

**DEPARTMENT OF DEFENSE**  
**Developmental Test and Evaluation**  
**FY 2012 Annual Report**



MARCH 2013

A handwritten signature in blue ink, reading "Steven J. Hutchison".

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The estimated cost of this report for the Department of Defense  
is approximately \$523,000 in Fiscal Years 2012–2013.  
Generated on 2013Mar08 RefID: 8-F48E80D

*Department of Defense Developmental Test and Evaluation FY 2012 Annual Report*

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# 1 EXECUTIVE SUMMARY

The Deputy Assistant Secretary of Defense for Developmental Test and Evaluation (DASD(DT&E)) is pleased to submit this Annual Report for Fiscal Year (FY) 2012 in response to 10 U.S.C. 139b and section 102(b) of Public Law 111-23. This report addresses activities relating to the Major Defense Acquisition Programs (MDAPs) including:

- A discussion of the extent to which the MDAPs are fulfilling the objectives of their developmental test and evaluation (DT&E) plans.
- A discussion of the waivers of and deviations from requirements in the Test and Evaluation Master Plans (TEMPs) and other testing requirements that occurred during the preceding year with respect to such programs, any concerns raised by such waivers or deviations, and the actions that have been taken or are planned to be taken to address such concerns.
- An assessment of the organization and capabilities of the Department of Defense (DoD) for DT&E with respect to such programs.
- Any comments on such report that the Secretary of Defense considers appropriate.

This report also includes two sections that were identified in section 904 of the FY 2013 National Defense Authorization Act (NDAA). These sections cover the activities of the DoD Test Resource Management Center (TRMC) during FY 2012 and address the adequacy of the resources available to the DASD(DT&E) and the Lead DT&E Organizations of the Military Departments to carry out the responsibilities prescribed in law.

## 1.1 Developmental Test and Evaluation

This report provides descriptions of DASD(DT&E) activities and initiatives, assessments of the DT&E capabilities and organizations of the Military Departments, and a compilation of engagements with major programs that have reached a significant milestone or programs that have conducted considerable DT&E activity in FY 2012. In addition to the Military Department assessments, this report includes organizational and capabilities assessments of two DoD Components with acquisition responsibility: the Defense Information Systems Agency (DISA) and the Missile Defense Agency (MDA).

For FY 2012, DoD Components with MDAPs, Major Automated Information System (MAIS) programs, and special interest programs were required to provide self-assessment reports to the DASD(DT&E). The DoD Components provided updates to their FY 2011 reports regarding test and evaluation (T&E) involvement in early acquisition activities, T&E planning and strategic execution, T&E execution, and T&E personnel. In addition, the DoD Components were asked to provide details of the T&E workforce composition to include all categories of T&E personnel.

DASD(DT&E) requested information on the designation of Chief Developmental Testers (T&E Key Leadership Positions (KLPs)) for MDAPs and MAIS programs, the use of Defense Acquisition Workforce Development Fund (DAWDF) Section 852 funding in support of the T&E workforce, and

any impact to the T&E organizations based on Directive-Type Memorandum (DTM) 11-003, “Reliability Analysis, Planning, Tracking, and Reporting.”

DASD(DT&E) continues to examine the composition of the T&E workforce. As in previous years, there is continued reliance on support contractors and developer T&E support. Non-acquisition-coded, and specifically non-T&E-coded, personnel are still the major contributors to T&E activities. A significant number of T&E resources remain outside this Defense Acquisition Workforce Improvement Act (DAWIA)-certified workforce, which therefore excludes them from being accounted for in this report.

This report also includes an assessment of 46 programs that have reached a significant milestone or had significant test events in FY 2012. None of the programs assessed in this report has requested a deviation or waiver from the TEMP.

## **1.2 DoD Test Resource Management Center**

The TRMC achieved many notable accomplishments in FY 2012, providing advocacy, oversight, and guidance for all matters pertaining to assessment of and strategic planning for the Major Range and Test Facility Base (MRTFB). These responsibilities included the annual certification of the Service and Defense Agency T&E budgets and development of the congressionally directed biennial Strategic Plan for DoD Test and Evaluation Resources. During FY 2012, the Central Test and Evaluation Investment Program (CTEIP) again made significant progress in the development and deployment of test infrastructure capabilities. The Joint Mission Environment Test Capability (JMETC) advanced the infrastructure objectives of the “Testing in a Joint Environment Roadmap,” expanding the DoD persistent capability for joint testing. The T&E/Science and Technology (S&T) Program made significant progress in more than 80 developments executed across the eight focus areas. Also in FY 2012, at the direction of the Under Secretary of Defense for Acquisition, Technology, and Logistics (USD(AT&L)), the TRMC produced the report of the Comprehensive Review of T&E Infrastructure. The final report detailing the findings and recommendations of the study effort was delivered to the USD(AT&L) on December 27, 2012.

The TRMC long-term goal continues to be to guide the development of the T&E infrastructure—not just facilities and property, but also the processes and workforce, skills, and capacity needed to fulfill current and future missions, providing robust and flexible T&E capabilities in support of the Warfighter.

## **1.3 Adequacy of Resources**

The Office of the DASD(DT&E) has a staffing level of 16 Government personnel with additional contractor support. Working within available resources, DASD(DT&E) focuses its activities on the congressionally mandated MDAPs, with additional support to MAIS and special interest programs as directed by the USD(AT&L).

In FY 2012, DASD(DT&E) initiated a process to have the DoD Components identify the Lead DT&E Organization for each MDAP in the DoD Component portfolio and address the adequacy of



the resources available to the Lead DT&E Organizations to carry out the responsibilities prescribed in 10 U.S.C. 139b.

For FY 2012, the DoD Components identified in their self-assessments the Lead DT&E Organization for each MDAP. In FY 2013, the DoD Components will be tasked to address the adequacy of the resources available to the Lead DT&E Organizations and will provide an update in the FY 2013 annual report.

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## 2 DASD(DT&E) ACTIVITIES

### 2.1 Policy and Guidance Summary

In FY 2012, DASD(DT&E) strived to improve policy and guidance in support of the acquisition of major DoD weapon systems and to provide advocacy, oversight, and guidance to elements of the acquisition workforce responsible for DT&E. DASD(DT&E) worked to improve the measurable performance criteria and associated metrics used to gain insight into DT&E performance; improve the training, education, and prestige of the DAWIA T&E acquisition workforce; develop policy and guidance to implement recent statutory language; promote the increased use of scientific and statistical T&E methodologies and tools within the acquisition programs; and develop DT&E methods for capabilities operating in the cyber domain.

DASD(DT&E) continued its four-phased approach to develop and implement measurable performance criteria and associated metrics. Phase III began in late FY 2012, applying the framework to the 46 programs selected for reporting in the FY 2012 annual report. DASD(DT&E) used the resulting assessments to support the development of the program engagement section of this report.

To improve the T&E acquisition workforce, DASD(DT&E) led a full review of the Defense Acquisition University (DAU) T&E course curriculum, the T&E Workforce Competency Model, the T&E position category description (PCD), and the T&E training standards. At the conclusion of the review, DASD(DT&E):

- Developed a road map to assist in T&E workforce development through annual improvement blocks for FY 2012 to FY 2015. The goal is to develop T&E professionals capable of performing their critical role throughout the acquisition life cycle.
- Added additional training courses for T&E certification, along with required continuous learning modules (CLMs) and prerequisite courses, to enhance the training for T&E and better prepare the students for future challenges. The complete list is at Sections 2.3.1 and 2.3.2.
- Updated DAU courses TST 102, TST 203, and TST 303 to enhance rigor within the courses, increase student application through practical exercises, and promote additional critical thinking within student exercises.

DASD(DT&E) participated in the USD(AT&L) Project #3, Elevating the Status, Prestige, and Professional Standards of Acquisition Personnel – Focusing on Key Leaders, which focused on competency and accountability. This project is setting standards and selection criteria for KLPs to enhance prestige, status, and recognition for the acquisition workforce members.

DASD(DT&E) is actively participating with the Workforce Management Group (WMG) and serves as an advocate for the T&E community. During FY 2012, DASD(DT&E) participated in working groups to update the DoD Instruction (DoDI) governing the acquisition workforce. This update will include updated information and requirements for KLPs and recertification. DASD(DT&E) is participating in working groups to improve the availability of and access to acquisition workforce data and working groups to develop the AT&L Human Capital Strategic Plan.

Title 10 U.S.C. 139b(c) requires that the Secretary of Defense shall require that each MDAP be supported by a Chief Developmental Tester and governmental test agency, serving as Lead DT&E Organization for the program. This mandate requires policy changes, and the DASD(DT&E) is working to add the changes into the next update to DoDI 5000.02, “Operation of the Defense Acquisition System”; the Defense Acquisition Guidebook (DAG); the T&E Management Guide; and the DAU T&E curriculum. DASD(DT&E) is working with the DoD Components on the implementation.

DASD(DT&E) continued to execute the Scientific Test and Analysis Techniques (STAT) in T&E Implementation Plan, approved in January 2012. FY 2012 activities included the announcement of the establishment of a STAT in T&E Center of Excellence (COE) at the Air Force Institute of Technology (AFIT), enhancement of the T&E workforce training for STAT, and an update to guidance on the use of STAT.

DASD(DT&E) worked collaboratively to develop an approach for cyber DT&E. The strategy incorporates immediate measures to address critical needs while assessing and refining long-term measures that will form the basis of an enduring cyber T&E strategy. The strategy comprises four focus areas (process, methodology, infrastructure, and workforce), each being aligned and integrated in parallel. DASD(DT&E), in coordination with the TRMC, completed most of the planning for the next InterTEC Cyber Event (ICE) 2013, which will include representation of the Computer Network Defense Service Provider (CNDSP), a significant enhancement from ICE 2011.

DASD(DT&E) supported the update to DoDI 5000.02; the DAG; the T&E Management Guide; and the DAU T&E curriculum, to include a rewrite of the DAU CLM for Probability and Statistics.

## 2.2 Measurable Performance Criteria

Background. DASD(DT&E) is continuing the effort to establish measurable performance criteria and associated metrics to gain insight into DT&E performance. The primary intent is to institutionalize the process and use of criteria and metrics within the Office of the DASD(DT&E) and to set the conditions for entry into production and successful initial operational test and evaluation (IOT&E). The effort consists of four phases:

- Phase I – Develop the framework, performance criteria, and associated metrics.
- Phase II – Pilot the framework.
- Phase III – Expand the scope of the pilot program.
- Phase IV – Integrate the performance measures into the DASD(DT&E) decision support capability.

DASD(DT&E) initiated Phase I in FY 2010 to develop a framework containing performance criteria and metrics to assess individual program DT&E performance and also to assess the overall performance of DT&E functions across DoD. The program DT&E performance criteria focus on assessing the program TEMP, DT&E planning, evaluation framework, key performance parameters (KPPs) and critical technical parameters (CTPs), technical progress and system maturity, DT&E

schedule performance, and resource management. The overall DT&E performance criteria focus on assessing DT&E performance across a portfolio of programs and the performance of DASD(DT&E).

