzer (T12), a towed gun system (KS-19), a radar van, and a light observation helicopter (OH-58) to external air-blast loads. Testers detonated bare explosive spheres at various positions and made careful assessments of the resulting blast damage. Instrumentation characterized the applied air-blast load to the target. Engineers then analyzed the data to develop lethal miss distance contours (the distance from a detonation that a person or equipment must be to survive) with respect to mobility, firepower, and catastrophic target kills.



Arena Testing Methodology Improvements. The proper evaluation of the lethality of a weapon against a target requires accurate characterization of the lethal effects of its warhead. This study assessed the state-of-the-art of warhead arena testing. The study also investigated the possible benefits of new technologies and concluded by making a series of recommendations. First among these recommendations is to augment warhead arena testing with predictive analysis. This will both lower the cost and improve the quality of warhead characterization. The study also recommended a new medium for capturing the fragments produced in these arena tests. This will improve the accuracy of the fragment recovery process and lower the test cost.

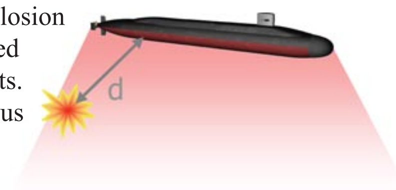
SEA SYSTEMS PROGRAM

The JLF/SS made significant progress in 2009 toward assessing the survivability of submarines and surface ships. Examples of these efforts are discussed below.

Finnish Fast Attack Craft Testing. In 2009, a multi-year, trilateral (US, Finland, Germany) cooperative effort was initiated to perform damage testing against two aluminum, decommissioned Finnish fast attack craft. The Finnish Navy is providing the boats, and has conducted testing on their test range; the German and U.S. Navies are providing instrumentation, test planning, and analysis. The objective is to understand the behavior of aluminum structures subjected to various weapon effects; the ongoing validation of analytical tools for these applications is a primary objective.

Network Fire Model Enhancements. This project provided funds to the Naval Research Laboratory (NRL) to further develop the Fire and Smoke Simulator (FSSIM). This investment allowed the incorporation of non-traditional Navy ship structural materials, such as aluminum, into FSSIM models. The enhanced model was used to assess the structure of the Joint High Speed Vessel. The model can be used by engineers to develop designs that limit the spread of smoke and fire. The FSSIM enhanced model is available to ship designers through the NRL.

Submarine Susceptibility to Mines. This project is improving the ability to assess the susceptibility and vulnerability of submarines to threat mines through testing and analysis. In August 2009, small-scale testing was initiated for the purpose of advancing underwater explosion vulnerability analyses based on susceptible engagements. Remaining efforts will focus on understanding the data, validating analyses, and constructing relevant engagement scenarios for vulnerability analyses.



Full Ship Shock Trial (FSST) Cost Reduction Study. This study investigated the costs associated with the planning and execution of FSSTs. It also explored options to conduct FSSTs at a cost of no more than $15 Million. The effort based its findings on an in-depth study of the most recent FSSTs: the LPD-19 (2008) and the DDG 81 (2001).

SPECIAL PROGRAMS

The JTCG/ME, JASP, and JLF programs are formal programs funded by DOT&E. In addition to these programs and DOT&E's statutory oversight responsibilities, DOT&E participates in focused initiatives that directly support warfighters deployed to OEF/OIF, and/or address issues of significant importance to the Congress. Four of these efforts are described in the Special Programs section.

Personnel Protection Equipment. DOT&E continued oversight of personnel protection equipment testing. DOT&E and the Army provided an interim report to Congress in October 2008, on testing completed to support PEO - Soldier's source selection process for hard body armor. Subsequently, the Army Test and Evaluation Command (ATEC) completed First Article Testing (FAT) in February 2009 and follow-on Lot Acceptance Testing (LAT) on material submitted for government purchase. Concurrent with those LATs, ATEC initiated a second phase of extended ballistic testing in February 2009, to characterize rigorously the performance of plates that passed FAT and LAT. Phase II results are also helping DOT&E, in partnership with the Services and the U.S. Special Operations Command, to develop a new hard body armor testing protocol. ATEC completed Phase II testing in October 2009 and expects to complete their report in mid-January 2010. DOT&E will prepare an independent report of the Phase II testing.

The DoD Inspector General (IG) published a report in January 2009, which focused on testing overseen by PEO - Soldier prior to 2007. The DoD IG indicated inconsistencies in First Article and Lot Acceptance tests that questioned the performance of some hard body armor plates in the Army's inventory. Though DOT&E did not agree with all of the DoD IG's findings related to FAT and LAT efforts, DOT&E did agree with the DoD IG that government oversight of testing should be increased and that DOT&E should prepare a DoD-wide standard for body armor ballistic inserts. Subsequently, the Army transferred responsibility for all hard body armor testing to ATEC. DOT&E is exercising oversight of that testing, and is in the process of preparing a DoD-wide standard for hard body armor testing.

The Government Accountability Office (GAO) published a report in October 2009, indicating that Army testers did not consistently follow appropriate testing procedures during the previously mentioned testing conducted by ATEC. The GAO indicated that the Department cannot be assured that the capability of body armor plates procured by the government and tested by ATEC will protect against threats they are designed to defeat. Although the DoD did not agree with some of GAO's conclusions, the DoD agreed that inconsistencies in testing did occur. To address the GAO's recommendations, DOT&E commissioned the National Academy of Sciences to conduct an independent review of tests conducted at Aberdeen Test Center that were the subject of the GAO review. The review is broad in scope and the Academy is asked to provide recommendations on how to best test hard body armor. A final report will be completed in early 2011. An interim report will be provided in early January 2010 providing recommendations on the use of the laser measuring instruments and clay backing material used in body armor testing.

Enhanced Combat Helmet. During FY09, the U.S. Marine Corps and the Army invited DOT&E participation on their joint effort to rapidly develop and field an enhanced combat helmet. This program seeks to increase ballistic protection for warfighters while maintaining weight equivalent to the Army's currently fielded Advanced Combat Helmet. The Services have made significant progress on a very technically challenging effort. Testing against developmental models of helmets will continue into FY10.

Active Protection Systems (APS). In response to FY08 legislation, DOT&E continues to direct and oversee testing of active protection systems with the potential of protecting wheeled tactical vehicles, especially light wheeled tactical vehicles. Presently six manufacturers are participating in this program. Efforts to include international vendors have been successful. Testing will continue through FY10. Upon completion, DOT&E will provide a report to the Congress.

Non-Lethal Weapons (NLW) Test and Evaluation. In response to FY07 legislation, DOT&E continues its involvement with the Joint Non-Lethal Weapons Directorate and the Service force protection equipment and NLW program managers. DOT&E published its "Policy for Operational Test and Evaluation and Survivability Testing of Force Protection Equipment and Non-Lethal Weapons" via memorandum in September 2008. This policy established the Services' responsibility in meeting the DOT&E policy and defined DOT&E's goals for complying with the legislative requirement.

Information Assurance and Interoperability

Information Assurance and Interoperability

Information Assurance (IA) and Interoperability (IOP) Evaluations

SUMMARY

Assessments in FY09 were performed during 25 Combatant Command and Service exercises, with the following observations:

- Approximately 75 percent of the fielded systems observed do not have current interoperability certifications. Additionally, interoperability among mission-critical systems is less than expected for certified and previously tested systems. Manual means and overrides are used to ensure the timely and accurate exchange of critical operational information. Data incompatibility among fielded systems continues to inhibit efficient exchange of intelligence as well as command and control information.
- DoD has improved awareness and preparations to meet the growing threats to military information systems and networks. Nonetheless, the ability of DoD to protect critical information, detect intrusions and exploitations, and rapidly react and restore capabilities continues to be challenged by the capabilities of potential adversaries.
- Several major Combatant Commander exercises incorporated more realistic depictions of network adversary tactics and activities; however, many of the effects are simulated or examined in pre/post-exercise table top events. While this approach can support exercise-training objectives, it does not provide the data collection opportunity to support system assessment. A majority of the exercises conducted do not realistically portray the array of cyber threats facing DoD networks. As a result, exercise assessment results may provide a more optimistic portrait of DoD network readiness than may actually exist. The Secretary of Defense (SECDEF) guidance to plan for, implement, and regularly exercise the capability to fight through cyber/kinetic attacks that degrade the Global Information Grid has not yet been fully implemented.
- The majority of vulnerabilities and network security shortfalls observed in both exercise and acquisition system assessments continue to be basic in nature and easily remedied by qualified local personnel. Across assessed organizations, network-defender manning and training has improved slightly, but manning remains well below the level of comparable industry networks.
- Commercially available anti-virus and security-management tools have improved the security of military operations where fielded, but implementation of these tools remains incomplete, and a number of systems/networks remain at risk. Effectively restricting use of network resources to authenticated users, and detecting unauthorized and unauthenticated use of information systems remain challenges.
- Process improvements for FY09 included the following:
  - DOT&E developed updated standards and guidance for exercise assessments to enhance the analytical rigor, consistency, and focus on interoperability of those assessments.
  - DOT&E and Joint Forces Command (JFCOM) have formed a partnership for enhanced interoperability assessments that focus on specific systems identified by Service representatives that are critical for mission accomplishment.
  - DOT&E issued revised procedures for Information Assurance (IA) evaluations during Operational Test and Evaluation (OT&E) events, with added emphasis on attack detection, reaction, and system restoration capabilities.
  - DOT&E and the Under Secretary of Defense (AT&L) have undertaken a combined effort to better integrate IA testing and evaluation across the developmental and operational testing continuum.

PROCESS

DOT&E oversees the execution of the IA and Interoperability (IOP) assessment program. Participating Service and Agency teams perform the assessments and assist the Combatant Commands (COCOMs) and Services in designing the exercise scenario in which the assessments take place. DOT&E aggregates and analyzes assessment data to provide feedback to the Military Services and DoD agencies.

Interoperability assessments include the following phases:

- Review and Coordination – Identify known or suspected interoperability problems, key systems that support the Commanders Critical Information Requirements (CCIRs), or systems and mission threads that support the Joint Forces Command Optimum Capability Mix goals.
- Research and Planning – Research identified systems and mission threads; identify best assessment venue to acquire needed interoperability data; and develop a detailed assessment plan that details how the required data will be captured, analyzed, and reported.
- Execution and Analysis – Collect exercise assessment data and analyze (including post-exercise reconstruction, where available) to document interoperability successes and shortfalls.

The IA assessment process includes the following:

- Review and Coordination – Identify known and suspected IA problems or key systems and mission threads that support the CCIRs. Review appropriate threat assessments and identify

the appropriate level of threat portrayal and Blue and Red Team support requirements.
- Research and Planning – Research identified systems and mission threads and develop a detailed assessment plan that details how the required data will be captured, analyzed, and reported.
- Blue Team Vulnerability Assessment – Perform technical and non-technical assessments, including scans and surveys of networks, network personnel, and network policies and practices.
- Green Team Remediation and Mitigation Support – Assist the Exercise Authority in interpreting the results of an assessment, addressing shortfalls, and coordinating remediation and training, as required.
- Red Team Penetration and Exploitation Assessment – Perform live network assessments via penetration testing and other activities as part of the exercise scenario, and in support of the exercise opposition force.
- Analysis – Collect all data and analyze (aggregating Blue, Green, and Red Team results) to document IA successes and shortfalls.

FY09 ACTIVITY

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 significant findings are reported to Service acquisition authorities, Service Chief Information Officers, and specific program offices, where appropriate, for investigation and resolution.

To improve assessment rigor, this year the IA and IOP assessment program performed the following activities:

General

- Continued the development, validation, and implementation of a standardized set of IA and IOP metrics and analytical methods that quantify operational performance attributes and outcomes. These metrics are closely linked with other efforts within DoD to quantify and evaluate IA and IOP effectiveness, determine return on investment, and identify areas for improvement. New measurement areas include adversary level-of-effort metrics, direct outcome metrics, and personnel training demographics. DOT&E issued guidance in FY09 to increase the emphasis on threat realism, more rigorous data collection, and analytical requirements.
- Developed an IA & IOP Assessment Database that will provide program analysts with a secure, automated, and standardized source of exercise results. The database will support queries and analyses, and produce automated displays and reports.
- Examined a number of "prototype" IA and IOP metrics and methods of measurement during assessment events. These efforts allowed the experimental use of new measures and techniques in order to evaluate not only the networks and systems in question, but evaluate the assessment process for improvements and enhanced practices.
- The JFCOM led development of a net-enabled Universal Joint Task List (UJTL) will provide a mission context for the interoperability and information assurance findings. DOT&E is incorporating the net-enabled UJTL construct in both OT&E and fielded system assessments.