As part of the framework, DASD(DT&E) developed a method for assessment. For each performance criterion, DASD(DT&E) assesses performance against the particular criterion and provides a confidence level in making the assessment.

For the performance assessment, DASD(DT&E) uses the stoplight colors of green, yellow, and red. The meaning of each stoplight assessment color was developed uniquely for each criterion to reflect the proper status. A “Not Rated” assessment is also available, as appropriate.

The confidence assessment consists of three levels: high, medium, and low.

- High confidence is assessed when the presence and maturity of program T&E artifacts and documentation are consistent with expectations for the current point in the program life cycle.
- Medium confidence is assessed when the presence of program T&E artifacts and documentation is consistent with expectations, but detail and maturity of documentation are lacking.
- Low confidence is assessed when there are omissions, gaps, inconsistencies, lack of expected detail, and/or conflicting data and information observed in program T&E artifacts and documentation.




Phase II commenced in FY 2011 to apply the framework to two MDAPs and use the results from that effort to refine the initial set of performance criteria and associated metrics. Phase II concluded in FY 2012. The effort produced a framework of 11 performance criteria: six performance criteria for program DT&E performance and five performance criteria for overall DT&E performance. The criteria are shown in Table 2-1 and Table 2-2, respectively.

**Table 2-1. Program DT&E Performance**

<b>Program DT&amp;E Performance Criteria</b>	<b>Metrics</b>
Evaluation framework for KPPs/CTPs established	KPPs/CTPs exit criteria at decision points are established and can be evaluated
KPPs evaluated for mission capabilities	KPPs values meeting planned values
Technical progress and system maturity	Technical and system maturity progress at decision points
DT&E phase schedule performance	Test schedule trends
DT&E resource management	Test resource availability to support planned test activities
TEMP adequacy and currency	TEMP adequacy and currency at decision point

**Table 2-2. Overall DT&E Performance**

Overall DT&E Performance Criteria	Metrics
Acceptance of DT&E recommendations	Program acceptance of DASD(DT&E) recommendations
DT&E assessment recommendations	DT&E assessment recommendations at decision points
TEMP approvals	TEMP approvals
T&E workforce certification status	Percentage of T&E acquisition workforce certified and/or within 24-month training programs
Fill identified T&E KLPs for all qualified programs	Filled T&E KLPs for MDAP/MAIS and selected DoD special interest programs

-  Meets Performance Criteria
-  Partially Meets Performance Criteria
-  Failed to Meet Performance Criteria
-  High Confidence
-  Medium Confidence
-  Low Confidence
-  N/A

DASD(DT&E) began Phase III in late FY 2012 to apply the revised framework to the 46 programs selected for reporting in the FY 2012 annual report. DASD(DT&E) used the resulting assessments to support the development of the program engagement section of this report. The framework in Table 2-2 was applied to the overall DT&E programs under oversight.

Next Steps. DASD(DT&E) will now shift to Phase IV to fully integrate the performance measures into assessment and decision support processes. The framework will be reviewed on a periodic basis and adjusted as necessary. Future annual reports will document progress, if needed.

### 2.3 T&E Acquisition Workforce Development

The DASD(DT&E) serves as the functional leader for the T&E career field in accordance with DoDI 5000.66, “Operation of the Defense Acquisition, Technology, and Logistics Workforce Education, Training, and Career Development Program.” In this capacity, the DASD(DT&E) role is to establish, oversee, and maintain the education, training, and experience requirements including competencies and certification standards, T&E PCD, and content of the DAU courses as current, technically accurate, and consistent with DoD acquisition policy.

During FY 2012, DASD(DT&E), the DAU T&E Performance Learning Director, and T&E course managers conducted a full review of T&E curriculum. The T&E Functional Integrated Product Team (FIPT), led by the DASD(DT&E) Deputy Director for T&E Competency and Development and composed of DoD Component functional representatives, directors of acquisition career management (DACMs), and DAU representatives, reviewed the T&E Workforce Competency Model, T&E PCD, and T&E training standards. This review resulted in a plan for FY 2012 and beyond.

DASD(DT&E) developed a road map through FY 2015 to assist in T&E workforce development through annual improvement blocks. This road map will be reviewed and updated annually. The goal is to develop T&E professionals capable of performing their critical role throughout the acquisition life cycle. Figure 2-1 depicts the DASD(DT&E) road map.

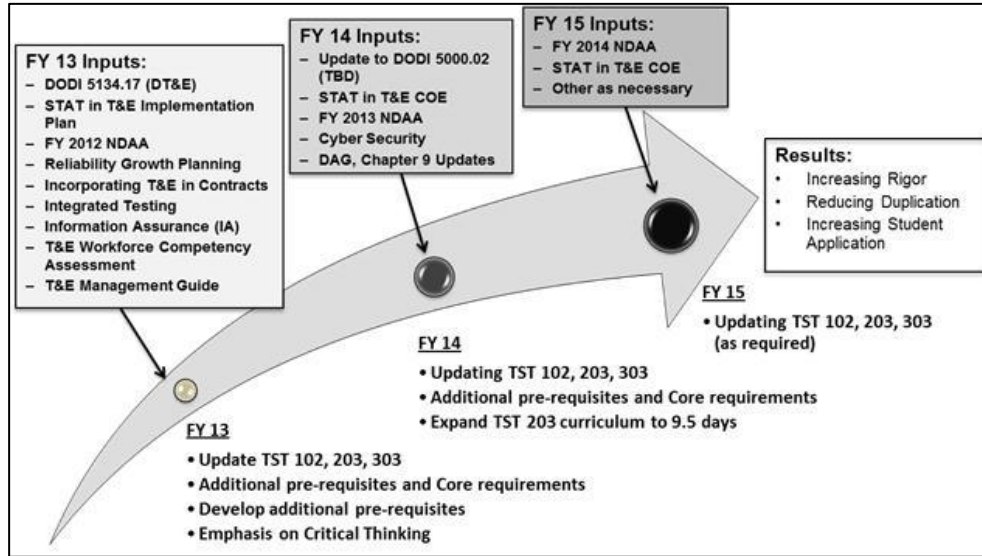


Figure 2-1. DASD(DT&E) FY13 to FY15 T&E Workforce Development Road Map

### 2.3.1 Core T&E Certification

**Background.** The DASD(DT&E) certified the T&E core curriculum on June 7, 2012. Additional functional training courses, shown in Table 2-3, were added for T&E certification. All courses are online and offered at DAU. The requirement became effective at the start of FY 2013.

Table 2-3. Additions to Core Functional Training

Level	New Functional Training (CLMs)
Level I	Introduction to Probability and Statistics Information Assurance
Level II	Technical Reviews Reliability and Maintainability Introduction to the Joint Capabilities Integration and Development System
Level III	Planning, Programming, Budgeting, and Execution and Budget Exhibits Product Support Business Case Analysis Integrated Product Team (IPT) Management and Leadership Improved Statement of Work

**Next Steps.** DASD(DT&E) will continue to monitor the curriculum in accordance with the responsibilities assigned in DoDI 5000.66.

### 2.3.2 T&E Curriculum

Background. DASD(DT&E) worked through the T&E FIPT to develop a T&E workforce road map for FY 2013 that includes updates of the DAU T&E curriculum for courses TST 102, TST 203, and TST 303. Updates include increased rigor within the courses, increased practical application exercises, and additional emphasis on critical thinking within student exercises. The intent is to provide a robust training curriculum that takes the T&E professional from entry level to senior level. In addition, the review focused on ways to improve efficiency by satisfying supplemental and required training using computer-based training. Table 2-4 shows key changes to the T&E curriculum.

**Table 2-4. FY 2013 DAU Curriculum Updates**

Course	FY 2013 Updates
TST 102	Update to reflect the 4-Part TEMP Chief Developmental Tester Lead DT&E Organization Expanded discussion of DT&E assessments Discussion of Cybersecurity Scientific Test and Analysis Techniques (STAT) in T&E
TST 203	Expanded discussion of Integrated Testing Chief Developmental Tester Lead DT&E Organization STAT in T&E Updated assignments involving development of the TEMP Exercises on T&E Planning, T&E Execution, and Analysis
TST 303	Delete redundant material on Test Ranges, Funding, and Resources and Systems Engineering (SE) covered in other courses and prerequisites Add lesson in T&E Contracts Update exercises to include Request for Proposal (RFP) Review, TEMP Concept Brief, and Reliability Growth

As part of the review, the course managers recommended that additional DAU courses be designated as prerequisites to the TST courses. Table 2-5 provides the details of those requirements that became effective in FY 2013.

**Table 2-5. Prerequisite Courses**

Course	New Prerequisite
TST 102	Fundamentals of Systems Planning, Research, Development, and Engineering
TST 203	Introduction to Probability and Statistics Reliability and Maintainability Introduction to the Joint Capabilities Integration and Development System
TST 303	Planning, Programming, Budgeting, and Execution and Budget Exhibits IPT Management and Leadership

Next Steps. DASD(DT&E) will continue to monitor the curriculum in accordance with the responsibilities assigned in DoDI 5000.66.



### **2.3.3 Support to AT&L Workforce Development**

Background. In February 2012, USD(AT&L) initiated Project #3 to address “Elevating the Status, Prestige, and Professional Standards of Acquisition Personnel – Focusing on Key Leaders.” DASD(DT&E) is supporting many aspects of this project, which focuses on competency and accountability. This effort sets standards and selection criteria for KLPs and creates an aura of prestige, status, and recognition for the acquisition workforce members.

In 2012, the WMG, led by the Assistant Secretary of Defense for Acquisition (ASD(A)), also initiated teams to address improvements for the acquisition workforce. DASD(DT&E) is the advocate for the T&E community and participates in the teams that are addressing updates to the DoDI governing the acquisition workforce, improving data analysis and metrics, developing an approach for recertification and currency, and addressing the AT&L Human Capital Strategic Plan.

Next Steps. DASD(DT&E) will continue to participate in the acquisition workforce efforts.

## **2.4 Program Engagement**

DASD(DT&E) assists acquisition decision makers by providing an impartial evaluation of a program’s status and risks before commitment to production. The primary DT&E product at technical reviews is credible knowledge of a system, a component, or technology maturity, as well as the ability to provide the end user with a characterization of capabilities and limitations. Program insight comes from early and continuous engagement with MDAPs, MAIS programs, and special interest programs. In FY 2012, DASD(DT&E) advised 51 Defense Acquisition Boards (DABs), 66 Overarching Integrated Product Teams (OIPs), and one Nunn-McCurdy review. The DASD(DT&E) completed and released 13 DT&E assessments (previously referred to as an assessment of operational test readiness (AOTR)) and approved 33 TEMPs.