Interoperability

- Partnered with U.S. Joint Forces Command (JFCOM) for enhanced interoperability assessments that focus on Optimum Capability Mix systems identified by Service leadership that are critical for mission accomplishment. This partnership will be leveraged to enhance assessments during FY10 and beyond, by ensuring realistic C4ISR functionality and appropriate levels of threat portrayal are included for these assessments. By working collaboratively with the JFCOM Joint Systems Interoperability Integration Laboratory, there is an opportunity to provide additional technical rigor to understand problems seen in the field exercises.

Information Assurance

- Expanded the set of core IA compliance measures from 32 to 46 to more fully represent requirements for detection and restoration, in addition to protection and reaction activities. These core measures were also supplemented by a set of specific interoperability measurements, both technical and operational, to permit more accurate measurement of system performance and interoperation in mission contexts.
- Sponsored Defense Intelligence Agency development of cyber threat support documents to guide the realistic portrayal of network threats during COCOM and Service exercises, and worked with the National Security Agency (NSA) and other DoD Red Teams to enhance their tools and techniques to more realistically portray nation-state level threats during exercise assessments.

FY09 ASSESSMENT ACTIVITIES

In FY09, the assessing organizations performed 25 assessments. These included 17 COCOM and eight Service exercise assessments (Table 1). Five of these assessments involved units preparing to deploy (or already deployed) to Iraq and Afghanistan.

DOT&E revised the IA policy for acquisition programs. The policy was updated through a "Lean Six Sigma" process with an emphasis on assessment procedures of attack detection, reaction, and restoration in addition to the long-standing protection focus. A number of programs, including T-AKE, LPD-17, Ship Self-Defense System, Global Hawk, Palladin PIM, F-15E, Integrated Air and Missile Defense, Patriot PAC-3, Mobile User Objective System, Distributed Common Ground Station-Army, Net-Enabled Command Capability, CVN-78, C-5 Reliability Enhancement and Re-engining Program, MQ-9, and SM-6 have begun to implement these new procedures in their OT&E planning.

Interoperability assessments are becoming more effective at identifying problems. Two interoperability assessments conducted during the latter part of FY09 had a greater operational context and interoperability focus than most of the others, signaling progress toward achieving more realistic and robust interoperability assessments as we move into FY10. One of these assessments focused on achieving real-time sharing of track data among a large number of Command, Control, and Communication systems that support Carrier Strike Group operations. Another focused on achieving information sharing among multiple information systems for intelligence support within a Joint Task Force Service Headquarters.

DOT&E continued the practice of providing classified Finding Memoranda to cognizant Service and Agency senior leadership in FY09. Finding Memoranda detail specific problems identified during one or more assessment exercises that have the potential to negatively impact warfighter operations. In three identified systems, assessors identified a total of six specific issues. To date, two of these issues have been fully resolved and four are partially resolved or mitigated until complete resolution can be accomplished.

ASSESSMENT

Interoperability

In focused assessments of 10 systems, six demonstrated less than full compatibility with other key systems, resulting in data loss, required manual intervention, false alerts and presentations, and reduced speed of information exchange. Often these interoperability problems are remediated with local workarounds; however, the latter are generally not well documented or consistent across DoD networks, and may further exacerbate interoperability problems. Issues caused by the implementation of local solutions generally go unrecorded, including the level of effort required to accomplish the workarounds. Interoperability certification rates continue to be low for assessed systems. Approximately 75 percent of the fielded systems encountered during assessments do not have current interoperability certifications.

Information Assurance

Following several network security incidents in early FY09, DoD undertook aggressive actions that have significantly improved the awareness of – and defenses against – threats to U.S. military information systems and networks. The new policies, procedures, and systems that were rapidly introduced have reduced, in part, the gap between potential adversary actions and demonstrated defensive capabilities. In spite of these improvements, most DoD networks remain insufficiently manned, trained, or equipped to consistently preclude or detect network intrusions during assessed Red Team events. This shortfall increases risk to mission accomplishment.

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. Some exercise authorities adopted exercise structures in FY09 that synchronize the network Red Teams more closely with the exercise opposition force, allowing for more realistic adversary portrayals. Others are seeking new approaches to ensure that warfighters are prepared to successfully operate in realistic threat environments with degraded systems. However, SECDEF guidance to plan for, implement, and regularly exercise the capability to fight through cyber/kinetic attacks that degrade the Global Information Grid still needs to be fully implemented. In FY10, DOT&E, in concert with the Defense Intelligence Agency, will include an evaluation of the level of threat actually portrayed during assessment events, relative to the anticipated threat.

While some improvement in both protection and detection has been seen where new systems and processes have been fully implemented, none of these have been tested to the full level of the anticipated adversary capabilities. Also, Red Teams have reported some improvement in the ability of networks and network personnel to resist short-duration intrusion threats; but long-duration intrusion efforts continue to succeed. Therefore, any noted improvement must be tempered with the fact that the threats presented during these exercises generally fall well below what might be expected from a top-tier nation-state in both capability and duration.

The three most prevalent weaknesses exploited during assessments continue to be: (a) basic compliance with configuration standards, (b) inadequate response to abnormal network activity, and (c) physical security of critical network infrastructure. Assessors continue to find most vulnerabilities are basic in nature, and easily remedied by local personnel, given adequate skills and training, but many organizations lack a full complement of trained personnel, and this remains one root cause in all three issues. In the majority of assessments, penetration testing does not examine the full range of compliance-related vulnerabilities, does not test the full skill range of network operators, and does not aggressively assess physical security.

Collaboration suites, and particularly commercial products designed for other (e.g. conferencing and tele-education) purposes have appeared to improve warfighter interoperability and operational interaction, but often at the expense of introducing network vulnerabilities that are either inherent to the commercial product design or unexpected consequences of user utilizations. Additionally, the life cycle of some commercial products upon which DoD-developed tools depend, has presented challenges where those products have expired or are no longer actively maintained commercially. During FY09 exercise assessments, critical command and control systems were identified as dependent on expiring software operating systems, and one commercial collaboration tool was identified to have a number of inherent vulnerabilities easily induced by inadvertent user actions. In each case, DOT&E identified these issues to the cognizant Service/Agency, resulting in the following rapid resolutions and / or mitigations:

- Stronger network protocols for authentication of system users
- Revised system requirements and procurement/fielding plans
- Upgraded system architectures and components

- Accelerated migration to updated and fully supported software baselines

General exercise assessment trends and findings include the following:

General

- Configuration. Software inventories are assessed as having improved in control and documentation, but hardware configuration controls have not significantly improved. Use of configuration specifications and compliance with configuration standards is assessed as "improved overall." Compliance with port and protocol policies has improved, but is still assessed as satisfactory in only four out of every five assessments.
- Personnel and Training. Manpower requirements for new systems and applications generally do not address additional network support personnel requirements. Some improvement has been seen in the overall expertise levels of network personnel managing COCOM networks during exercises, and user/manager training has increased in frequency overall. The frequency of drills and security exercises remains low, and few commands have viable disaster recovery plans or continuity plans for network operations.

Interoperability

- Techniques and Processes. Operator actions required to manage the exchange of situational awareness information are labor-intensive (e.g., the multi-step manual process necessary to reduce redundant track reporting), and can result in a less than complete or common tactical/operational picture.

Information Assurance

- Intrusions Rates. Red Teams report that penetration of warfighter networks has become more challenging at some sites, but intrusion success rates overall remain high. Long-duration, stealthy intrusion efforts succeed more often than the short-duration attempts most often permitted during exercise scenarios. Few long-duration intrusions are detected. Some improvement has been seen in the detection of short-duration intrusion attempts. In some short-duration scenarios, the Red Teams have been unable to establish an intrusion on the target network, but over time have been able to develop and exploit network weaknesses and successfully intrude. Incident response plans are assessed as improved overall, but effective incident management (response implementation) remains only modestly improved.
- Boundary Defenses. Significant improvement has been seen in reducing vulnerabilities of enclave protection, including control and authentication of users, and configuration/control of network devices. Virus protection was found to be satisfactory at all sites assessed in FY09. Control and compliance of wireless devices is also improved. Correct use and review of audit logs improved substantially in FY09, but still remains low.
- 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 intrusion opportunities. Lack of token-based authentication on classified networks has been seen to permit hard-to-detect exploitation of otherwise protected systems.
- Automated Management Tools. The majority of military information networks and systems are regularly scanned for vulnerabilities. Automated tools for identification and analysis of abnormal activities through audit and correlation are not generally available but are under development by DoD. The recent introduction of an enterprise host-based security suite for DoD has been observed to improve network defenses and detection capabilities, but only after extensive "tuning" of the system and training of the operators.

Exercise assessments and OT&E continue to identify shortcomings in both the information assurance and interoperability of fielded systems. System limitations may 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 and training to rapidly detect, assess, and respond to network exploitations or attacks.

FY10 GOALS AND PLANNED ASSESSMENT ACTIVITIES

DOT&E has identified 23 COCOM and Service exercises for assessment in FY10, 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. Three of the exercises will be for units preparing for deployment to Iraq and Afghanistan. The FY10 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.
- Executing assessments in accordance with priorities identified by the DOT&E and JFCOM partnership for the Optimum Capability Mix.
- Transmitting critical findings to Service and DoD leadership for their awareness and remediation, as appropriate.

TABLE 1. INFORMATION ASSURANCE AND INTEROPERABILITY EXERCISE EVENTS IN FY09

Exercise Authority	Exercise	Lead OTA	Support OTA
AFRICOM	Judicious Response 09	ATEC	
CENTCOM	Internal Look 09	ATEC	
	CJTF-101	ATEC	
	NAVCENT	ATEC	
EUCOM	Austere Challenge 09	ATEC	JITC, AFIOC
	Jackal Stone 09	ATEC	
JFCOM	Empire Challenge 09	JITC	
NORAD/NORTHCOM	Ardent Sentry 09	AFIOC	JITC, MCOTEA
	Vigilant Shield 09	AFIOC	MCOTEA, JITC
PACOM	Talisman Saver 09	ATEC	MCOTEA
	Terminal Fury 09	ATEC	MCOTEA
SOUTHCOM	HQ Assessment	ATEC	
STRATCOM	Global Lightning/Bulwark Defender 09	JITC	COTF, MCOTEA, AFIOC
	Global Thunder 09	JITC	
TRANSCOM	Turbo Challenge 09	JITC	
USFK	Key Resolve 09	ATEC	
USA	UE-09-1-III (25 ID)	ATEC	
	UE-09-1-V (I Corps & 1st Cav.)	ATEC	JITC
	UE-09-3-IV	ATEC	
	UE-09-3-V	ATEC	
USN	JTFEX-09-4	COTF	
	JTFEX-09-5	COTF	JITC
USAF	Black Demon 09	AFIOC	
USMC	UE-09-1-IV (II MEF)	USMC	JITC
Other	CWID	JITC	COTF, MCOTEA

AFIOC – Air Force Information Operations Center
AFRICOM – African Command
ATEC – Army Test and Evaluation Command
CENTCOM – Central Command
CJTF – Combined Joint Task Force
COTF – Commander, Operational Test and Evaluation Task Force
CWID – Coalition Warrior Interoperability Demonstration
EUCOM – European Command
HQ – Headquarters
JFCOM – Joint Forces Command
JITC – Joint Interoperability Test Command
JTFEX – Joint Task Force Exercise
MCOTEA – Marine Corps Operational Test and Evaluation Activity
MEF – Marine Expeditionary Force
NAVCENT – Navy, CENTCOM
NORAD – North American Defense Command
NORTHCOM – Northern Command
PACOM – Pacific Command
SOUTHCOM – Southern Command
STRATCOM – Strategic Command
TRANSCOM – Transportation Command
UE – Unified Endeavor
USFK – U.S. Forces, Korea
USA – U.S. Army
USN – U.S. Navy
USAF – U.S. Air Force
USMC – U.S. Marine Corps

TABLE 2. PLANNED IA AND INTEROPERABILITY EXERCISE EVENTS FOR FY10

Exercise Authority	Exercise	Lead OTA	Support OTA
AFRICOM	Judicious Response 10	ATEC	
	JTF Horn of Africa 10	ATEC	
CENTCOM	Internal Look 10	ATEC	
	AOR Site Assessment #1	ATEC	
EUCOM	Austere Challenge 10	ATEC	
JFCOM	Unified Endeavor 10-1	JITC	
	Angel Thunder	JITC	24th Air Force
NORTHCOM	Ardent Sentry 10	24th Air Force	JITC, MCOTEA
PACOM	Terminal Fury 10	COTF	ATEC, JITC, MCOTEA
SOCOM	Able Warrior 10	ATEC	
SOUTHCOM	Direct Report Unit Assessment #1	ATEC	
	Direct Report Unit Assessment #2	ATEC	
STRATCOM	Global Lightning/Bulwark Defender 10	JITC	24th Air Force
	Global Thunder 10	JITC	24th Air Force, COTF
TRANSCOM	Turbo Distribution 10	JITC	
USFK	Key Resolve 10	ATEC	
USA	Unified Endeavor 10-1 MRX	ATEC	
	Unified Endeavor 11-1 MRX	ATEC	
USN	Joint Task Force Exercise 10 (LANT)	COTF	
	Joint Task Force Exercise 10 (PAC)	COTF	MCOTEA
USAF	Black Demon/Blue Flag 10	24th Air Force	JITC
USMC	I MEF MRX	MCOTEA	JITC
Other	CWID		24th Air Force,

AFRICOM – African Command
ATEC – Army Test and Evaluation Command
CENTCOM – Central Command
COTF – Commander, Operational Test and Evaluation Task Force
CWID – Coalition Warrior Interoperability Demonstration
EUCOM – European Command
JFCOM – Joint Forces Command
JITC – Joint Interoperability Test Command
MCOTEA – Marine Corps Operational Test and Evaluation Activity
MEF – Marine Expeditionary Force
MRX – Mission Rehearsal Exercise
NORTHCOM – Northern Command
PACOM – Pacific Command
SOUTHCOM – Southern Command
STRATCOM – Strategic Command
TRANSCOM – Transportation Command
UE – Unified Endeavor
USFK – U.S. Forces, Korea
USA – U.S. Army
USN – U.S. Navy
USAF – U.S. Air Force
USMC – U.S. Marine Corps

Test & Evaluation Resources

Test & Evaluation Resources

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Test and Evaluation Resources

The Director is required under Title 10, U.S. Code to assess the adequacy of the planning for, and execution of, operational testing conducted on systems under oversight. The ranges, test sites, and assets used in testing are important elements in assessing the adequacy of operational and live fire testing. DOT&E monitors DoD and Service-level strategic plans, involvement in investment programs, and the assessment of budget decisions to ensure key T&E capabilities necessary for operationally realistic T&E are supported. DOT&E collaborates with the Defense Test Resources Management Center (TRMC) to address critical T&E resource needs through its Central T&E Investment Program (CTEIP), and the Test and Evaluation Science and Technology (T&E S&T) program. DOT&E also conducts studies of resource needs and potential solutions through the Threat Systems program. This section outlines key interest areas for this reporting period.

Summary

The DoD saw progress in specific high-interest test resource capabilities, such as aerial and land targets, offshore ranges, and joint test capabilities, yet saw setbacks in areas such as instrumentation and other targets. The operational testing environment continues to become more complex as a result of advances in weapon and sensors, new threats, new methods of employing current systems, and the proliferation of advanced technology. Service budget projections will further stress investment in and support of test resources and staffing at test centers and activities.

DOT&E, either on its own or in coordination with the TRMC and Services, sponsored over 30 new prototype projects and studies to upgrade threat models, simulations, and processors and delivered low-cost threat realistic static, movable, and mobile targets for use in testing across many of U.S. ranges. There are also ongoing studies and prototype efforts for common target sub-systems, submarine targets, undersea warfare countermeasures, and capabilities to test aircraft early warning systems.

Threat Trends Affecting T&E Resources

Advances in threat capabilities continue to present challenges to test resources development and procurement. The increasing sophistication of foreign weapons systems and network attack capabilities require increasingly complex test resources. Current threat sensors and weapons and new anti-ship ballistic missiles, coupled with increased operations in urban and littoral areas, proliferation of unmanned vehicles, and non-traditional Chemical Warfare agents continue to stress Service and DoD resource strategic planning.

Testing Jointly

The test community, primarily through TRMC, DOT&E, and the Defense Information Systems Agency in partnership with the Joint Forces Command, is making progress in its ability to innovatively test weapons systems in a joint environment. In the five years since the approval of the DoD's Testing in a Joint Environment Roadmap, there has been marked progress, but work remains if the DoD expects a persistent capability by the end of FY12 and a fully interactive capability in FY15.

The most significant progress has been in infrastructure, primarily under the Joint Mission Environment Test Capability program. The Joint Test and Evaluation Methodology program completed its efforts this year, with a follow-on transition program further developing the methods and processes. The Joint Forces Command is continuing its efforts in fundamental joint mission-area descriptions. The areas of future focus will be in managing system representations and developing the processes to effectively and efficiently test in this new environment. In this regard, the Army's demonstrations of simulations and visualizations for testing families of systems, system-of-systems, and joint test events have been encouraging, but considerable work remains.

Aerial Targets and Target Control

The aerial target suite reached a major milestone as the Air Force initiated a replacement program for the aging QF-4 aerial target. However, this effort only addresses part of the future need as this solution does not adequately represent future 5th Generation fighters. A study on affordable ways to provide 5th Generation threat characteristics to the test community with preliminary cost analysis supports a follow-on effort further refining the preliminary design and cost models.

Target interoperability across test ranges remains a key objective. The DoD's Strategic Plan for Test Resources, as well as a 2005 Defense Science Board Task Force, recognized that legacy systems are becoming difficult to support and reemphasized the need for Services to test at all major ranges. DOT&E is part of tri-Service efforts examining control systems and standards used by the tactical unmanned systems community for use by the targets community.

Land and Urban Warfare, Real-Time Casualty Assessment and Instrumentation

The DoD made good progress this year with the introduction of a number of capabilities for low-cost, operationally realistic, pop-up, portable, and moving target systems critical for precision weapons testing. These targets better reflect the unique demands of operating in urban environments as well as exercise the entire sensor-to-shooter kill chain.

Operating in an urban environment is identified as a requirement in over 40 percent of new programs. This year, the U.S. Joint Forces Command and the Army initiated a study to identify key capability requirements and conduct surveys of currently available test and training ranges to support an Analyses of Alternatives.

The continued lack of a reliable high-fidelity Real-Time Casualty Assessment (RTCA) system to support operational testing and evaluation of unit combat effectiveness remains a major concern. The Army does not have a high-fidelity RTCA system for testing of large force-on-force engagements. Consequently, the Army is relying on a collection of existing and modified low-fidelity training systems. The OneTESS Program, intended as follow-on-capability for both test and training, sustained major setbacks forcing a program restructuring. Nevertheless, selected OneTESS technologies are being integrated into the existing training systems to field a limited RTCA capability.

The inclusion of compatible and less-intrusive test instrumentation throughout the DoD's ranges is a high priority. The Common Range Integrated Instrumentation System jointly supports land, naval, and air testing needs. There are numerous system capability tradeoffs necessary that present risk to the DoD's ability to provide a robust capability sometime shortly after FY12. To reduce risk, the TRMC initiated a study to support selecting the most promising instrumentation solutions.

Anti-Ship Cruise Missile Supersonic Sea-Skimming and Other Missile Targets

The Multi-Stage Supersonic Target program, cited as a capability gap in the 2005 DoD Strategic Plan for Test and Evaluation Resources, will conduct early flight testing in 2010. Delays in resolving this long-standing issue for key ship self-defense systems present significant risk to future tests.

To satisfy other near-term ship self-defense testing requirements, testing of the GQM-163A supersonic sea-skimming target concluded, which supported a full-rate production approval. In addition, after a series of failed tests, other modified sub-sonic aerial targets simulating other high-interest anti-ship cruise missile threats were delivered. Finally, the Navy initiated a replacement program for the aging, and non-threat representative, BQM-74E subscale aerial target. Together, these developments represent marked progress in long-standing deficiencies.

The Anti-Ship Ballistic Missile (ASBM) has emerged as a key threat for a number of Navy programs. A validated target is now cited as a test capability need in the 2009 TRMC Strategic Plan for Test Resources. ASBM surrogates will become crucial aspects of future ship self-defense testing. At this time, no such surrogate development program is programmed.

Navy Ranges and Naval Warfare Test Resources

Significant progress was seen in offshore test ranges. The west coast shallow water training range extensions at the Southern California Offshore Range have been approved. The Navy will improve its littoral training (and test) capability in the Jacksonville and Virginia Capes areas having released the Records of Decision for the Environmental Impact Statements. This decision paves the way for improvements in Atlantic Fleet testing and training that could be in place by 2014 if follow-on environmental reviews are successful.

In addition, there was progress in portable ranges and test capabilities for minefield testing with the introduction of new portable tracking systems and an instrumented mine surrogate for a high-interest threat. However, the DoD needs a more realistic threat surrogate for modern threat diesel submarines. The existing diesel submarine surrogate target is no longer available to support testing, while use of foreign assets present their own unique security challenges.

The DoD requires adequate seaborne targets and scoring systems for anti-surface warfare testing, but ensuring sufficient quantities of threat representatives targets continues to be a challenge.

Countermeasure, Counter Weapon, and Electronic Warfare Test Capabilities

Operational testing of integrated defensive systems requires threat-representative hardware and validated models, simulations, and test environments. The DoD continues its efforts integrating threat models at test facilities as part of a four-year effort to upgrade the Services' inventory of missile simulators with standard, validated models. Long-term maintenance of these models and the increasing complexity of integrated sensor and warning systems continue to be a challenge.

Health of the Operational Test Agencies

The DoD carries out its operational test and evaluation responsibilities largely through the Operational Test Agencies (OTAs). Accordingly, the "health of the OTAs," (the adequacy of their mission funding and military, government, and contractor workforce) to carry out the operational testing and evaluation of weapons systems is a matter of DOT&E interest. With an increased emphasis on early involvement during acquisition, joint experimentation, and rapid testing for urgently required systems for war, the OTAs face challenges. The budget expenditures for the OTAs were relatively constant between FY08 and FY09 and essentially flat in FY10 and beyond. The impacts of any potential in-sourcing of contractor-to-government civilian personnel has not yet been assessed.

Joint Test & Evaluation Program

Joint Test & Evaluation Program

Joint Test and Evaluation Program

The Joint Test and Evaluation (JT&E) Program develops solutions to joint operational problems through enhanced tactics, techniques, and procedures (TTP) and measures the associated improvements based on rigorous analysis and operational evaluation. The JT&E Program's objective is to provide rapid solutions to operational 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 in FY09 that focused on emerging needs of today's deployed forces:
- Joint Air Defense Operations-Homeland (JADO-H)
- Joint Airspace Command and Control (JACC) *
- Joint Civil Information Management (J-CIM)
- Joint Command and Control for Net-Enabled Weapons (JC2NEW) *
- Joint Data Integration (JDI)
- Joint Electronic Protection for Air Combat (JEPAC)
- Joint Mobile Network Operations (JMNO) *
- Joint Non-Kinetic Effects Integration (JNKEI)
- Joint Test and Evaluation Methodology (JTEM) *
- Joint Test and Evaluation Methodology-Transition (JTEM-T)

The JT&E Program instituted a quick reaction test (QRT) capability in 2003 to respond to pressing warfighter needs. The program managed 10 QRTs in FY09:
- Engage On Remote (EOR) *
- Joint Base Expeditionary Targeting and Surveillance System-Combined (JBETSS-C) *
- Joint Combat Outpost (JCOP) *
- Joint Communications Redundancy (JCR) *
- Joint Defense Support to Civil Authorities (JDSCA)
- Joint Entry Control Point/Escalation of Force Project (JEEP)
- Joint Early Warning Operator (JEWO)
- Joint Sniper Defeat (JSD) *
- Joint Systems Prioritization and Restoration (JSPAR)
- Joint Unmanned Aircraft System Full-Motion Video Integration for Command and Control (JUFIC)

(* indicates projects that closed in FY09)

JOINT TESTS

JOINT AIR DEFENSE OPERATIONS-HOMELAND (JADO-H)

Sponsor/Charter Date: North American Aerospace Defense and U.S. Northern Command/August 2007

Purpose: To develop deployable homeland air and cruise missile defense (D-HACMD) joint TTP and planning processes.