## **2.5 DASD(DT&E) Focus Areas**

In FY 2012, DASD(DT&E) concentrated on the following areas:

- Chief Developmental Tester
- Lead DT&E Organization
- Cost of DT&E
- T&E Policy Initiatives
- Scientific Test and Analysis Techniques (STAT) in T&E
- Cybersecurity T&E
- Cybersecurity DT&E
- Cyber T&E Events
- T&E Management Guide

- Defense Acquisition Guidebook (DAG)
- DT&E Assessments
- Modeling and Simulation (M&S)
- DT&E Recommendations
- “Shift Left”

The following paragraphs describe the findings and path ahead for each of these focus areas.

### **2.5.1 Chief Developmental Tester**

Background. Title 10 U.S.C. 139b(c) requires that the Secretary of Defense shall require that each MDAP and MAIS program be assigned a Chief Developmental Tester.

The Chief Developmental Tester is responsible for:

- Coordinating the planning, management, and oversight of all DT&E activities for the program.
- Maintaining insight into contractor activities under the program.
- Overseeing the T&E activities of other participating Government activities under the program.
- Helping program managers (PMs) make technically informed, objective judgments about contractor DT&E results under the program.

The Chief Developmental Tester will be a designated KLP. DASD(DT&E) continues to work with the acquisition workforce community and the DoD Components on the implementation of the Chief Developmental Tester for each MDAP and MAIS program. Section 3.3.2 provides information on DoD Component implementation.

Next Steps. DASD(DT&E) will continue to work on behalf of the USD(AT&L) to assist Component Acquisition Executives (CAEs) with the implementation of the Chief Developmental Tester.

### **2.5.2 Lead DT&E Organization**

Background. Title 10 U.S.C. 139b(c) requires that the Secretary of Defense shall require that each MDAP be supported by a governmental test agency, serving as the Lead DT&E Organization for the program. In the FY 2011 annual report, DASD(DT&E) provided recommendations for future policy considerations regarding the designation of a governmental test agency as Lead DT&E Organization for MDAPs.

DASD(DT&E) continues to work with the DoD Components on the implementation of the Lead DT&E Organization for each MDAP. Section 3.3.3 provides information on DoD Component implementation plans.

Next Steps. DASD(DT&E) will continue to work on behalf of the USD(AT&L) to assist CAEs with implementation of the Lead DT&E Organization.

### 2.5.3 Cost of DT&E

#### Infrastructure Costs

Background. In January 2012, the TRMC requested that the Military Departments and Defense Agencies review and provide changes to the MRTFB Composition List. The DASD(DT&E) met with the DoD Component T&E Executives to discuss the effort and the path forward.

DASD(DT&E) and the TRMC are working cooperatively with the Military Departments and Defense Agencies to address any concerns.

Next Steps. DASD(DT&E) will coordinate with the Military Departments and Defense Agencies to identify the recognized capabilities and address any concerns.

#### Program T&E Costs

Background. DoD 7000.14-R, “Department of Defense Financial Management Regulations (FMRs),” instructs formulation of the T&E Exhibit “dash one” (T&E-1) needed for review and analysis of DoD Component T&E funding requirements. In FY 2011, the DASD(DT&E) and the Director of Operational Test and Evaluation (DOT&E) coordinated to modify the T&E-1 to include additional information on prior year funding as well as an estimate for completion, beginning in FY 2012.

DASD(DT&E) worked closely with the Service and Defense Agency points of contact (POCs) to implement the modifications. DASD(DT&E) also trained its staff specialists on the modifications and how they could utilize the information to better support the TEMP development and review effort. Modified submissions by the Services and Defense Agencies now provide actual data for the current budget years. These data help DT&E staff specialists better understand a program’s resource requirements, as described in the TEMPs seeking approval.

Next Steps. DASD(DT&E) will review future budget submissions for T&E funding to ensure:

- T&E resources, as identified in each TEMP, are adequately funded.
- DoD is not maintaining unwarranted test capabilities at private industry facilities.
- Unwarranted duplication does not exist among DoD Component assets.
- Test facilities and capabilities required are adequately funded and supported.
- New major test facilities are warranted and meet the needs of the DoD Components.

### 2.5.4 T&E Policy Initiatives

Background. DASD(DT&E) continued to provide recommendations for future policy considerations that include fact-of-life changes to statute and policy, and those directed by the USD(AT&L) in DTM 09-027, “Implementation of the Weapon Systems Acquisition Reform Act of 2009,” and DTM 11-003, “Reliability Analysis, Planning, Tracking, and Reporting.”

The recommended topics for future policy considerations include:

- Roles and responsibilities of the Chief Developmental Tester (designated as a T&E KLP).
- Requirement for the identification or designation of a Lead DT&E Organization.
- Replacement of the Test and Evaluation Strategy (TES) with the TEMP at Milestone (MS) A.
- Identification of contractor DT&E and Government DT&E within the TEMP.
- Use of Government test facilities.
- Requirement to report on progress to plan for reliability growth assessment.
- Emphasis on scientific and statistical rigor when developing the T&E program.
- Guidance on T&E in support of information technology (IT) programs and defense business systems (DBS) programs.
- Guidance on DT&E in support of rapid acquisition.
- Guidance on DT&E in support of joint interoperability test and certification.
- DT&E support of cybersecurity.

Next Steps. DASD(DT&E) will support the DoD staffing and coordination process for future updates to T&E policies and adjudicate any comments, if necessary.

### **2.5.5 Scientific Test and Analysis Techniques (STAT) in T&E**

Background. In FY 2011, the DASD(DT&E) chartered a working group composed of representatives from the Office of the Secretary of Defense (OSD) agencies and the DoD Component T&E Executive functional representatives to review scientific and statistical techniques and assess their potential applications and limitations for T&E. The review produced a STAT in T&E Implementation Plan, endorsed by the DoD Components and the DOT&E and approved by the DASD(DT&E) in January 2012.

The goal of this effort is to assist acquisition programs in the use of STAT to generate T&E efficiencies; provide rigorous, defensible T&E strategies and results; and improve the level of knowledge for the developmental test (DT) planning, execution, and analysis process. When used in the proper context, STAT will enable the PMs to make better informed decisions based on acceptable risk thresholds.

In FY 2012, the effort included the announcement of the establishment of a STAT in T&E COE, enhancement of T&E workforce training for STAT, and an update to guidance on the use of STAT.

- Establishment of a STAT in T&E COE. The DASD(DT&E), in collaboration with the Commander, Air Education and Training Command, established the STAT in T&E COE in April 2012 under the stewardship of AFIT. The COE attained full operational capability in July 2012.

The COE is a reachback T&E capability that will provide advice and assistance in the application of STAT in the development of the TEMP. The COE, consisting of an interdisciplinary group of

DoD T&E professionals with knowledge and experience in DoD T&E and statistical expertise, was established as a pilot program with the capability to provide assistance to up to 20 acquisition programs, identified and submitted by the DoD Components.

The COE works in partnership with the PMs and the Chief Developmental Tester to improve effectiveness and efficient use of scarce resources during the development of the TEMP. Utilizing a combination of rigorous scientific methods and lessons learned, the COE identifies where test designs can be improved and efficiencies gained, and then provides recommendations and assistance in the development of an efficient T&E strategy.

Currently, the COE is providing assistance to the following 20 acquisition programs, identified and submitted by the DoD Components:

- **Army**
  1. Armored Multipurpose Vehicle
  2. Common Infrared Countermeasures
  3. Indirect Fire Protection Capability Increment 2 – Intercept
  4. Integrated Air and Missile Defense
  5. Next Generation Diagnostic System
  6. Logistics Modernization Program
  7. Stryker Engineering Change Proposal
- **Department of the Navy**
  1. DDG-51 Flight III Guided Missile Destroyer
  2. Distributed Common Ground System–Navy Increment 2
  3. Joint Precision Approach and Landing System
  4. LHA-R Amphibious Assault Ship (Flight 0 and 1)
  5. Next Generation Enterprise Network
  6. Ship-to-Shore Connector (SSC)
- **Air Force**
  1. Air and Space Operations Center – Weapon System Initiative 10.2
  2. Air Force Integrated Personnel and Pay System
  3. B-61 Mod 12 Life Extension
  4. Combat Rescue Helicopter
  5. KC-46 Tanker Replacement
  6. Space Fence
  7. Space-Based Infrared System High Component (SIBRS High)

- Enhancement of T&E Workforce Training for STAT. In FY 2012, DASD(DT&E), in coordination with DAU and AFIT, updated the current Design of Experiments (DOE) block of instruction in the DAU course TST 203. Other accomplishments in FY 2012 include:
  - Development and release of a STAT in T&E Glossary.
  - Compilation and release of STAT-related training available within DoD.
  - An update to the DAU CLM for Probability and Statistics and inclusion of this CLM as a core requirement for Level II T&E certification. The updated CLM became available online in December 2012.
- Update to Guidance on the Use of STAT. In FY 2012, DASD(DT&E), in collaboration with the DoD Components, provided guidance to assist the PM and the Chief Developmental Testers in the application of STAT within T&E planning, execution, and assessment. DASD(DT&E) inserted a section on the application of STAT in the following:
  - DAG, Chapter 9, T&E.
  - T&E Management Guide, Chapter 2, T&E Process.

Next Steps. DASD(DT&E) will continue to support the implementation of STAT in T&E.

### **2.5.6 Cybersecurity T&E**

Background. The July 2011 DoD Strategy for Operating in Cyberspace stated that the Department and the nation have vulnerabilities in cyberspace, and that our reliance on cyberspace stands in stark contrast to the inadequacy of our cybersecurity – the security of the technologies that we use each day. Moreover, the strategy stated that the continuing growth of networked systems, devices, and platforms means that cyberspace is embedded into an increasing number of capabilities upon which DoD relies to complete its mission.

The ability to effectively operate and dominate in cyberspace is dependent on the cybersecurity characteristics of our warfare systems. Section 933 of the FY 2011 NDAA is early legislation intended to address the needs of the Department in achieving operational superiority in cyberspace. Section 933 directs DoD to provide a strategy for the rapid acquisition of tools, applications, and other capabilities for cyber warfare for the U.S. Cyber Command and the cyber operations components of the Military Departments.

In its report entitled “Report on the Acquisition and Oversight of Department of Defense Cyberspace Operations Capabilities” (known as the “933 Report”), USD(AT&L) defined the activities and responsible agencies that will accomplish the objectives of FY 2011 NDAA Section 933 (Cyber Acquisition). This year, DASD(DT&E) worked with the TRMC and DOT&E to address the report’s recommended actions in the area of T&E.

In FY 2012, DASD(DT&E) collaborated with the TRMC, DOT&E, DoD Chief Information Office, Threat Systems Management Office (TSMO), JMETC, Joint Information Operations Range (JIOR), and DoD Component T&E facilities to develop an approach for cyber DT&E. This strategy incorporates measures to improve resilience and reduce the cyber “attack surface.” The strategy comprises the following four focus areas, each being aligned and integrated in parallel:

1. Process – DoD policy, directives, and guidance for cyberspace DT&E requirements within the acquisition process.
2. Methodology – Test approaches, metrics, and measures to assess defensive and offensive cyberspace warfighting requirements in weapon systems and operational support system programs.
3. Infrastructure – DoD cyber labs, ranges, networks, tools, and instrumentation development and coordination required for T&E of cyberspace requirements in defense programs.
4. Workforce – Cyberspace-specific training for T&E professionals in labs, ranges, and operations.

Updates to relevant policy documents are needed to reflect cybersecurity developmental testing requirements. DASD(DT&E) is developing an approach to update guidance to programs on planning and procedures for developmental testing of system cybersecurity. In addition, DASD(DT&E) is developing guidance on how to evaluate the thoroughness of interoperability and cybersecurity testing within programs.

Accomplishments:

- A four-step methodology is being developed for DT&E to reliably demonstrate that requirements for cybersecurity have been met. Implementation of this methodology for acquisition programs is expected to result in significant improvements in the cybersecurity of all net-ready DoD systems, including information, weapons, aviation, and life support systems. The draft cybersecurity DT&E methodology is described more fully in Section 2.5.7.
- A T&E, information assurance (IA), and IT acquisition workforce survey has been completed to develop recommendations for training and certification requirements for a cybersecurity T&E workforce, which would comprise both acquisition and non-acquisition personnel.
- An information campaign has been initiated to promulgate the need to complete cybersecurity testing beyond the standard IA controls.
- DASD(DT&E) and the TRMC executed ICE 2011 in the 1st quarter FY 2012. The ICE and related events are described more fully in Section 2.5.8.

Next Steps. DASD(DT&E) and the TRMC are continuing their efforts to fully develop and implement a strategy for cyber DT&E. As visibility and critical concerns increase with respect to cybersecurity of mission critical systems in the next year, DASD(DT&E) will continue to employ measures such as increased oversight and guidance of early IA and cyber testing activities, while further developing a well-supported and well-documented long-term plan.

### **2.5.7 Cybersecurity DT&E**

To support robust cybersecurity testing in DT&E, DASD(DT&E) has developed an initial draft four-step cybersecurity DT&E methodology:

- Step 1. Develop Cybersecurity DT&E Strategy.
- Step 2. Characterize the Cyber Attack Surface.

- Step 3. Understand the Cyber Kill Chain.
- Step 4. Conduct Cybersecurity DT&E.

The four-step process will not require additional documentation; it will use existing documents such as the Program Protection Plan to assist in identifying critical areas that are vulnerable to focus cybersecurity DT&E. The first step is to understand the cybersecurity requirements; thus, it begins very early in the acquisition life cycle, at MS A or B, to begin to develop an approach for cybersecurity DT&E. Step 2 takes into consideration the integrated environment in which the system interoperates to characterize the *attack surface*; that is, understand the avenues by which a potential adversary may gain access to the system, escalate privileges, monitor data exchanges, or embed malicious software. The third step, once the potential attack surface is defined, is to understand the cyber *kill chain*. The kill chain is a construct that describes potential adversary actions, thereby allowing system developers and network defenders to plan response measures to improve resilience. Finally, as Step 4 indicates, cybersecurity testing should include testing with a capable cyber threat representation, in a range intended for that purpose, during DT&E.

### **2.5.8 Cyber T&E Events**

Background. ICE 2011, completed in December 2011, simulated cyber attacks on a command and control system involved in a joint close air support mission. This initial cyber pilot event was a valuable first step in understanding T&E in the defensive cyber domain.

In FY 2012, DASD(DT&E) completed most of the planning for ICE 2013, which will include representation of the CNDSP. As part of ICE 2013, DASD(DT&E) overlaid as much of the newly developed four-step cyber DT&E methodology as possible.

The testing to be included in ICE 2013 can serve as the model for execution of the cybersecurity DT&E methodology in support of all acquisition programs and improve readiness to enter production.

Next Steps. Future events are being explored to further refine the methodology.

### **2.5.9 T&E Management Guide**

Background. The T&E Management Guide is a technical management educational guide, published by DAU, to be utilized within the T&E curriculum at DAU and as a source of reference for all T&E workforce members. DASD(DT&E), supported by the DoD Component T&E Executive functional representatives, initiated an effort to update the T&E Management Guide, last issued in January 2005.

In FY 2012, the T&E FIPT reviewed the guide and provided updates on the existing material as well as recommended additional sections such as STAT in T&E, Chief Developmental Tester, Lead DT&E Organization, cyber security DT&E, interoperability, space systems, reliability, and software testing. The updated guide was completed in December 2012 and is available online from DAU.

Next Steps. The activity is complete.



### **2.5.10 Defense Acquisition Guidebook (DAG)**

Background. The DAG complements DoD Directive 5000.01, “The Defense Acquisition System,” and DoDI 5000.02, “Operation of the Defense Acquisition System,” by providing the acquisition workforce with discretionary best practices that should be tailored to the needs of each program.

In FY 2012, multiple revisions were made to the DAG, including the following:

- Added a section on DT&E based on section 139b of Title 10, U.S.C.
- Modified the format of Chapter 9 to better reflect the role of T&E in acquisition.
- Added information from section 835 of Public Law 112-81 establishing the Lead DT&E Organization for MDAPs and the Chief Developmental Tester for each MDAP and MAIS program.
- Added section 9.9 on the use of Government test facilities for T&E.
- Added OSD and DoD Component T&E Executive information with hyperlinks so PMs and action officers (AOs) can easily access organizational information.
- Made significant revisions to the “Integrated Testing” section.
- Added a table that provides key inputs within the TEMP.

Next Steps. The DAG will be updated again to account for the changes in the forthcoming DoDI 5000.02.

### **2.5.11 DT&E Assessments**

Background. In the FY 2011 annual report submission, DASD(DT&E) provided information on AOTRs provided in accordance with DoDI 5000.02. This section includes a summary of DASD(DT&E) assessments and how those programs then performed in IOT&E.

DASD(DT&E) provides a DT&E assessment to inform the CAE decision-making process, including determination of materiel readiness for IOT&E. In the 3rd quarter FY 2012, DASD(DT&E) revised the assessment format by adding assessments of interoperability and IA. This new format maintains the focus on assessment of test data collected during DT, including pre-MS C operational assessments, and increases visibility into the status of interoperability and IA testing.

Summary. DASD(DT&E) published 13 formal assessments in FY 2012, summarized in Table 2-6. Tables 2-7 through 2-18 display the DASD(DT&E) recommendation and the program’s subsequent performance in IOT&E as described in the Operational Test Agency (OTA) report and the DOT&E beyond low-rate initial production (BLRIP) or IOT&E report, if available. DASD(DT&E) continues to closely compare system performance during DT and IOT&E to identify trends in program development that require additional focus in DT&E to enable improved outcomes in operational test and evaluation (OT&E).

**Table 2-6. DASD(DT&E) Assessments and Recommendations (FY 2012)**

<b>Program</b>	<b>DT&amp;E Recommendation</b>
Joint Tactical Radio System (JTRS) Handheld, Manpack, and Small Form Fit (HMS) Rifleman Radio (RR) (October 2011)	Do Not Proceed to IOT&E
C-130 Avionics Modernization Program (AMP) (November 2011)	Proceed to IOT&E
HC/MC-130 Recapitalization Program (January 2012)	Proceed to IOT&E
E-2D Advanced Hawkeye (AHE) (January 2012)	Proceed to IOT&E
Apache Block III (AB3) (January 2012)	Proceed to IOT&E
Warfighter Information Network–Tactical (WIN-T) (March 2012)	Proceed to IOT&E
Air Intercept Missile (AIM)-9X (April 2012)	Proceed to IOT&E
B-2 Extremely High Frequency (EHF) Increment 1 (April 2012)	Proceed to IOT&E
Joint Tactical Radio System (JTRS) Handheld, Manpack, and Small Form Fit (HMS) Manpack (May 2012)	Do Not Proceed to IOT&E
MQ-1C Gray Eagle Unmanned Aircraft System (UAS) (June 2012)	Do Not Proceed to IOT&E
Update to the MQ-1C Gray Eagle UAS (July 2012)	Do Not Proceed to IOT&E
P-8A Multi-Mission Maritime Aircraft (August 2012)	Proceed to IOT&E
Space-Based Infrared System (SBIRS) Effectivity 5 (E-5) Geosynchronous Earth Orbit (GEO) Message Certification Operational Utility Evaluation (OUE) (August 2012)	Proceed to IOT&E

Specific DT&E findings are provided in the following sections.

#### **2.5.11.1 JTRS HMS Rifleman Radio**

DASD(DT&E) assessed that the JTRS HMS RR met two of four KPPs (Intra-Squad Communications, Soldier Location), partially met one KPP (Net Ready), and did not meet the fourth KPP (Sustainment–Operational Availability). Additionally, the system demonstrated poor reliability and had completed less than 33 percent of planned Government DT&E when the Army chose to proceed to IOT&E in conjunction with Network Integration Evaluation (NIE) 12.1. The system demonstrated the ability to deliver voice communications and position location capabilities down to the Soldier level; however, the program encountered challenges in demonstrating reliability growth to predicted levels. DT&E data revealed that mean time between essential function failures (MTBEFF) had declined from an estimated 277 hours to 103 hours during limited Government testing of low-rate initial production (LRIP) articles (the requirement is 477 hours). DASD(DT&E) also assessed the JTRS HMS RR at moderate to high risk for demonstrating adequate suitability and supportability and moderate risk for demonstrating adequate survivability during IOT&E. Accordingly, DASD(DT&E) recommended not proceeding to IOT&E.

The Army Test and Evaluation Command (ATEC) assessed the systems as operationally effective, and operationally suitable with limitations. DOT&E issued an operational assessment indicating that the RR, once properly loaded, proved useful in supporting combat leaders and Soldiers in a wide variety of missions but demonstrated poor reliability. DOT&E also assessed that the Network Manager did not support the unit’s mission and demonstrated poor reliability.

**Table 2-7. JTRS HMS RR**

JTRS HMS RR				
DT&E Recommendation	OTA Report		DOT&E Report	
Do Not Proceed to IOT&E	Effective	Suitable with Limitations	N/A	N/A

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

DASD(DT&E) assessed that the C-130 AMP met all six KPPs and recommended proceeding to IOT&E. Testing remains suspended pending budget resolution.