Products/Benefits: Standardized planning to counter emerging air threats to the homeland. Collaborative tools will include the following:
- D-HACMD process modeling that provides a view of the entire planning process
- Checklists for critical steps in the planning process
- An exercise planning guide
- A commanders planning handbook

JOINT AIRSPACE COMMAND AND CONTROL (JACC) (COMPLETED DECEMBER 2008)

Sponsor/Charter Date: Army/August 2006

Purpose: To provide faster, more lethal access to joint airspace for surface and airborne sensors, weapons, and command and control systems to carry out missions in support of forward operating bases and maneuver elements.

Products/Benefits
- *Joint Airspace Command and Control Techniques* handbook
- Checklists for airspace control for use in Air Land Sea Application Center publications
- Airspace Command and Control chapter in the Air Force's TTP 3-1, *Theater Air Control System*

JOINT CIVIL INFORMATION MANAGEMENT (J-CIM)

Sponsor/Charter Date: U.S. Special Operations Command/ August 2008

Purpose: To develop joint TTP to standardize, collect, consolidate, and share civil information among DoD, other U.S. government agencies, host nations, coalition forces, and non-governmental organizations to support the joint force commander's operational planning efforts.

Products/Benefits: A users guide that will:
- Standardize collection, consolidation, and sharing of civil information
- Identify senior leader and staff requirements for the integration of civil data to support planning, operations, and assessments in support of non-lethal operations
- Enable commanders, senior leaders, and other stabilization and development partners to better share, identify, prioritize, and apportion resources

JOINT COMMAND AND CONTROL FOR NET-ENABLED WEAPONS (JC2NEW) (COMPLETED SEPTEMBER 2009)

Sponsor/Charter Date: Air Force/August 2006

Purpose: To improve the operational concepts and procedures for controlling net-enabled weapons by developing command and control processes required to exchange information between net-enabled weapons and the delivery platforms, sensor platforms, and command and control systems.

Products/Benefits: New capabilities that allow joint force commanders to prosecute time-sensitive targets with net-enabled weapons. Other benefits are the following:

- Minimized risks to operators, friendly ground forces, and noncombatants through precise engagement of moving and stationary surface targets
- Optimized use of net-enabled weapons through in-flight re-tasking capabilities
- Training methodologies that support the use of net-enabled weapons

JOINT DATA INTEGRATION (JDI)

Sponsor/Charter Date: U.S. Joint Forces Command and Joint Task Force 519/August 2008

Purpose: To develop joint TTP for Global Command and Control System – Joint operators, track data managers, and systems administrators to provide the joint task force and combatant commanders with an effective theater common operational picture.

Products/Benefits to the Warfighter: *Quick Reference Guide for Developing and Sharing the Common Tactical Picture*. This guide provides new command and control data management procedures that improve the quality of the common tactical picture used by joint task force and component commanders to support force employment decisions.

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 air-to-air electronic attacks using situational awareness tools and off-board sensor data.

Products/Benefits to the Warfighter:
- TTP that assisted tactical and operational planners in performing their missions
- Training package that is currently taught by Marine Aviation and Weapons Tactics Squadron 1 and the Naval Strike and Air Warfare Center.

JOINT MOBILE NETWORK OPERATIONS (JMNO) (COMPLETED MARCH 2009)

Sponsor/Charter Date: Marine Corps/February 2006

Purpose: To develop joint 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
- Improved mobile network access while maintaining quality of service
- Enhanced mobile users' connectivity to their home network resources while maneuvering
- Enabled interoperability while maintaining information assurance

JOINT NON-KINETIC EFFECTS INTEGRATION (JNKEI)

Sponsor/Charter Date: U.S. Strategic Command/August 2007

Purpose: To develop joint TTP that assist planners in integrating the non-kinetic effects of electronic attack, computer network attack, and space control-negation capabilities into operational planning.

Products/Benefits: Improved integration of non-kinetic effects during operational planning that expand the range of possible courses of action for joint force commanders. These improvements will be captured in joint doctrine and training centers publications and curricula.

JOINT TEST AND EVALUATION METHODOLOGY (JTEM) (COMPLETED APRIL 2009)

Sponsor/Charter Date: DOT&E/February 2006 – April 2009

Purpose: To develop 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.

Products/Benefits: Delivered *Capability Test Methodology* version 3.0 in February 2009 that included the following:
- Methods and process guides
- A measures framework for joint mission effectiveness
- Handbooks

Additional products include the following:
- 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 identify testing and acquisition process gaps, seams, and overlaps

JOINT TEST AND EVALUATION METHODOLOGY–TRANSITION (JTEM-T)

Sponsor/Charter Date: DOT&E/May 2009

Purpose: To integrate the JTEM methods and processes into component and agency test organizations, beginning with the operational test agencies while facilitating the methods and processes used in ongoing tests for the Global Combat Support System-Joint and Digitally-Aided Close Air Support programs.

Products/Benefits

- Institutionalize enhanced methods and processes needed to effectively test in a joint mission environment
- Determine additional training and skill sets needed by the testing and acquisition workforces to meet the enhanced methods and processes.

QUICK REACTION TESTS

ENGAGE ON REMOTE (EOR) (COMPLETED MARCH 2009)

Sponsor/Charter Date: North American Aerospace Defense Command/February 2008

Purpose: To develop joint TTP that enhance air defense targeting by providing fire-control-quality data via tactical data link from surface-based sensors to an aircraft cockpit.

Products/Benefits: TTP that enhance pilot's ability to successfully engage a variety of threats to include low-speed and low-visibility unmanned aerial vehicles while:

- Increasing pilot situational awareness and reducing workload in a high demand environment
- Enhancing aircraft and pilot survivability
- Updating 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) (COMPLETED MARCH 2009)

Sponsor/Charter Date: U.S. Central Command/June 2008

Purpose: To provide joint TTP for the employment of the Base Expeditionary Targeting and Surveillance System-Combined.

Products/Benefits: Joint force commanders in U.S. Central Command received a handbook on the use of the BETSS-C family of systems to provide protective measures that reduce the risk of combat injuries and deaths at forward operating bases, joint security sites, main supply routes, and combat outposts. The JBETSS-C project published 5,000 handbooks to coincide with the fielding of BETSS-C systems.

JOINT COMBAT OUTPOST (JCOP) (COMPLETED MARCH 2009)

Sponsor/Charter Date: U.S. Central Command and the Army Engineer Research and Development Center/February 2008

Purpose: To develop joint TTP to defend against a vehicle-borne IED attack against a combat outpost.

Products/Benefits: TTP to defend combat outposts against vehicle-borne IED attacks and a handbook that addresses many of the material and equipment challenges that joint forces conducting contingency operations face.

JOINT COMMUNICATIONS REDUNDANCY (JCR) (COMPLETED JULY 2009)

Sponsor/Charter Date: U.S. Northern Command/June 2008

Purpose: To develop joint TTP for the employment of strategic and contingency operational communications procedures.

Products/Benefits: Provided empirical data to support recommendations to the joint operational, training, and acquisition communities concerning redundant communication paths. Developed, validated, and delivered guidance for the joint employment of strategic and operational communications procedures.

JOINT DEFENSE SUPPORT TO CIVIL AUTHORITIES (JDSCA)

Sponsor/Charter Date: U.S. Northern Command/July 2009

Purpose: To develop, assess, and validate concept of operations and TTP for brigade personnel providing operational support to civil authorities in disaster relief missions.

Products/Benefits: Handbook, concept of operations, and TTP that will enhance the capabilities of local, state, and federal emergency management authorities to better utilize DoD assets during disaster response.

JOINT ENTRY CONTROL POINT/ESCALATION OF FORCE PROJECT (JEEP)

Sponsor/Charter Date: U.S. Central Command/December 2008

Purpose: To develop concept of operations and TTP to adequately train troops on escalation of force at entry control points.

Products/Benefits: A handbook that improves training on force protection and escalation of force processes at entry control points.

JOINT EARLY WARNING OPERATOR (JEWO)

Sponsor/Charter Date: U.S. Central Command/December 2008

Purpose: To assess U.S. Central Command's ballistic missile warning network and document the existing warning architecture, current platforms involved in the warning mission, and current methods of information collection, processing, reporting, and dissemination.

Products/Benefits: TTP for allied and joint forces in the U.S. Central Command's area of responsibility to improve their capabilities to detect, track, and report enemy ballistic missiles.

JOINT SNIPER DEFEAT (JSD) (COMPLETED OCTOBER 2008)

Sponsor/Charter Date: Army Infantry Center/September 2007

Purpose: To mitigate the threat snipers pose to coalition forces.

Products/Benefits: Increased situational awareness and force protection measures that reduce casualties from sniper attacks. A handbook that provides guidance on the use of sniper defeat systems that have been fast tracked to operational theaters and on other sniper defeat solutions such as exposure reduction and counter-sniper observation.

JOINT SYSTEMS PRIORITIZATION AND RESTORATION (JSPAR)

Sponsor/Charter Date: U.S. Northern Command (USNORTHCOM)/July 2009

Purpose: To develop and validate North American Aerospace Defense Command, USNORTHCOM, and U.S. Pacific Command coordinated TTP for continuity of communications for DoD entities in the state of Alaska.

Products/Benefits: A strategy to implement MINIMIZE (an order from a commander that normal message, telephone, and e-mail traffic be reduced drastically so that vital messages are not delayed) message protocols between USNORTHCOM and other agencies during disruptions to normal communications.

JOINT UNMANNED AIRCRAFT SYSTEM FULL-MOTION VIDEO INTEGRATION FOR COMMAND AND CONTROL (JUFIC)

Sponsor/Charter Date: Air Force Warfare Center and Joint Unmanned Aircraft Systems Center of Excellence/ December 2008

Purpose: To develop TTP to improve the commander's ability to effectively use full-motion video from unmanned aircraft systems for command and control.

Products/Benefits: Improved integration of unmanned aircraft system full-motion video within various command and control systems supporting operational and tactical combat operations centers.

The Center for Countermeasures

The Center for 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 FY09, 75 percent of the Center's activities supported of DOT&E oversight programs and 70 percent directly related to current Overseas Contingency Operations (OCO). The majority of the OCO activities involved rotary wing survivability events.

The Center participated in operational test/developmental test, fixed and rotary wing aircraft survivability testing, fielded system improvement verifications, and foreign systems and exercise support related to the CM/CCM mission area. The Center also continued to develop test tools for Infrared Countermeasures (IRCM) testing needs. The Center performed 20 tests/activities this year. The following are representative of this year's activities.

OPERATIONAL TEST/DEVELOPMENTAL TESTS

- **Navy:** Brite Star Block II

  Sponsor: Commander, Operational Test and Evaluation, VX-9

  Activity: The Center coordinated and conducted a test that provided multiple CM devices for evaluation of the UH-1Y turret-based targeting system in both the technical and tactical environments in order to assess the system's capabilities and limitations in a CM environment.

  Benefit: VX-9 is incorporating the test results into their Fleet Tactics Guide. Test results confirmed performance before the UH-1Y upgrade transitioned into full-rate production.

- **Navy:** Department of the Navy Large Aircraft Infrared Countermeasure (DoN LAIRCM)

  Sponsor: Navy Program Executive Officer, Tactical Aircraft Programs (PMA-272)

  Activity: The Center provided two Joint Mobile Infrared Countermeasures Test System (JMITS) test assets and crew to perform end-to-end testing of the system at several test locations throughout the year. Platforms participating included CH-53E and CH-46E.