**Table 2-8. C-130 AMP**

C-130 AMP		
DT&E Recommendation	OTA Report	DOT&E Report
Proceed to IOT&E	Testing suspended pending budget resolution	Testing suspended pending budget resolution

**2.5.11.3 HC/MC-130 Recapitalization Program**

DASD(DT&E) assessed that the HC/MC-130 program met all seven KPPs and recommended proceeding to IOT&E.

The Air Force Operational Test and Evaluation Center (AFOTEC) found the HC/MC-130 effective and suitable during IOT&E. DOT&E has not published its findings as of the date of this report.

**Table 2-9. HC/MC-130 Recapitalization Program**

HC/MC-130 Recapitalization Program			
DT&E Recommendation	OTA Report		DOT&E Report
Proceed to IOT&E	Effective	Suitable	Report not yet published

**2.5.11.4 E-2D Advanced Hawkeye (AHE)**

DASD(DT&E) assessed that the E-2D AHE program met all of its KPPs. However, DT&E demonstrated shortfalls in the theater air and missile defense (TAMD) mission. In a preliminary assessment, DASD(DT&E) expressed concern over radar performance and Cooperative Engagement Capability (CEC) integration issues. System performance was stable and predictable, and DASD(DT&E) assessed low likelihood of new discovery in IOT&E.

The Commander, Operational Test and Evaluation Force (COMOPTEVFOR) completed the IOT&E of E-2D AHE and assessed it as effective with limitations and suitable with limitations. DOT&E assessed the E-2D AHE as effective for legacy E-2C missions, not effective for TAMD, suitable for legacy E-2D missions, and not suitable for TAMD.

**Table 2-10. E-2D AHE**

E-2D AHE				
DT&E Recommendation	OTA Report		DOT&E Report	
Proceed to IOT&E	Effective with Limitations	Suitable with Limitations	Effective for legacy E-2C missions, and Not Effective for TAMD	Suitable for legacy E-2D missions, and Not Suitable for TAMD

**2.5.11.5 Apache Block III (AB3)**

DASD(DT&E) assessed that the AB3 met two of five KPPs and was on track to meet the remaining three KPPs during IOT&E. DT results indicated that the system was ready to proceed to IOT&E contingent upon the program successfully completing the remaining scheduled DT prior to IOT&E. DT results showed reliability was slightly below the planned reliability growth curve (RGC) but continued to show improvement.

ATEC and DOT&E assessed the AB3 as operationally effective and operationally suitable.

**Table 2-11. Apache Block III**

AB3				
DT&E Recommendation	OTA Report		DOT&E Report	
Proceed to IOT&E	Effective	Suitable	Effective	Suitable

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

DASD(DT&E) assessed that the WIN-T Increment 2 met or was in a schedule-appropriate stage for meeting its KPPs. DT did reveal significant difficulty in maintaining network connectivity in certain environments. Additionally, shortfalls in achieving reliability requirements were observed, with all but one configuration item failing to meet reliability goals during Government production qualification testing.

ATEC assessed the system as effective with limitations concerning the Soldier Network Extension (SNE), and suitable with significant limitations due to reliability and maintainability shortfalls. DOT&E assessed the majority of the WIN-T Increment 2 equipment and technologies as operationally effective with the exception of the SNE, Highband Networking Waveform, and Tactical Relay-Tower, and assessed WIN-T Increment 2 as not operationally suitable due to reliability shortfalls for the majority of the configuration items.

**Table 2-12. WIN-T Increment 2**

WIN-T Increment 2				
DT&E Recommendation	OTA Report		DOT&E Report	
Proceed to IOT&E with Limitations	Effective with Limitations	Suitable with Significant Limitations	Effective (9)* Not Effective (3)*	Not Suitable

\*DOT&E BLRIP assessed 9 equipment and technologies as operationally effective and 3 equipment and technologies as not operationally effective.

**2.5.11.7 Air Intercept Missile (AIM)-9X**

DASD(DT&E) assessed that the AIM-9X achieved all applicable KPPs; however, reliability predictions showed a high risk of not achieving the threshold by the end of IOT&E.

The AIM-9X system was still in operational testing at the time of this report.

**Table 2-13. AIM-9X**

AIM-9X		
DT&E Recommendation	OTA Report	DOT&E Report
Proceed to IOT&E	IOT&E in progress	IOT&E in progress

**2.5.11.8 B-2 Extremely High Frequency (EHF) Increment 1**

DASD(DT&E) assessed that the B-2 EHF Increment 1 met all of its KPPs with limitations. DT results identified performance limitations and validated known shortfalls in legacy functions not part of this increment. Deficiencies were noted with in-flight communications, system integration, and mission loading. Substantial progress was made prior to entering IOT&E.

AFOTEC assessed the system as operationally effective and suitable. DOT&E assessed the system as operationally effective but stated that limited flight test hours accumulated precluded making a definitive assessment of the system’s ability to meet the legacy system demonstrated mean time between critical failures (MTBCF) of 671 hours.

**Table 2-14. B-2 EHF Increment 1**

B-2 EHF Increment 1				
DT&E Recommendation	OTA Report		DOT&E Report	
Proceed to IOT&E	Effective	Suitable	Effective	No rating (insufficient data)

**2.5.11.9 JTRS HMS Manpack**

DASD(DT&E) assessed that the JTRS HMS Manpack was not sufficiently mature to enter multi-Service operational test and evaluation (MOT&E). Reliability predictions showed a high risk of meeting thresholds, and multichannel, simultaneity, and route and retransmission operations had not

been fully demonstrated. The Joint Enterprise Network Manager had completed basic radio loading tasks but had not demonstrated network planning, configuration, modification, and monitoring capabilities. The program had completed very little developmental testing to assess platform integration. Because the program was likely to experience unfavorable reliability and network management shortcomings, DASD(DT&E) recommended that the Army not proceed to MOT&E. Additionally, DASD(DT&E) recommended that the Army re-designate the Manpack participation in the NIE 12.1 as an operational assessment rather than IOT&E to allow the program to complete corrective actions and additional developmental testing before proceeding to MOT&E at a later date.

ATEC, AFOTEC, and the Marine Corps Operational Test and Evaluation Activity (MCOTEA) conducted the MOT&E in coordination with NIE 12.1 and collectively rated the system not operationally effective and not operationally suitable. DOT&E also assessed the JTRS Manpack as not operationally effective and not operationally suitable.

**Table 2-15. JTRS HMS Manpack**

JTRS HMS Manpack				
DT&E Recommendation	OTA Report		DOT&E Report	
Do Not Proceed to IOT&E	Not Effective	Not Suitable	Not Effective	Not Suitable

**2.5.11.10 MQ-1C Gray Eagle UAS**

DASD(DT&E) assessed that the MQ-1C system demonstrated potential to provide significant capability to the Warfighter; however, the program was in the midst of the final phase of DT&E prior to IOT&E. The DASD(DT&E) identified that concurrent development, testing, and fielding adversely impacted system development and did not set the conditions needed to successfully complete IOT&E. The program continued to experience significant reliability shortfalls, sensor integration issues, and system aborts that would adversely impact mission effectiveness and operational availability. Accordingly, DASD(DT&E) recommended not proceeding to IOT&E until an event-based plan could provide sufficient DT&E to demonstrate improvements prior to IOT&E. At the completion of DT&E, DASD(DT&E) prepared an updated assessment that concluded the system had still not demonstrated sufficient progress. Although the system demonstrated improved sensor performance during the remaining DT&E, reliability continued to fall short of requirements and the system continued to experience system aborts across all subsystems. Although the common sensor payload showed improvement in reliability during testing, the unmanned aircraft and ground control station did not.

Upon completion of IOT&E, ATEC assessed the system as effective with limitations and suitable with limitations. The DOT&E report stated that “the Gray Eagle-equipped unit was effective at operating the MQ-1C system and has the potential to provide effective support to combat units.” DOT&E assessed the Gray Eagle-equipped unit as operationally suitable and survivable. Additionally, DOT&E reported that the modeling assumptions that established the reliability requirements thresholds were not valid.

**Table 2-16. MQ-1C Gray Eagle UAS**

MQ-1C Gray Eagle UAS				
DT&E Recommendation	OTA Report		DOT&E Report	
Do Not Proceed to IOT&E	Effective with Limitations	Suitable with Limitations	The Gray Eagle-equipped unit was effective at operating the MQ-1C system and has the potential to provide effective support to combat units	Suitable

**2.5.11.11 P-8 Multi-Mission Maritime Aircraft**

DASD(DT&E) assessed that the P-8 Multi-Mission Maritime Aircraft met or was on track to meet its aircraft and mission system performance requirements and was stable and predictable with low risk of new discovery in IOT&E. Analysis of DT data indicated several system issues remained, including interoperability, fuel heating, weapon bay heating, vulnerability, and radar performance. These issues, however, were deemed not of such magnitude to preclude entrance into IOT&E.

The P-8 Multi-Mission Maritime Aircraft operational testing was still in progress as of the date of this report.

**Table 2-17. P-8 Multi-Mission Maritime Aircraft**

P-8 Multi-Mission Maritime Aircraft		
DT&E Recommendation	OTA Report	DOT&E Report
Proceed to IOT&E	IOT&E in progress	IOT&E in progress

**2.5.11.12 SBIRS E-5 Operational Utility Evaluation (OUE)**

DASD(DT&E) assessed that the SBIRS program met the system performance and non-degradation requirements established by the Air Force and recommended entry into OUE. The system performed well in an operationally focused integrated test and evaluation period but revealed system deficiencies in several areas, including loss of communication, autonomous event recovery, restricted commanding, and IA. The program developed corrective actions and an implementation plan for all deficiencies.

Following the OUE, AFOTEC assessed the SBIRS as operationally effective but not operationally suitable. DOT&E assessed the system as operationally effective and suitable.

**Table 2-18. SBIRS E-5 OUE**

SBIRS E-5 OUE				
DT&E Recommendation	OTA Report		DOT&E Report	
Proceed to IOT&E	Effective	Not Suitable	Effective	Suitable

Next Steps. DASD(DT&E) continues to refine the DT&E assessments to improve the information provided to decision makers. Our objective is to shift the timing of the DT&E assessments to the left

in the program schedule to better support the decision to begin production at MS C as opposed to entrance to IOT&E. Future annual reports will document updates, as needed.

### **2.5.12 Modeling and Simulation (M&S)**

Background. In January 2011, the USD(AT&L) designated the DASD(DT&E) as the T&E representative on the M&S Steering Committee. In the FY 2011 annual report, DASD(DT&E) reported on the initiation of the T&E Modeling and Simulation Working Group (MSWG). The T&E MSWG had meetings during FY 2012 to establish the organization, membership, charter, and strategic plan.

In FY 2012, a draft strategic plan was developed and reviewed by the T&E MSWG. The strategic plan is an overarching document that can be used for identifying, prioritizing, acquiring, and sustaining M&S capabilities for effective use in support of DoD T&E. The plan's strategic-level objectives will become the basis for a T&E M&S implementation plan.

In addition, the T&E community was funded for an M&S high-level task for Cyber Operations for Research and Network Analysis (CORONA) with management assigned to the TRMC. Upon completion, CORONA will provide DoD with an architecture "blueprint" for rapidly integrating cyberspace live, virtual, and constructive (LVC) capabilities, and software that enables standardization. CORONA capability will directly benefit the combatant commands; the testing, training, acquisition, experimentation, and intelligence communities; the existing and emerging ranges; and the Armed Services.

Next Steps. DASD(DT&E) will continue to provide T&E community representation to the MSWG.

### **2.5.13 DT&E Recommendations**

Background. Tracking the extent to which program offices are adopting developmental testing recommendations is one of the recommendations for executive action listed in the Government Accountability Office (GAO) Report GAO-10-774, "DEFENSE ACQUISITIONS: DOD Needs to Develop Performance Criteria to Gauge Impact of Reform Act Changes and Address Workforce Issues." In the DoD response to the GAO, DoD concurred in the recommendation.

In FY 2012, DASD(DT&E) developed a process and began tracking acceptance of developmental testing recommendations documented in Acquisition Decision Memorandums (ADMs); the minutes of DAB, Defense Acquisition Executive Summary (DAES), and OIPT meetings; DT&E/SE annual reports; and TEMP approval, AOTR, and DASD(DT&E) memorandums.

In FY 2012, there were 72 recommendations, with 25 completed and 47 ongoing as of the end of FY 2012. Of the 72 recommendations, 68 were accepted/partially accepted and four were not accepted. The recommendations that were not accepted are listed below:

- Joint Tactical Radio System (JTRS) Handheld, Manpack, and Small Form Fit (HMS) Rifleman Radio (RR) (AN/PRC-154): The DASD(DT&E) recommended in the October 26, 2011, AOTR memorandum that the program not proceed to IOT&E. The program proceeded to IOT&E.



- Joint Tactical Radio System (JTRS) Handheld, Manpack, and Small Form Fit (HMS) (AN/PRC-155): The DASD(DT&E) recommended in the May 3, 2012, AOTR memorandum that the program not proceed to MOT&E. The program proceeded to MOT&E.
- Gray Eagle: The DASD(DT&E) recommended in the June 1, 2012, AOTR memorandum that the program not proceed to IOT&E until an event-based plan provides sufficient DT&E to ensure readiness for IOT&E, consistent with the direction in the March 25, 2012, ADM. The program proceeded to IOT&E without taking the recommended actions.
- Gray Eagle: The DASD(DT&E) reiterated the recommendation in the July 25, 2012, AOTR memorandum that the program not proceed to IOT&E. The program proceeded to IOT&E.

Next Steps. DASD(DT&E) will continue to track the extent to which program offices are adopting developmental testing recommendations.

#### **2.5.14 “Shift Left”**

The basic premise of “shift left” is to improve DT&E to find and fix problems before entering production. There are three key focus areas to the shift-left concept: earlier mission context, earlier interoperability testing, and earlier cybersecurity testing. Improved DT&E moves beyond the traditional technical focus to include testing in the mission context to characterize capabilities and limitations. Robust DT&E should also include all of the elements of interoperability and cybersecurity testing that are typically not tested until late in the acquisition life cycle.

DASD(DT&E) will focus attention on these areas and work with the PM, Chief Developmental Tester, and Lead DT&E Organization to address these issues when they assemble the T&E Working Integrated Product Team (WIPT) and write the TEMP. In the areas of interoperability and cybersecurity, DASD(DT&E) is working with all stakeholders to insert needed testing early and define the right way to oversee these processes. It is important that we be clear in our intent: Our objective is to establish processes to oversee the DT activities that support certification, not oversee the certification process.

DASD(DT&E) will shift the timing of the DT&E assessments to the left in the program schedule to better support the decision to begin production at MS C as opposed to entrance to IOT&E. In the DT&E assessment, we will focus on performance, reliability, interoperability, and cybersecurity.

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### **3 DoD Component Assessments**

The DoD Component T&E Executive functional representatives provided self-assessments in support of the DASD(DT&E) Annual Report. The following DoD Components responded: Army, Department of the Navy (DON), Air Force, DISA, and MDA.

The DoD Components updated their FY 2011 reports regarding T&E involvement in early acquisition activities, T&E planning and execution, and T&E personnel. In addition, the DoD Components provided details of the T&E workforce composition to include all categories of T&E personnel and to address the following specific recommendations from the FY 2011 annual report:

- DoD Components – It is the DASD(DT&E) position that DoD Components should be able to target and hire interns directly into the T&E acquisition career field. Across the acquisition workforce, interns are targeted in the career fields of SE, program management, and contracting.
- Air Force – It is the DASD(DT&E) position that the Air Force space community should grow its DT&E workforce and training in order to provide a robust Government DT&E capability.
- Air Force – The DASD(DT&E) recommends that the Air Force review the number of Level II coded positions and take action to increase the certification level of a majority of those positions.
- MDA – During a reorganization, the analysis and evaluation functions were moved from the T&E organization into the SE organization. It is the DASD(DT&E) position that T&E functions should be performed by T&E workforce members.

Summaries and assessments of the DoD Component responses are provided in the following sections.

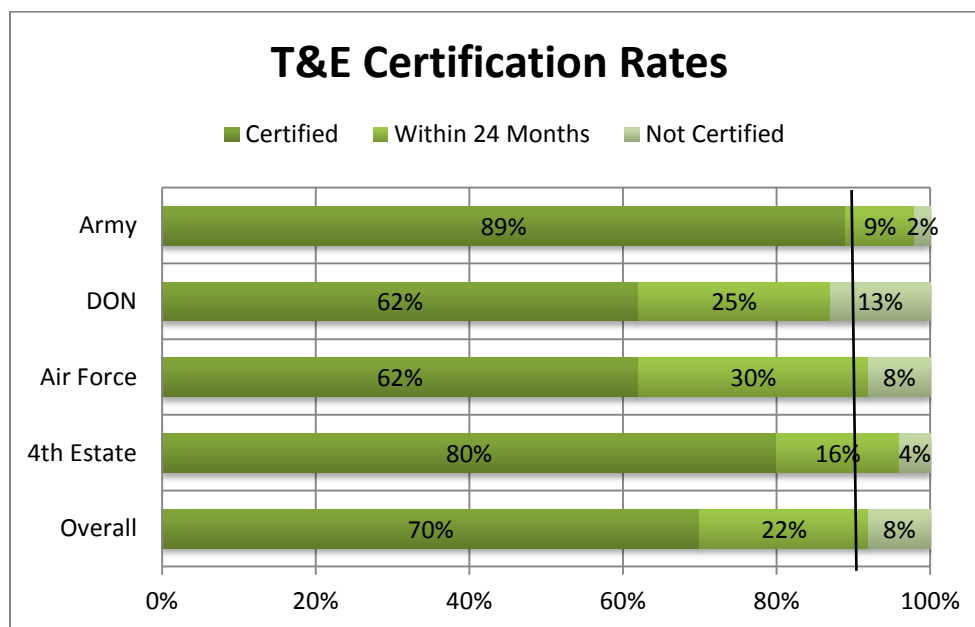
The DoD Components continued to actively participate in DASD(DT&E)-led working groups, such as the T&E Working Group (TEWG), the T&E FIPT, the STAT Implementation Panel, and groups updating T&E policy and guidance. These groups directly support the T&E workforce, education, and policy.

#### **3.1 Updates from FY 2011 DoD Component Assessments**

The DoD Components reported on progress and improvements in the T&E acquisition workforce. The DoD Components reported certification rates across the T&E workforce. The DASD(DT&E) overall goal for certification is for 90 percent of the workforce to either be certified or be within the 24-month grace period for certification. Currently, the overall workforce is exceeding this goal with 92 percent either certified or within the grace period. Certification rates for the T&E workforce continued to improve in FY 2012. The current rates shown in Figure 3-1 are taken from the AT&L Workforce Data Mart as of the end of FY 2012.

The DoD Components also reported concern regarding the change to the T&E certification that requires a scientific or technical degree. The change applies only to members entering the T&E career field as of October 1, 2012. The DoD Components are concerned about the impact to T&E position coding for T&E professionals that need to be in the T&E acquisition workforce. Further

discussions with the DoD Components will be conducted in FY 2013 through the T&E FIPT. DASD(DT&E) will monitor the impact on recruiting and hiring.



**Figure 3-1. FY 2012 T&E Certification Rates**

Table 3-1 shows the composition of the T&E workforce by certification level. The chart is based on data provided in the DoD Component self-assessment reports and briefings to the DASD(DT&E), and includes only the T&E-coded positions at the Military Departments, MDA, and DISA. The majority of the T&E positions are coded at Level III. In the FY 2011 annual report, the DASD(DT&E) stated the position that achieving Level III training and certification should be a goal for the DoD Components in the management of their T&E workforce positions. During discussions, the Air Force, which has more than 70 percent of its positions coded at Level II, is planning to review its positions during FY 2013 and report progress in next year’s report.

**Table 3-1. T&E Acquisition Workforce Certification Levels**

Level	Army	DON	Air Force	MDA	DISA	Total
Level I	1%	9%	15%	0%	6%	9%
Level II	38%	21%	72%	28%	6%	43%
Level III	61%	70%	13%	72%	88%	48%

The DoD Components reported on their use of DAWDF Section 852 funding. Section 852 funds permit the DoD Components to hire new T&E personnel, provide training for new and existing personnel, develop training courses, provide incentives and awards for T&E, and facilitate outreach programs. DASD(DT&E) will work with the DoD Components to identify training gaps and develop proposals for Section 852 funding.

## **3.2 DASD(DT&E) Assessment of the DoD Component Reports**

### **3.2.1 Army**

The Army's self-assessment report indicated that the overall state of personnel to conduct DT&E within the Army is adequate to support the needs of its acquisition community.

The Army Acquisition Executive directed all program executive offices (PEOs) to include the delivery of contractor test data in their contracting actions in order to provide early involvement by ATEC. This initiative will provide ATEC with the opportunity to review test plans for contractor DT, witness testing at the contractor facility, and review test reports (to include all derived test data) in conjunction with PMs. The goal is to increase T&E efficiencies through reduction of test costs and program cycle times.

ATEC has conducted comprehensive T&E program reviews in conjunction with materiel developers and combat developers to obtain efficiencies. These phased reviews include deep dives into system TEMPs for opportunities to save time and money. Cost avoidances of more than \$100 million and significant range time savings have been identified. The top strategies for finding efficiencies include leveraging all data sources, refining the test scope, combining tests, eliminating low-priority tests, and utilizing M&S.

The Army reported on efforts to use Lean Six Sigma to improve the efficiency and effectiveness of its T&E events, organization, and technology investments. These efforts resulted in cost savings, manpower and staffing improvements, and efficient utilization of test resources.