  Benefit: The testing revealed software anomalies that were corrected by the system developer.

- **Air Force:** LAIRCM NexGen Phase II C-17A

  Sponsor: 654th Aeronautical Systems Squadron, Wright Patterson AFB, Ohio

  Activity: The Center deployed JMITS systems to support end-to-end testing and conduct an independent assessment of the LAIRCM NexGen system, which is intended to meet a critical need of IRCM systems on Air Force heavy-lift aircraft.

  Benefit: Test results contributed to the development of the next generation technology to better protect tactical and strategic air lift in OCO.

- **Army:** Joint Air-to-Ground Missile (JAGM) System

  Sponsor: U.S. Army Joint Attack Munition System, JAGM Program Office, Redstone Arsenal, Alabama

  Activity: The Center planned, coordinated, and executed a mission to provide a realistic CM environment for the JAGM system.

  Benefit: This testing supported research and development of the JAGM system, so that this next generation air-ground missile will operate in CM/CCM battlefield environments.

FIELDED SYSTEM IMPROVEMENTS

- **Army:** Hellfire II Diminished Manufacturing Sources (DMS) and Hellfire II R guidance systems comparative test activities

  Sponsor: Hellfire Systems Joint Attack Munitions Systems (JAMS) Office, Redstone Arsenal, Alabama

  Activity: The Center provided crew, equipment, and an analysis report for comparative testing of the Hellfire II legacy guidance section and the production version of the Hellfire II DMS guidance system.

  Benefit: Results from these verification tests are being used to extend the life of legacy Hellfire II guidance systems to perform OCO.

- **Air Force:** Litening Advanced Targeting (AT) and Sniper Extended Range (XR) Phase II Pod Test

  Sponsor: Air National Guard (ANG) Air Force Reserves Training Center

  Activity: The Center created a realistic CM environment to test the upgraded Sniper and Litening targeting pods for refining tactics, techniques, and procedures (TTPs). An analysis report was published on the effects of this environment on the pods.

Benefit: This test environment allowed the ANG to explore the performance capabilities and limitations of these targeting systems in a CM environment.

FIXED- AND ROTARY-WING AIRCRAFT SURVIVABILITY IMPROVEMENTS

- **Navy/Army:** Navy/Marine Corp Tactical Development and Evaluation IRCM Test and Army IRCM Captive-Seeker Test

  Sponsor: Naval Surface Warfare Center (NSWC), Crane, Indiana, and Armament Research, Development and Engineering Center, Picatinny Arsenal, New Jersey

  Activity: The Center provided a test van instrumented with six threat man-portable air defense system (MANPADS) missiles to assess the effectiveness of flare sequences under special operational conditions.

  Benefit: Sponsors are using these test results to enhance currently deployed flare sequences from rotary-wing and tilt-rotor aircraft in terrain conditions similar to those found in OEF/OIF.

- **Air Force:** ANG Air Force Reserve Command Test Center Flare Test

  Sponsor: ANG Air Force Reserve Command Test Center

  Activity: The Center provided an instrumentation package that measures the intensity of the flares in order to support and assess reactive flare effectiveness for the A-10, F-16, and C-26 aircraft.

  Benefit: The Center reported the qualitative improvements of flare sequences so sponsors could enhance the survivability of fixed-wing aircraft.

- **Air Force/Navy/Marine/Army:** Joint Infrared Countermeasures Test

  Sponsor: Air Force Special Operations Command, Air Combat Command, Office of Program Management Close Combat Systems, NSWC, Air Mobility Command, Marine Corps

  Activity: The Center provided an instrumentation package that measures the intensity of the flares to assess the effectiveness of flare sequences on fixed- and rotary-wing aircraft.

  Benefit: Sponsors are using these test results on the effectiveness of flares and their sequencing to enhance protection of various aircraft in the infrared MANPADS threat environment.

- **Army:** Reduced Optical Signature Emissions Solution (ROSES)

  Sponsor: Department of the Army Technology Applications Program Office (TAPO); NSWC, Crane, Indiana; and Armament Research, Development and Engineering Center, Picatinny Arsenal, New Jersey

  Activity: The Center provided a test van equipped with threat seekers to evaluate flare sequence performance.

  Benefit: These test results enabled the sponsors to finalze the flare sequences on the 160th Special Operations Aviation Regiment rotary-wing aircraft.

FOREIGN EQUIPMENT TEST

- **Urban Combat Test**

  Sponsor: The Technical Cooperation Program (TTCP)

  Activity: The Center coordinated this test among four allied nations to participate in urban electro-optical/improvised explosive device CM testing. The four allied nations were United Kingdom, Australia, New Zealand, and the United States.

  Benefit: Sponsors are using these test results to evaluate the capabilities of various technologies for counter-improvised explosive device and sniper electro-optical devices in OCO urban environments.

JOINT FORCES COMMAND (JFCOM) AND EXERCISE SUPPORT

- **Red Flag Nellis Exercise at Nellis AFB, Nevada**
- **Desert Talon Exercise at the Marine Corps Air Station, Yuma, Arizona**
- **Carrier Air Wing Exercises at Fallon Naval Air Station, Nevada**

  Sponsor: Various

  Activity: The Center provided a realistic CM environment for aircrews during combat training. Also, realistic MANPADS engagements were used to raise pilots' situational awareness of potential threats.

  Benefit: Use of CMs and MANPADS in training exercises exposed aircrews to realistic CM environments and threats prior to deployment.

HOMELAND SECURITY

- **Department of Homeland Security (DHS) Test**

  Sponsor: Department of Homeland Security Counter-MANPADS Office

  Activity: The Center provided a Directional Infrared Countermeasure (DIRCM) test capability that can simulate missile threats and gather system responses.

  Benefit: Test results allowed DHS to evaluate the capability of a military-derived DIRCM system to protect commercial airliners against MANPADS in the presence of non-threatening infrared sources.

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, 2008, and September 30, 2009. Six of the summaries from these reports are included in this section. Three are not included due to classification issues. These are the Surface Electronic Warfare Improvement Program (SEWIP) – Block 1B2, Logistics Vehicle System Replacement (LVSR), and Joint Biological Point Detection System (JBPDS).

DOT&E prepared four Early Fielding Reports. Three of the summary letters are included in this section. One is not included due to classification issues. This is the MC-12W Liberty Project Aircraft (LPA).

Program	Report Type	Date
Battlespace Command and Control Center (BC3) Air Force Central Command (AFCENT) Increment 1 Testing	OT&E Early Fielding Report	October 2008
MH-60S Block 3A Armed Helicopter Weapon System (AHWS)	Combined OT&E / LFT&E BLRIP Report	October 2008
Surface Electronic Warfare Improvement Program (SEWIP) – Block 1B2 *(Summary is not included)*	OT&E BLRIP Report	October 2008
Logistics Vehicle System Replacement (LVSR) *(Summary is not included)*	LFT&E Report	December 2008
Guided Multiple Launch Rocket System (GMLRS) - Unitary (classified Annex)	Combined OT&E / LFT&E BLRIP Report	December 2008
MQ-9 Unmanned Aircraft System (UAS)	OT&E BLRIP Report	March 2009
Joint Biological Point Detection System (JBPDS) *(Summary is not included)*	OT&E BLRIP Report	June 2009
Air Force Mission Planning System (MPS) Increment III (F-16)	OT&E BLRIP Report	July 2009
Battlespace Command and Control Center (BC3) Air Force Central Command (AFCENT) Increment 2 Testing	OT&E Early Fielding Report	September 2009
MC-12W Liberty Project Aircraft (LPA) *(Summary is not included)*	OT&E Early Fielding Report	September 2009
Extended Range Multi-Purpose (ERMP) Unmanned Aircraft System Quick Reaction Capability	OT&E Early Fielding Report	September 2009
EA-18G Airborne Electronic Attack (AEA) Aircraft (classified Live Fire Report)	Combined OT&E / LFT&E BLRIP Report	September 2009
B-2 Radar Modernization Program (RMP) Mode Set One (MS 1)	OT&E BLRIP Report	September 2009

Battlespace Command and Control Center (BC3) Air Force Central Command (AFCENT) Increment 1 Testing

This report provides my assessment of Battlespace Command and Control Center (BC3) Air Force Central Command Increment 1 performance demonstrated in testing, in accordance with the provisions of Section 231 of the 2007 National Defense Authorization Act (modifying Title 10, United States Code, Section 2399). The Air Force's Air Combat Command developed the BC3 system under a warfighter urgent and compelling capability need request for a theater air battle management command and control system. In the report, I conclude the following:

- Test limitations prevented a determination of BC3 Increment 1's operational effectiveness and operational suitability. The short duration of test, lack of a realistic desert environment, and dependence on targets of opportunity did not fully stress BC3 in an operationally representative environment.
- BC3 Increment 1 did not receive Joint Interoperability Testing Command certification due to several information assurance vulnerabilities. Instead, it received a Net Ready-Key Performance Parameter Assessment Letter and Interim Certificate to Operate.
- The suitability of BC3 is unclear because of the lack of adequate reliability, availability, and maintainability testing.

MH-60S Block 3A Armed Helicopter Weapon System (AHWS)

The MH-60S, with the Armed Helicopter Weapon System (AHWS) upgrade, as tested, is 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 due to limited testing. Follow-on operational test and evaluation with Hellfire missile employment under operationally realistic conditions against threat representative targets at sea is required before making a definitive SUW effectiveness evaluation. The MH-60S AHWS is operationally survivable in all missions.

The Navy's operational test agency, Operational Test and Evaluation Force (OPTEVFOR), conducted the Initial Operational Test and Evaluation (IOT&E) intermittently over an extended period (February 2006 – June 2007). OPTEVFOR conducted the test and evaluation based on the DOT&E-approved test plan with the exceptions described under the Test Adequacy section.

IOT&E, supplemented by a 2008 Verification of Correction of Deficiencies (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.

During testing, a major change to the Operational Requirements Document (ORD Change 2) was in the final stages of the formal approval process. This change reduced the thresholds for mission radius Key Performance Parameters (KPP), added the MIO mission, and changed the SWS mission from a KPP to a required capability. Although the Navy anticipated approval of the change prior to the completion of OT&E, it was not until OPTEVFOR had issued the final IOT&E report and begun the formal VCD that it received final signature. Results of the VCD, reported on March 20, 2008, enabled OPTEVFOR to reverse their evaluations in three of the five mission areas, making all areas operationally effective and suitable and to recommend fleet introduction of the Armed Helicopter. DOT&E requested an additional follow-up phase to include additional testing, data collection, and confirmation of analyses. The Navy reported those findings in a VCD Addendum Message issued July 7, 2008. DOT&E considered the analysis of results from both the VCD and the follow-up phase in completing this report.

The Navy's execution of the MH-60S Live Fire Test and Evaluation (LFT&E) program was in accordance with the approved Alternative LFT&E Strategy. The available data were adequate to assess the survivability of the MH-60S AHWS as configured for each of its designated missions. The MH-60S AHWS is survivable in the expected threat environments.

System Overview

The MH-60S Multi-Mission Combat Support Helicopter is a ship-based, medium lift, general-purpose helicopter. Designed for all weather, day/night operations, the aircraft is the Navy's primary helicopter for airborne logistics and, with appropriate upgrades, CSAR, CVPG/SAR, SWS, SUW, and Airborne Mine Countermeasures (AMCM) operations. It also provides increased MIO combat capability in the AHWS configuration.

The Navy adopted an evolutionary block development and acquisition strategy to field the aircraft enabling a time-phased fleet introduction of platform capabilities. Blocks 3A and 3B provide Armed Helicopter capability; the difference between Block 3A and Block 3B configurations is the added Link 16 (data link) capability of the latter. Two discrete kits make up the AHWS, known as the "A Kit" and the "B Kit." The A Kit represents permanent modifications to the airframe and the B Kit consists of removable mission equipment and weapons systems.

In order to expedite development and minimize integration costs, the AHWS integrates previously fielded and proven weapons and sensors that, for the most part, can be installed to meet the demands of a specific mission or tactical scenario. Major components of the AHWS include the AGM-114 Hellfire Missile System, the AN/AAS-44C Multi-Spectral Targeting System, and the crew-served weapons consisting of the GAU-21 .50 caliber Machine Gun and the M-240D 7.62 mm Machine Gun System.