The Army reported on its efforts pertaining to KLPs. The Army issued a memorandum in April 2012 regarding the identification of a Chief Developmental Tester and a Lead DT&E Organization. The memorandum stressed the importance of filling the Chief Developmental Tester position with properly qualified key leaders. Although the Army has defined only 12 KLPs as Chief Developmental Testers (per AT&L Workforce Data Mart), a Chief Developmental Tester has been assigned for each MDAP and MAIS program that has not, as yet, reached full-rate production (FRP).

The Army has made progress in funding the Army Center for Reliability Growth (CRG). The Army CRG tools, models, and methodology are highly applicable to the reliability issues encountered across DoD.

Based upon the report submitted by the Army and subsequent presentation, the DASD(DT&E) assesses that the Army has not completed assignment of KLPs to all MDAPs and MAIS programs. The DASD(DT&E) assesses the Army as having adequate T&E organizations and capabilities to support the Army T&E mission in all other areas.

### **3.2.2 Department of the Navy**

The DON reported that its T&E workforce, facilities, processes, and practices are adequate to support DT&E activities for acquisition programs.

Systems command (SYSCOM) commanders continue to structure their organizations to meet workload demands and provide for the overall competency expertise at the local level. The DON T&E Improvement Process (TEIP) continues to be used to provide strategic planning and continuous process improvement for the DON T&E enterprise. The TEIP is used to identify and implement T&E improvements across the DON enterprise emanating from DON and OSD acquisition reform initiatives (e.g., better buying power, acquisition workforce improvement) and T&E efficiency and effectiveness mandates (e.g., integrated test, reliability growth planning, T&E infrastructure reuse, STAT).

The TEIP continues to examine and implement improvement initiatives across SYSCOMs, PEOs, and Naval Warfare Centers (NWCs) in five thrust areas: workforce, policy, infrastructure, acquisition support, and operations (includes communications strategy).

In FY 2012, the DON created the DON T&E Total Training Catalog. The catalog is a compendium of T&E-related training across DoD, DON, industry, and academia in one summary document for use by the T&E workforce. The document provides training resources and career guidance information for those seeking T&E career field and continuous learning certification. The catalog is also useful to the non-acquisition T&E workforce, providing information on available training courses, prerequisites, and training providers. The catalog has been shared with the T&E community, and DASD(DT&E) intends to expand on this effort during FY 2013 to cover additional training resources for the full T&E workforce.

The DON highlighted the Naval Infrastructure and Capabilities (NICAP) Tool. It is a DON-wide effort initiated this year with a goal to document all research, development, test, and evaluation (RDT&E) infrastructure capability residing at SYSCOMs and NWCs. NICAP will address capability needs and alignment to mission, functions, workforce, investments, and budget.

The DON continues its efforts of recoding positions to T&E in the Naval Sea Systems Command (NAVSEA) in accordance with guidance in the AT&L Workforce PCD for T&E and expects to increase the number of T&E-coded positions.

The DON Deputy T&E Executive issued an update to the DON T&E workforce classification guidance. The guidance reiterated information from the September 2011 memorandum on Critical Acquisition Positions and KLPs. The DON provided a list of the MDAPs and MAIS programs showing the Chief Developmental Testers assigned to each MDAP and MAIS program. The DON has increased the number of KLPs from 28 to 39 during FY 2012 (per AT&L Workforce Data Mart).

Based upon the report submitted by the DON and subsequent presentation, the DASD(DT&E) assesses that the DON has not completed coding of all appropriate positions in T&E. The DASD(DT&E) assesses the DON as having adequate T&E organizations and capabilities to support the DON T&E mission in all other areas.

### **3.2.3 Air Force**

The Air Force reported that overall its workforce and DT&E infrastructure are adequate to support the needs and requirements of Air Force acquisition programs. The Air Force continues to refine its

internal processes and organization to revitalize the DT&E workforce and streamline the DT&E infrastructure.

For example, the Air Force Materiel Command completed a reorganization of its entire structure as of October 1, 2012, consolidating 12 centers into five (one of which is the Air Force Test Center).

The Air Force Directorate of Test and Evaluation (AF/TE) continues its active participation in DASD(DT&E)-led working groups such as the TEWG, the T&E FIPT, two working groups for STAT and DOE, and the groups rewriting DoDI 5000.02, the DAG, and the DAU T&E Management Guide, among others. AF/TE made significant contributions to DAU in helping to write two new courses on integrated testing and STAT.

The Air Force expressed several concerns in its report, including the following concerns directly related to the T&E workforce:

- A shortage of T&E resources for cyber and IT systems.
- The need for detailed policy and specific Service roles to implement the Chief Developmental Tester and Lead DT&E Organization.
- A lack of policy to address IT acquisition.
- The new requirement for T&E certification that requires a scientific or technical degree.

The Air Force is exploring initiatives to obtain DAWIA Level III T&E personnel for key DT&E positions, implement additional best practices for documenting test results, and increase the T&E staff within the Space and Missile Systems Center. The Air Force has prepared a detailed response for Congress as directed in the U.S. Senate Report 112-173, FY 2013 NDAA. DASD(DT&E) reviewed the draft of this report and provided input and comments.

The Air Force discussed T&E KLPs. As stated in previous years, Air Force KLPs are at the general officer and senior executive service (SES) level and are not specifically assigned to MDAPs and MAIS programs as intended by the August 25, 2010, USD(AT&L) memorandum, "Government Performance of Critical Acquisition Functions." The Air Force has made no changes since the previous year and is awaiting additional USD(AT&L) guidance, which is expected early in 2013. The Air Force provided a list of its MDAPs, with only six Chief Developmental Testers identified (per AT&L Workforce Data Mart).

Based upon the report submitted by the Air Force and subsequent presentation, the DASD(DT&E) assesses that the Air Force needs to complete its review of staffing at the Space and Missile Systems Center and the assignment of KLPs. The DASD(DT&E) assesses the Air Force as having adequate T&E organizations and capabilities to support the Air Force T&E mission in all other areas.

### **3.2.4 Defense Information Systems Agency**

DISA reported that it has the T&E personnel and expertise to meet the demands of the agency. DISA reported that its acquisition process enables the agency to get capabilities to the Warfighter in the most effective way.

The DISA T&E workforce is composed of engineers, computer scientists, IT specialists, and operations research professionals. They are assigned primarily under the DISA Office of the Test and Evaluation Executive (TEO), with a subset of the T&E workforce assigned to DISA portfolios, which are tasked with the acquisition and fielding of enterprise services and IT capabilities.

The Joint Interoperability Test Command (JITC) performs developmental, operational, and IA test execution; conducts joint interoperability certifications for all of DoD; and reports directly to the DISA T&E Executive. JITC provides DT&E services to DISA programs when required; however, most of the programs have test managers within their program management offices (PMOs) who are responsible for testing. DISA MAIS programs have their own DT&E teams, allowing JITC to focus on conducting interoperability, IA, and OT&E events.

Within the agency, there is a broad range of IT that T&E must support. The IT includes emerging concepts such as cloud and enterprise services, which are driving the IT community toward modular services that are then integrated onto a single converged IT infrastructure. These concepts are creating a need for stronger interoperability and increasing the importance of operational suitability and effectiveness. Likewise, mobility programs are adding a new dimension to distant end users, and cyber defense initiatives have resulted in a new DoD cyber command and control (C2) framework. These new concepts have required DISA TEO to evolve its methods for conducting T&E without increasing resources or time.

DISA T&E also continues to build out its enterprise test environment, ensuring that test tools, reference implementations, and test infrastructure are in place to support rigorous T&E of applications and services. DISA TEO is evolving this environment to serve as a federated infrastructure that aids development and ensures that DISA rigorously tests, evaluates, and certifies enterprise solutions before they are fielded.

During FY 2012, DISA continued its training initiated during FY 2011. In FY 2013, DISA will conduct a skills survey to ascertain the level of improvement after completion of the first round of training courses.

DISA reported on the KLPs in its organization. DISA has identified Chief Developmental Testers for two MAIS programs. They are occupying properly coded KLPs and have full Level III certification.

Based upon the report submitted by DISA and subsequent presentation, the DASD(DT&E) assesses DISA as having adequate T&E organizations and capabilities to support the DISA T&E mission.

### **3.2.5 Missile Defense Agency**

MDA reported that the composition of the Test Functional Area (TFA) T&E workforce is optimal. All manpower initiatives directed by the Secretary of Defense have been implemented. MDA will continue to adjust the balance of the T&E workforce in accordance with future manpower and fiscal guidance.

MDA detailed how its T&E program functionally aligns a highly technical and qualified workforce composed of employees from multiple program offices for sensors, shooters, and C2, and various



support functions across the agency to execute an increasingly complex ground test, flight test, and war games and exercises program. The MDA Director for Test serves as the Test Functional Manager (TFM) to coordinate all activities within the Ballistic Missile Defense System (BMDS) TFA. The MDA T&E program continues to support all DT&E activities with a highly trained T&E workforce. The MDA T&E workforce consists of civilian and military acquisition-coded T&E personnel, other career field civilian personnel that support T&E activities, advisory and assistance services personnel, Missile Defense Agency Engineering and Support Services contractor support personnel, Federally Funded Research and Development Center (FFRDC) personnel, and University Affiliated Research Center (UARC) personnel.

Although the MDA T&E workforce already operates at a high tempo and successfully balances multiple internal and external requirements and test objectives in a resource-constrained environment, the TFM constantly seeks new opportunities to enhance efficiency, communication, adaptability, and responsiveness across a large and diverse workforce. To that end, the MDA test program instituted new workforce initiatives in 2012 with the stand-up of a Test Directorate Strategic Cell and a “War Room.” The Strategic Cell facilitates centralized strategic planning for the BMDS test program and crafts strategic messages and content of external responses for consistency with all Test Directorate and MDA communications and policies. The War Room is designed to integrate and deconflict complex test planning and execution activities with the combatant commands to fulfill both test and operational requirements while utilizing limited resources to achieve the mission.

During FY 2012, the scope, size, and complexity of BMDS test activities increased from previous years, while funding levels decreased. Therefore, the ability to attract, develop, and retain the highest caliber workforce is paramount to the agency’s continued success.

In the FY 2011 annual report, DASD(DT&E) reported a concern regarding the realignment of the analysis and evaluation functions in the SE organization. MDA provided details of the personnel conducting analysis, and approximately 30 percent are T&E certified; however, none of the positions are T&E coded. DASD(DT&E) again recommended reviewing these positions for T&E coding. The alignment with the Engineering Directorate does not preclude the coding of the positions for T&E.