The MH-60S AHWS also includes an integrated self-defense countermeasures suite. The suite includes the APR-39A(V)2 Radar Warning Receiver, the AAR-47A(V)2 Missile and Laser Warning System, the ALQ-47 Countermeasure Dispensing System, and the ALQ-144A(V)6 Infrared Countermeasures System.

Test Adequacy

As a result of real-world operational commitments, testing did not include ship-based helicopter operations at sea. However, testing (IOT&E, VCD phase, and follow-up phase) was adequate to determine operational effectiveness and suitability in all missions except for operational effectiveness in the SUW mission. With the notable exception of not operating from an aircraft carrier at sea as well as other exceptions explained further in the report body, fleet personnel operated and maintained the MH-60S in the intended operating environment. 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.

Operational Effectiveness

The MH-60S AHWS is operationally effective for the CSAR, CVPG/SAR, SWS (Overland), and MIO mission areas. Its operational effectiveness in the SUW mission is undetermined as a result of insufficient Hellfire missile firings, the lack of threat-representative targets at sea, no firings during darkness, and no multiple missile shots at rapid rates of fire. Despite numerous identified deficiencies, the AHWS Mission Planning System (MPS) had sufficient utility to support mission accomplishment based on the mitigating actions outlined in the VCD addendum.

For SUW, the Hellfire testing was inadequate with only three developmental test/operational test missile shots, all against non-evasive targets and fired well short of the 4 nautical mile engagement range (standoff range to avoid manned portable air defense attack from the threat boat). Additionally, there were no nighttime or rapid rate of fire shots and excessive crew workload also affected Hellfire effectiveness.

For CSAR, although ORD Change 2 reduced the requirement for the number of transportable survivors from four to two, there is still only room for one litter in the cabin.

CVPG is a legacy mission executable by other aircraft and by itself does not justify AHWS. The intent of the test was to demonstrate that AHWS does not degrade the capability.

In the MIO mission area, the use of legacy fast-rope equipment negatively impacted effective deployment and crew safety, but does not preclude the AHWS from satisfactorily completing the mission.

Compared to the legacy HH-60H armed helicopter, the MH-60S AHWS provides a second cabin door, significantly improved targeting system, and additional firepower.

Operational Suitability

The MH-60S AHWS is operationally suitable for the CSAR, CVPG/SAR, SWS, and MIO mission areas. It is not operationally suitable for the SUW mission because of significant safety, human factors, and compatibility deficiencies.

The MH-60S AWHS has safety, human factor, and compatibility deficiencies for all missions, most arising from the overcrowded cabin. While configured for SUW, all of the AWHS components are installed and present an even greater challenge for the crew to safely operate the aircraft and complete the mission. Following the IOT&E, multiple Naval Air Systems Command (NAVAIR) Safety Action Records (SAR), used to support Naval Aviation Training and Operating Procedures Standard (NATOPS) changes and warnings, mitigated these deficiencies, but did not correct the material problems. Although these administrative resolutions are acceptable in the Navy to consider the aircraft safe, they really only address the symptoms and not the causes.

Operational Survivability

The MH-60S AHWS is operationally survivable in most threat environments. Its design is a derivative of the Army's Black Hawk helicopter, which has demonstrated survivability in combat. The MH-60S AHWS includes many features designed to avoid threat engagements such as signature reduction of the engine exhaust, an integrated self-defense countermeasures suite, threat suppression weapons, and situational awareness improvements. The aircraft is also ballistically tolerant against expected small arms threats and can continue to fly in spite of damage to many dynamic components.

Recommendations

The Navy should address the following issues and verify correction of deficiencies during follow-on OT&E:

- Determine CV(N) shipboard compatibility of MH-60S AHWS under operationally realistic conditions. Testing should include underway flight operations with a representative complement of all air wing aircraft embarked. It should specifically address armed aircraft handling and servicing, arming and de-arming, alert launches, and aircraft stowage on both the flight and hangar decks.

- Determine operational effectiveness of AHWS 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.
- Correct the safety and compatibility deficiencies through redesign in addition to procedural efforts where appropriate.
- Correct human factors and mission planning deficiencies.
- Redesign or reposition the gunner's stroking seats to avoid injury during a crash.
- Redesign the gunner's belt system to prevent accidental release of the gunner's belt when operating crew-served weapons.

To further improve the suitability and survivability of the MH-60S AHWS, the Navy should consider the following:

- Integrate the developed Mission Planning System (MPS) workarounds into NATOPS and implement into a training program that is available Fleet-wide to standardize these procedures until the Navy introduces an adequate replacement into the aircraft.
- Development of a wireless internal communication system to mitigate entanglement issues.
- Development of a safety interlock system to prevent the firing of a Hellfire missile unless the GAU-21 is locked in a safe position vice using challenge/reply checklist procedures alone.
- Additional Hellfire missile exhaust testing with regard to potential health hazards to which the aircrew may be exposed.
- Increase the number of ALE-47 Chaff/Flare dispensers.
- Improve the APR-39A(V)2 Radar Warning Receiver.
- Inert the fuel tanks to prevent fires and ullage reactions.
- Reduce the potential for gearbox chip detector screen blockage resulting from ballistic impacts to the main transmission and input gearboxes.
- Make necessary design changes in the main transmission to prevent cascading damage to the tail rotor drive system when impacted by ballistic threats.
- Improve the engine bay fire detection and suppression system and redesign engine nacelle structural components to ensure that the nacelle door remains closed after ballistic impacts.
- Incorporate dry bay fire protection in the tail boom and transition section.
- Improve crashworthiness and emergency egress for situations where the aircraft is forced to land or crash into water.
- Provide aircrew seats that are survivable and allow for sufficient space to provide a means for safe and effective aircraft egress.
- Since the MH-60S AWHS operates at higher gross weights than the legacy UH-60M, the Navy should consider retesting the main transmission without oil for 30 minutes and crashworthiness with different weapons configurations (i.e., full complement of AGM-114 and GAU-21s deployed).

Guided Multiple Launch Rocket System (GMLRS) – Unitary

The M31A1 GMLRS-Unitary rocket is operationally effective, suitable, and lethal. The Initial Operational Test and Evaluation (IOT&E) and live fire testing were adequate and executed in accordance with the Director, Operational Test and Evaluation (DOT&E) approved test plans.

The M31A1 GMLRS-Unitary rocket is operationally effective and lethal. Soldiers and leaders successfully executed 75 of 76 GMLRS-Unitary fire missions during ground phase testing and achieved required effects in 11 of 12 fire missions during the flight phase testing.

The M31A1 GMLRS-Unitary rocket is operationally suitable. During the IOT&E, the rocket achieved reliability and supportability requirements, demonstrating a reliability rate of 94 percent by completing 30 of 32 flights.

System Overview

The M31A1Guided Multiple Launch Rocket System-Unitary (GMLRS-Unitary) is a Global Positioning System (GPS) guided rocket with a 200-pound unitary warhead. The M31A1 GMLRS-Unitary has a multi-mode fuze with point detonate, delay, and proximity capabilities. The rocket is capable of attacking targets out to ranges of 70 kilometers and uses Inertial Measurement Unit guidance along with GPS to enhance accuracy. GMLRS-Unitary is launched from the M270A1 Multiple-Launch Rocket System (MLRS) and the M142 High Mobility Artillery Rocket System (HIMARS).

The M31A1 GMLRS-Unitary rocket is an improved version of the M31 GMLRS-Unitary rocket, replacing the previous dual-mode fuze with a multi-mode fuze with point detonate, delay, and proximity capabilities. The M31A1 GMLRS-Unitary warhead is designed to reduce collateral damage when employed against area and point targets in restrictive terrain.

The M270A1 MLRS and M142 HIMARS launch platforms provide the mobility, command and control interface, communications processing, computation, and Soldier-machine interface to accurately fire a single rocket or a multiple rocket sequence.

GMLRS-Unitary rockets, fired from the M270A1 MLRS or M142 HIMARS launch platforms, are fielded to Fires Battalions within Brigade Combat Teams and Fires Brigades. Artillery units will use GMLRS-Unitary rockets to accurately attack critical point targets, to include those in urban environments or restrictive terrain. Artillery commanders use GMLRS-Unitary to engage targets:

- Where DPICM submunitions are not effective or unexploded ordnance is not desirable
- With increased lethality and accuracy
- While minimizing collateral damage caused by or associated with area weapons or munitions

Test Adequacy

The Initial Operational Test (IOT) and live fire testing were executed in accordance with Director, Operational Test and Evaluation approved test plans. GMLRS-Unitary test plan execution was adequate to assess operational effectiveness, suitability, and lethality. This evaluation is based on the IOT and live fire tests, supplemented by developmental testing and combat reporting of the M31 GMLRS-Unitary rockets in Operation Iraqi Freedom.

The GMLRS-Unitary Live Fire Test & Evaluation program was adequate to assess lethality and focused on target effects throughout the developmental and operational flight testing and static test firings. The live fire testing centered on the rockets warhead's ability to defeat threat targets of interest. The Army used modeling and simulation to augment live testing with estimates of expected lethality performance for conditions and environments not executed during actual testing.

Operational Effectiveness and Lethality

The M31A1 GMLRS-Unitary rocket is operationally effective and lethal. Units equipped with M31A1 GMLRS-Unitary rockets can effectively process and execute GMLRS-Unitary fire missions using current Fire Support command, control, and communications systems. Soldiers and leaders successfully executed 75 of 76 GMLRS-Unitary fire missions during ground phase testing and achieved required effects in 11 of 12 fire missions during the flight phase testing. GMLRS-Unitary tactics, techniques, and procedures support effective system employment. Flight phase testing demonstrated the GMLRS-Unitary rocket can achieve effects on target in a GPS jamming environment. During the flight phase, 29 of 32 GMLRS-Unitary rockets had effects on target. Three of 32 rockets (from two different fire missions) missed their intended aim points by more than 30 meters. One rocket impacted and detonated 760 meters from the target.

Operational Suitability

The M31A1 GMLRS-Unitary rocket is operationally suitable. During the IOT&E, the rocket achieved reliability and supportability requirements demonstrating a reliability rate of 94 percent by completing 30 of 32 flights. The two failures occurred in the same fire mission. During the fifth planned fire mission three rockets were fired at the target. One rocket failed to function on impact (monolithic impact). The second rocket impacted approximately 760 meters from the desired aim point, which is outside the reliability requirement. The third rocket functioned properly.

The M31A1 GMLRS-Unitary rocket warhead and motor are not Insensitive Munition compliant.

Recommendations

The M31A1 GMLRS-Unitary rocket is operationally effective, suitable, and lethal. The M31A1 GMLRS-Unitary program executed the IOT and live fire testing in accordance with the DOT&E approved test plans. I recommend the Army consider the following recommendations:

Operational Effectiveness and Lethality

- Continue investigating and determine the root cause of the 760 meter target miss and detonation deficiency observed in the IOT. Implement and test the hardware manufacturing assembly procedures and software modifications recommended by the Government/contractor failure analysis team to mitigate reoccurrence.
- Implement and test the planned MLRS launcher software modifications to prevent M31A1 GMLRS-Unitary rockets from being launched without Global Positioning System data.
- Complete the planned testing of a design change to prevent further cases where the rocket remains restrained in the launcher after ignition.
- Update the Joint Munitions Effects Manual (JMEM) Weaponeering System (JWS) to include GMLRS-Unitary effects against buildings in the JWS targeting tool.
- Pursue solutions and update the M31A1 GMLRS-Unitary tactics, techniques, and procedures for the reported combat failure modes which precluded completion of fire missions over the last year using M31 GMLRS-Unitary rockets.

Operational Suitability

- Improve M31A1 GMLRS-Unitary Insensitive Munitions compliance of the rocket motor, warhead, and launch pod container.
- Pursue and test a method to improve the reliability of the M31A1 GMLRS-Unitary multi-mode delay fuze function.
- Qualify the M3A1 GMLRS-Unitary for transport on the Army's Palletized Load System (PLS) Trailer.

MQ-9 Unmanned Aircraft System (UAS)

The MQ-9 Reaper is operationally effective in the killer roll and operationally suitable. The Initial Operational Test and Evaluation (IOT&E) was adequate and executed in accordance with the Director, Operational Test and Evaluation (DOT&E) approved test plan.

System Overview

The MQ-9 Reaper is a remotely-piloted unmanned aircraft system (UAS) using optical, infrared, and radar sensors to find, fix, track, target, engage, and assess critical time-sensitive targets (both stationary and moving). It is designed to autonomously provide persistent, all-weather, time-sensitive hunter and killer capabilities with the Hellfire missile and GBU-12 (500-pound laser-guided) bombs. The MQ-9 system includes ground control stations (GCS) used for launch, flight, and recovery as well as mission control of the sensors and weapons. The MQ-9's primary mission is armed reconnaissance with secondary missions of aerial intelligence gathering and combat search and rescue support.

The Air Force designated three Key Performance Parameters (KPPs) for the Increment I system. The Joint Requirements Oversight Council who validated these KPPs in 2005, and considers them essential to meet UAS capability requirements. The three KPPs are the following:

- Net Ready: The system satisfies protocols designated as critical in the joint integrated network architecture.
- Hunter: The system's capability must allow a targeting solution at the weapon's maximum range.
- Killer: The system must be capable of computing a weapon's release point, passing required information at the required accuracy to the weapon, and reliably releasing the weapon upon command.

Test Adequacy

The Air Force Operational Test and Evaluation Center (AFOTEC) conducted the IOT&E in accordance with the DOT&E-approved test plan. The test was adequate to assess the MQ-9 in the killer role, but the hunter role was not assessed due to immature synthetic aperture radar (SAR) integration. SAR integration and hunter capabilities will be assessed during follow-on testing after system upgrades.

The Air Force Program Executive Officer (PEO) for Aircraft informed the AFOTEC Commander of 14 Increment 1 CPD threshold requirements being deferred for Follow-On Test and Evaluation (FOT&E) due to system integration or technical maturity. DOT&E concurs with the PEO recommendation that AFOTEC conduct a formal FOT&E to address the 14 deferred items, system upgrades, and deficiencies noted in the IOT&E.

Operational Effectiveness

The MQ-9 system is operationally effective in the killer role. The hunter role performance remains not assessed due to the SAR limitations previously mentioned. Although the SAR was not integrated per the Increment I CPD, it did demonstrate the capability to provide imagery within the CPD threshold. The MQ-9 system is able to deliver weapons to their targets consistently, supporting the killer KPP. AFOTEC observed 35 releases of the GBU-12 (500-pound laser-guided bomb) at varying slant ranges and altitudes. In 29 cases, the GBU-12 impacted and destroyed the target. AFOTEC observed 27 releases of the Hellfire missile at varying slant ranges and altitudes. In 24 cases, the Hellfire impacted and destroyed the target with the aircrew or ground personnel confirming the target destruction.

AFOTEC documented discrepancy reports on specific subsystems of the MQ-9 system. The discrepancies varied in scope from human system interface in the GCS, pilot sensitivities in the landing environment, and ARC-210 ultra-high frequency (UHF) radio performance. The Program Office is committing resources for the correction of these deficiencies.

Operational Suitability

The MQ-9 as a system is operationally suitable. Of the 22 suitability metrics DOT&E and AFOTEC calculated, four of the metrics did not meet or exceed their derived or CPD established metrics. DOT&E considers three of the four metrics which were not met to be not operationally significant. The third metric not met, Mean Time Between Critical Failure (MTBCF), considerably deviated from the requirement of 500 hours, with 32.8 hours MTBCF demonstrated. DOT&E does not believe this to be an achievable metric and recommends that the Air Force consider a more realistic value commensurate with similar weapons systems. Of note, aircrew surveys indicate the MQ 9's inability to accomplish the MTBCF metric did not adversely affect their ability to accomplish their mission.

The Joint Interoperability Test Command (JITC) conducted the Joint Interoperability Assessment Report during the IOT&E. DOT&E concurs with JITC's assessment that the MQ-9 system complied with the majority of the system requirements, but did not fully meet its Net-Ready KPP. JITC predicts the system will satisfy the Net-Ready KPP in a subsequent evaluation in 2009. DOT&E will monitor and report the results.

Recommendations

In order to fully assess the effectiveness and suitability of the MQ-9 system, the Air Force should complete the following:

- Conduct a formal FOT&E on the 14 deferred Increment 1 capabilities, SAR radar integration, and weapon's upgrades.
- Ensure the integration of the SAR into the GCS allowing effective aircrew use in its intended concept of operations.
- Implement pilot interfaces to minimize the risk of mishaps in the landing environment.
- Verify the correction of deficiencies identified as Category 1 discrepancy reports.
- Reevaluate and consider a more realistic MTBCF metric commensurate with similar weapons systems.
- Conduct operational testing in other than desert-like climates to include maritime, cold weather, and chemical/biological agent conditions.
- Complete successful JITC certification satisfying the Net Ready KPP.

Air Force Mission Planning System (MPS) Increment III (F-16)

The F-16 Mission Planning System (MPS) is operationally effective, but not operationally suitable. The Initial Operational Test and Evaluation (IOT&E) of the F-16 MPS was adequate and executed in accordance with the Director, Operational Test and Evaluation (DOT&E)-approved Test and Evaluation Master Plan and test plan.

System Overview

F-16 MPS is the representative mission planning system for Air Force Mission Planning System (MPS) Increment III. The Increment III MPS provides automated tools that assist in pre-flight and in-flight mission planning, programming platform sensors, creating mission media, and providing required data to the aircraft avionics systems depending on weapon system capabilities.

The basis for the F-16 MPS is the JMPS approach, which uses tailored software packages hosted on commercial Windows® personal computers. JMPS is intended to be a common solution for aircraft mission planning for all military Services. 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. It may operate in a Local Area Network (LAN) Windows® workgroup environment, in a laptop/desktop configuration from a LAN, or in a standalone configuration.

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 IV include newly-developed systems using the JMPS approach. Other platform mission planning systems are included in Increment III, including B-1, RC-135, F-22, and F-15. Pertinent findings from the operational testing of the B-1 MPS, completed prior to the F-16 IOT&E, are included in this report.

Test Adequacy

The IOT&E of the F-16 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 F-16 MPS from October 20 through November 14, 2008. Test participants included Block 40 and Block 50 F-16 pilots from Air Force bases in the United States, the United Kingdom, and the Republic of Korea; an intelligence specialist; and a system support representative.

Operational Effectiveness

The F-16 MPS is operationally effective. The system satisfied the intent of all four Key Performance Parameters: time to plan a mission, route creation and manipulation, data exchanges, and data transfer operations. However, system effectiveness was limited by deficiencies related to the user-system interface, other minor deficiencies, and the poor suitability performance described in Section Four. The deficiencies prevent the system from providing fully effective mission planning support. The pilots considered the F-16 MPS better than their legacy mission planning system.

Operational Suitability

The F-16 MPS is not operationally suitable. Although the F-16 MPS met the stated requirements for mean time between critical failure and operational availability, it did not meet the majority of suitability standards. Numerous suitability shortfalls adversely affected operations during test execution. Additionally, the F-16 MPS experienced data loss during numerous system crashes, requiring missions to be replanned. These shortcomings likely will impact squadron operations by increasing the overall system workload.

As the pilots gained familiarity and experience with the F-16 MPS during the test, they learned how to avoid some of the system shortfalls as they planned missions. The number of workarounds and the need to use safe paths to navigate through the system hampered mission planning efforts and was not consistent with operational employment of MPS. Although the system support representative attempted to mitigate planning deficiencies, there is a high potential for errors in fielded operations due to the need to avoid system pitfalls.

System suitability was degraded substantially by incomplete installation instructions, which caused system support personnel to resort to trial-and-error troubleshooting. Formal training for system support personnel did not exist at the time of the test. The system support representative on site was very knowledgeable and experienced, and his expertise benefitted the pilots planning missions using F-16 MPS. However, fielded sites may be supported by system support personnel with considerably less knowledge and experience.

Logistics supportability was negatively affected by the lack of response from the hardware warranty support contractor in replacing hardware that failed during the test.

User requirements for operational availability, reliability, transporting the system, and security were satisfied. Training for pilots was satisfactory, as was responsive technical support from the system support facility's Help Desk.

Recommendations

Correction of deficiencies and inadequacies identified during testing that limit system suitability must be corrected and operationally tested before the system can be assessed as satisfactory. 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 lessons learned. To improve system performance and overall mission planning, the Air Force should address the following:

- Use a larger sample size of aircrew for future testing to gain more confidence in the results, particularly for the survey assessments used to assist in the evaluation of many measures of effectiveness.
- Provide aircrew with more training on the specific type of weapons being planned, especially with advanced air-to-surface weapons like JASSM.
- Host early user reviews and implement good recommendations with the objective of improving the user interfaces.
- Continue development and adequate test of an acceptable in-flight mission planning capability. The Air Force should consider making in-flight replanning capability a Key Performance Parameter for bomber, airlift, and airborne command and control aircraft mission planning environments.
- Require that system support representatives participating in future operational tests be from operational squadrons rather than the MPSSF to more accurately assess the ability of typical users to operate and maintain the system.
- Include software installation instructions with the system installation discs in order to standardize system support representative actions on initial system set-up.
- Provide formal training for system support representatives prior to fielding F-16 MPS.
- Conduct additional IA vulnerability testing when the Air Force MPS is authorized to operate in a wide area computing environment.
- Review the reliability requirements for future MPS to ensure they are sufficient to support squadron operations with a more robust mission planning system.
- Plan and conduct an Air Force MPS Increment III Maintenance Demonstration to collect data on maintainability (including Built-In Test), maintenance training, and maintenance documentation.

Battlespace Command and Control Center (BC3) Air Force Central Command (AFCENT) Increment 2 Testing

This report provides an assessment of Battlespace Command and Control Center-Air Force Central Command (BC3-AFCENT) Increment 2 performance. The Air Force fielded BC3-AFCENT Increment 2 in March 2009. This report meets the intent of Section 231 of the 2007 National Defense Authorization Act. In the report, I conclude the following:

- The Air Force conducted an abbreviated BC3-AFCENT Increment 2 operational test to support initial fielding.
- Basic system performance appears to meet initial AFCENT air surveillance and command and control requirements. However, testing identified serious communications and information assurance deficiencies. Some data link and integrated air defense capabilities were not tested.
- The abbreviated operational test period did not produce sufficient operating hours to assess system reliability, availability, and maintainability performance. Testing did identify numerous suitability deficiencies, including environmental control system failures and shortfalls in supply support, technical data, support equipment, and training.

Extended Range Multi-Purpose (ERMP) Unmanned Aircraft System Quick Reaction Capability

In response to the Secretary of Defense's directive to increase intelligence, surveillance, and reconnaissance support in Iraq and Afghanistan, the Army deployed an early version of the Extended Range Multi-Purpose (ERMP) Unmanned Aircraft System for operational use. The Army conducted testing of this Quick Reaction Capability in conjunction with training for unit deployment to Iraq prior to Initial Operational Test and Evaluation. In this early fielding report, I conclude:

- The testing was an excellent example of combining training and testing to support a rapid fielding initiative.
- The unit effectively employed the system during testing and it will provide an increased reconnaissance, surveillance, target acquisition capability.
- The aircraft and sensor payload met reliability requirements. Use of the redundant Legacy Ground Control Station offsets poor One System Ground Control Station reliability. Overall system availability observed during testing met requirements.

This report does not satisfy the requirement in Section 2399, Title 10, United States Code for a DOT&E Operational Test and Evaluation report prior to the ERMP full-rate production decision. I will submit the required report at the completion of initial operational test.

EA-18G Airborne Electronic Attack (AEA) Aircraft

The EA-18G is operationally effective for all mission areas, except for missions that require a full escort profile against an active air defense system. It is not operationally suitable due to Built-in Test (BIT) failures that resulted in excessive maintenance. The EA-18G is survivable. Testing was adequate to determine operational effectiveness, operational suitability, and survivability within the usual limitations involved with testing Electronic Warfare systems. After operational testing was complete, additional testing in July 2009 using a newer version of aircraft software indicated the BIT problems that kept the EA-18G from being fully suitable have been improved. Additional testing will be required to confirm these preliminary results.

System Description

The EA-18G is the fourth major variant of the F/A-18 family of aircraft and will serve as the Navy's replacement for the aging fleet of EA-6Bs. It provides a capability to detect, identify, locate, and suppress hostile emitters (radars or communications equipment operating on land, sea, or in the air). The EA-18G is an F/A-18 F (Lot 30 and subsequent) aircraft with Airborne Electronic Attack (AEA) equipment and related systems installed. To reduce development risk and cost, the Navy adapted the EA-6B Improved Capability (ICAP) III AEA system for use on the EA-18G. This system includes Electronic Surveillance equipment to identify and locate threat radars and communications systems, and provides an integrated Electronic Attack suite to jam and degrade threats. The AEA system also provides targeting information on threat radar systems for employment of onboard weapons such as the High-Speed Anti-Radiation Missile (HARM). Additional EA-18G modifications include a new communications countermeasures set, a new electronics interface unit, and enhancements designed to improve aircrew communications reception while onboard jamming (transmission of radio signals that intentionally disrupt radar and/or communications receivers) is active.

Test Adequacy

Testing was adequate to assess the EA-18G AEA aircraft radar/communication signal receiving capability and the communications countermeasures capability. However, testing was not adequate to fully evaluate AEA radar jamming against early warning and engagement threat radars due to limited availability of threat systems, Federal Communications Commission (FCC) restrictions against certain frequency bands, and the poor reliability of the legacy tactical jamming pods. A total of five EA-18G production aircraft logged 471.4 hours between September 2008 and March 2009 in support of the Initial Operational Test and Evaluation (IOT&E). Operational testers used both developmental and operational test data to evaluate Key Performance Parameters (KPPs) and Key System Attributes (KSAs). Operational testing was conducted in accordance with the Director, Operational Test and Evaluation (DOT&E)-approved test plans.

Operational Effectiveness

Aircrews utilizing the EA-18G demonstrated the ability to conduct representative missions covering all seven of the mission areas defined for the EA-18G, utilizing all four typical mission profiles. The EA-18G is operationally effective for all missions, except for those requiring a full escort mission profile against an active air defense system. The shortfall in conducting a full escort profile is due to the excessive time required to display situational awareness information and the AEA suite's lengthy response time for making reactive jamming assignments. Supporting this conclusion, the EA-18G did not meet the KPP threshold criteria for selective reactive jamming response (SRJR). While the EA-18G did not meet this KPP, the full escort mission profile is uncommon and is not likely to be used by the EA-18G.

The EA-18G AEA system met KPP threshold criteria that support the standoff and modified escort mission profiles, including radar/communications receive frequency range and radar azimuth coverage. The system did not meet the KSA threshold criteria for geolocation of ground emitters, but demonstrated sufficient capability for aircrew situational awareness and to allow targeting of air-to-ground weapons. The EA-18G met KPP threshold criteria for deck spot factor, aircraft carrier launch and recovery wind limitations, recovery payload, and additional internal fuel capacity.

Operational Suitability

The EA-18G is not operationally suitable. The system met the availability KPP and reliability threshold for Mean Flight Hours Between Operational Mission Failure (MFHBOMF) while falling just below the threshold for maintainability. However, the BIT capability is immature and did not meet any of its thresholds. Poor BIT performance leads to additional maintenance on the aircraft to correctly isolate faults or to conduct unnecessary troubleshooting of false BIT indications.

Additionally, the high rate of false BIT indications can lead to a lack of aircrew confidence in the AEA system health impacting the decision to take the aircraft on a given mission. Additional testing in July of 2009 of software version H5E+ indicates that the newer software may have eliminated many of the BIT problems. The Navy has scheduled a Verification of Correction of Deficiencies for September 2009 and follow-on operational test and evaluation for spring of 2010 to confirm that the majority of suitability problems will have been corrected. The EA-18G system is compatible with the aircraft carrier operating environment.

Survivability

The EA-18G is survivable in the standoff and modified escort missions where the AEA system provides aircrews cues allowing them to avoid known threats. Testers assessed survivability by separately evaluating the EA-18G's susceptibility and vulnerability to threat Integrated Air Defense systems. Large Force Exercises (LFEs) conducted during operational test provided a susceptibility evaluation with multi-Service forces. Although quantitative data was limited, operational crews completed detailed surveys. Previous F/A-18E/F Live Fire Test and Evaluation (LFT&E) analysis provided the basis for assessing vulnerability of the EA-18G aircraft.

The EA-18G retains the vulnerability reduction features of the F/A-18E/F, and the vulnerabilities of the two aircraft are comparable over a wide range of threats. The vulnerability is acceptable and is less than that of the F-16 and EA-6B. The DOT&E EA-18G Live Fire Test and Evaluation Report dated September 2009 provides further details.

Recommendations

In order for the EA-18G to be fully operationally effective and suitable and to increase survivability, the Navy should do the following:

EA-18G Aircraft-specific

- Improve reliability of the current ALQ-99 pods and accelerate development of the Next Generation Jammer.
- Mature maintainability and BIT.
- Improve reactive jamming assignment and display performance.
- Improve INCANS performance reliability.
- Ensure logistics supportability and quality control support system availability.
- Minimize aircrew workload management to include upgrading the pilot Tactical Situation Display comparable to the EA-6B.
- Improve hardware and software diagnostic tools for the ALQ-218 and update the Interactive Electronic Technical Manual System accordingly.
- Conduct survivability studies to assess the benefits of a threat warning system that could provide timely notification of types and locations of targeting threats.
- Assess the safety and performance benefits of adding higher performance engines.

Electronic Warfare Warfighting Improvements

- Support ongoing DoD efforts to investigate, evaluate, and make recommendations to improve Enterprise Electronic Warfare test capabilities associated with open-air ranges, test and evaluation facilities, concepts, processes, and procedures.
- Assess requirements to improve Electronic Warfare modeling and simulation capabilities to support ground testing of future AEA capabilities, to include multi-signal threat environments.
- Assess the need for and benefits of building a more capable threat range at Naval Air Station Whidbey Island, Washington.

B-2 Radar Modernization Program (RMP) Mode Set One (MS 1)

The B-2 Radar Modernization Program (RMP) Mode Set One (MS 1) is operationally effective, suitable, and survivable with some limitations.

System Overview

The B-2 RMP replaces elements of the aircraft's legacy radar hardware and software with an active electronically scanned array radar system operating in a new frequency band of the electromagnetic communications spectrum. The legacy B-2 radar system operates within an electromagnetic communications frequency band where the U.S. Government is designated as a secondary user. Secondary user status means that the B 2 radar system cannot interfere with primary users. There were no other competing users operating within the legacy radar frequency band when the B-2 aircraft was initially developed and fielded. The recent emergence and licensing of primary commercial users within that frequency band required the Air Force to retrofit the B-2 radar system and shift to an operating frequency band for which the the U.S. Government holds a primary user license. The B-2 RMP is intended to provide the same operational capabilities as the legacy radar system without degrading the aircraft's low observable characteristics, avionics, and defensive systems capabilities. B-2 RMP does not provide additional enhancements to existing B-2 radar operating modes or capabilities.

RMP delivers two sets of radar capabilities to the B-2. RMP MS 1 capabilities encompass five radar modes necessary for B-2 conventional weapons mission execution. RMP Mode Set Two (MS 2) capabilities encompass additional radar navigation and targeting modes necessary to support B-2 nuclear weapons missions.

Test Adequacy

The operational testing of the B-2 RMP MS 1 adequately supported an evaluation of the system's operational effectiveness, suitability, and survivability.

Air Force Operational Test and Evaluation Center (AFOTEC) conducted RMP MS 1 Initial Operational Test and Evaluation (IOT&E) from October through December 2008. Operational test aircrews planned and flew operationally representative missions, and operational maintainers performed RMP maintenance actions to accomplish IOT&E. Testing included mission planning, flight test, and associated maintenance activities necessary to support radar operation and sortie generation. IOT&E assessed production representative RMP system hardware, software, publications, and maintenance equipment.

The Director, Operational Test and Evaluation (DOT&E) assessment of operational effectiveness and suitability included supplemental data from production representative RMP developmental test missions during 2008 and additional suitability data from the Air Force Air Combat Command (ACC) post-IOT&E Force Development Evaluation (FDE) of B 2 RMP MS 1 capabilities conducted from April to September 2009.

AFOTEC will assess RMP MS 2 navigation and targeting capabilities in follow-on test and evaluation (FOT&E) of the full-rate production RMP system. RMP MS 2 FOT&E is scheduled to begin in November 2009.

Operational Effectiveness

RMP MS 1 is operationally effective with some limitations in the weather avoidance mode. RMP detection and display of weather phenomena was inconsistent with the actual weather location relative to the aircraft; weather phenomena such as thunderstorms were approximately five miles closer to the aircraft in than cockpit-displayed RMP detections. Operational aircrews must increase desired weather avoidance distances by five miles to compensate for this inconsistency. DOT&E assesses that this limitation will not preclude the B 2 from accomplishing its conventional operational missions.

RMP effectiveness in the other MS 1 radar operating modes was as good as that of the legacy radar. RMP-configured B-2 mapping, targeting, aircraft rendezvous, and weapons accuracy performance was at least as good as the legacy system.

Operational Suitability

RMP is operationally suitable with some limitations. RMP met user needs for reliability, maintainability, supportability, deployability, and availability with some exceptions.

The demonstrated RMP system mean time between failure (MTBF) met the Air Force requirement. DOT&E's assessment included 430.8 hours of RMP flight test data from missions flown through July 31, 2009. The Air Force MTBF requirement is 68.1 hours, and RMP achieved a system MTBF of 71.8 hours in the test period. In comparison with the legacy radar MTBF, DOT&E assesses there is reasonable confidence that RMP MTBF is no worse than that of the legacy radar system.

Incomplete aircrew and maintenance technical publications required work-around actions to ready RMP aircraft for flight missions. Additionally, a modified hand tool was required and procured to facilitate removal and installation of RMP antenna components. These suitability shortfalls did not adversely affect RMP maintainability or supportability.

RMP-configured aircraft availability was slightly higher than that of the legacy radar equipped B-2. The RMP availability requirement is derived from the RMP system MTBF and mean time to repair requirements. During the test period, RMP achieved 95.8 percent availability against the derived requirement of 95.6 percent. In comparison with the legacy radar availability, DOT&E assesses there is reasonable confidence that RMP availability is no worse than that of the legacy system.

The RMP On-Board Test System (OBTS) is designed to provide 100 percent detection of radar system hardware or software faults. There was one hardware failure occurrence where OBTS did not detect the failed radar hardware module. Follow-on operational testing or assessment of OBTS performance in B-2 operational units is required to confirm that OBTS capability meets the user-defined requirements.

Operational Survivability

The RMP-configured B-2 is as survivable as the legacy radar-equipped aircraft. Both a legacy radar equipped B-2 and an RMP-configured B-2 flew side-by-side missions against operationally representative threat scenarios to evaluate and compare RMP vulnerability to threat detection. In direct comparison testing with the legacy radar-equipped B-2, results demonstrated that RMP did not increase B-2 susceptibility to detection by threat system radars. Flight testing demonstrated that the RMP operating frequencies did not interfere with performance of the B-2 Defensive Management System. Furthermore, RMP incorporation did not adversely affect B-2 radar or infrared signatures.

Recommendations

B-2 Radar Modernization Program Mode Set One is effective, suitable, and survivable for combat operations with some limitations. To address these limitations and meet the user's stated needs, the Air Force should accomplish the following:

1. Ensure that B-2 aircrews are fully trained on RMP MS 1 weather avoidance mode limitations, and establish operational procedures that enable mission accomplishment given the weather avoidance mode display discrepancies.
2. Complete, verify, and validate the applicable RMP aircrew and maintenance technical publications to support RMP sortie generation and mission execution.
3. Evaluate RMP On-Board Test System performance through follow-on operational testing or assessment of system performance in B-2 operational units to confirm system capability meets the user-defined requirements.

Index

Index

INDEX OF PROGRAMS

INDEX OF PROGRAMS

INDEX OF PROGRAMS

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