MDA reported on efforts pertaining to KLPs. As reported in FY 2011, MDA still does not have its test functional lead positions coded as T&E KLPs. The positions remain in synch with the roles, responsibility levels, and qualifications of the Chief Developmental Tester, but MDA has not properly coded them through its DACM. MDA reported that it will work closely with DASD(DT&E) to ensure that MDA workforce policies are fully consistent with USD(AT&L) requirements. DASD(DT&E) will follow up on this action during FY 2013.

Based upon the report submitted by MDA and subsequent presentation, the DASD(DT&E) assesses that MDA has not completed the alignment of the analysis and evaluation function to T&E coded positions. The DASD(DT&E) assesses MDA as having adequate T&E organizations and capabilities to support the MDA T&E mission in all other areas.

### 3.3 T&E Acquisition Workforce

#### 3.3.1 T&E Workforce

In accordance with DoDI 5000.66, DASD(DT&E) is the functional leader for the T&E career field in the acquisition workforce. This section provides a global perspective of the T&E workforce, including DT, operational test (OT), Government, and contractor, acquisition and non-acquisition. Over the last 4 years, the DASD(DT&E) has requested data on the entire T&E workforce. As noted in FY 2011, there have been limitations to the data over the years. The DoD Components used manual methods to collect the data and the data were not all-inclusive.

The full T&E workforce includes personnel supporting all aspects of the T&E mission beyond the acquisition-specific matter. These personnel provide critical expertise in support of the DT&E mission and the success of T&E across DoD but are not part of the acquisition workforce.

Table 3-2 shows the T&E workforce comparison between FY 2011 and FY 2012. During FY 2012, there was a minor increase of only six T&E positions. The Army showed the only decrease in T&E-coded positions, while all other DoD Components increased. T&E workforce data, extracted from the AT&L Workforce Data Mart system, are consistent with data provided in the DoD Component self-assessment reports; however, there are some minor differences between the DoD Component data and the data in the AT&L Workforce Data Mart system.

**Table 3-2. Acquisition T&E Workforce Comparison, FY 2011 vs. FY 2012**

DoD Component	FY 2011			FY 2012			Difference
	Civilian	Military	Total	Civilian	Military	Total	
Army	2,253	45	2,298	2,102	14	2,116	-182
DON	2,550	472	3,022	2,634	452	3,086	64
Air Force	1,691	1,245	2,936	1,694	1,315	3,009	73
4th Estate*	317		317	368		368	51
TOTAL	6,811	1,762	8,573	6,798	1,781	8,579	6

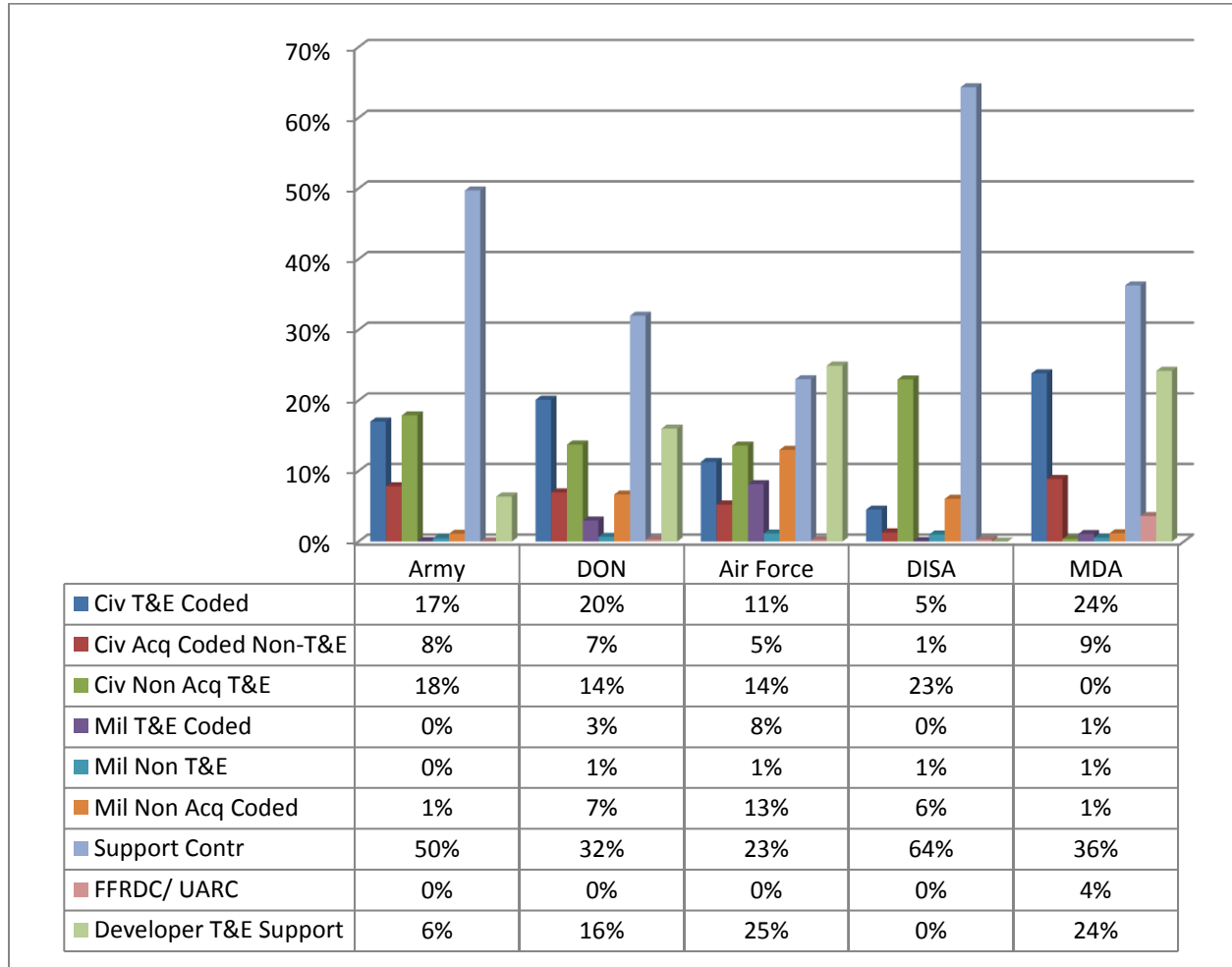
\*Includes T&E at DoD Components other than the Services; military are tracked by the Services.

The workforce data categories are as follows:

- Military and Civilians
  - T&E Coded
  - Acquisition Coded Non-T&E
  - Non-Acquisition Coded
- Additional T&E Support
  - Support Contractors
  - FFRDC/UARC
  - Developer T&E Support

Figure 3-2 shows the composition of the T&E workforce based on the data provided in the FY 2012 DoD Component self-assessment reports. With the baseline established, the DASD(DT&E) can evaluate the composition of the T&E workforce and work with the DoD Components to develop short- and long-term strategies for achieving an optimum balance of the T&E workforce. This balance should take into account strategies for enhancing the organic (civilian and military) T&E workforce.

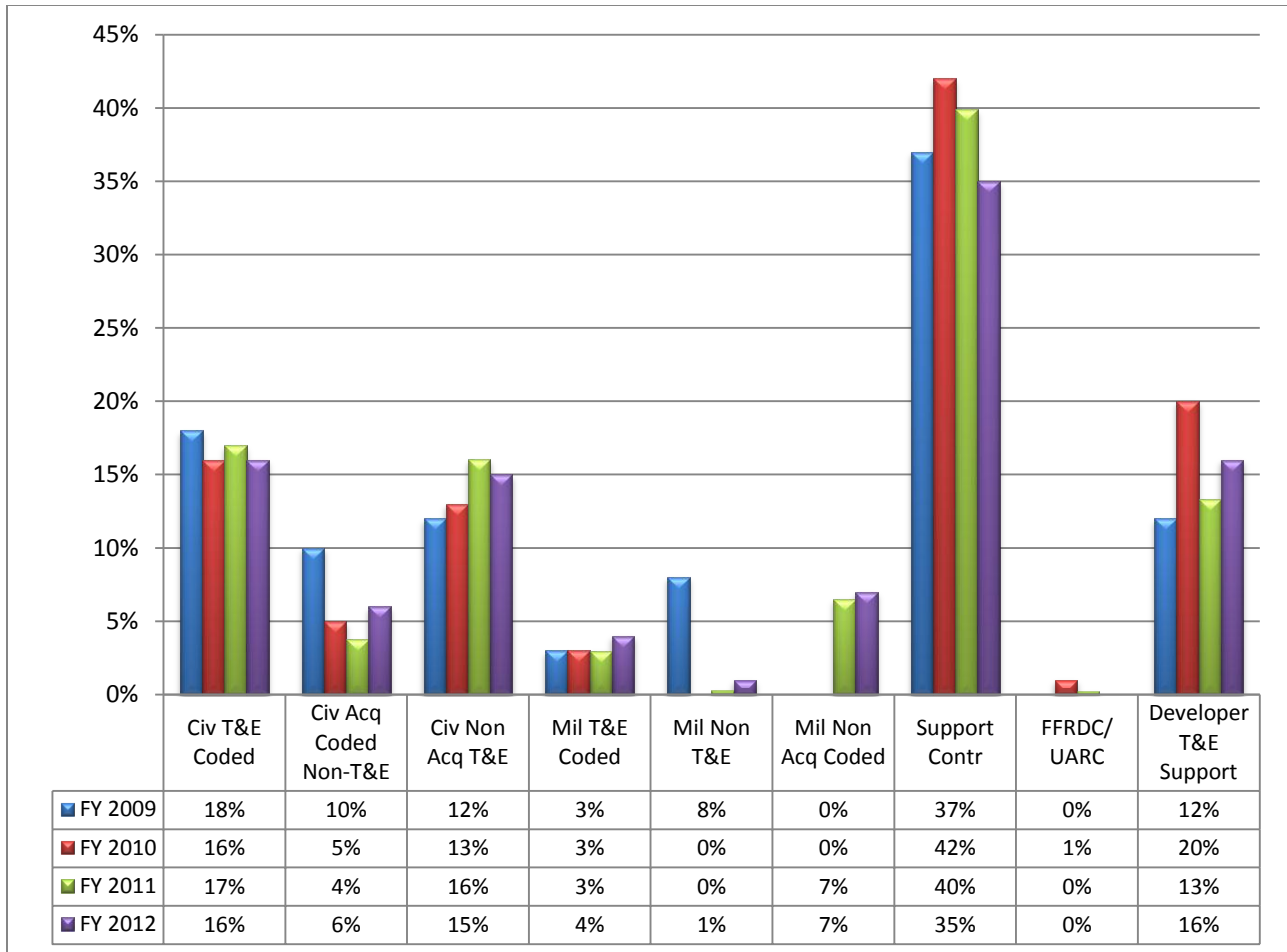
Although the Army has a high percentage of contractor support, the percentage declined from 53 percent to 50 percent in FY 2012. The Army highlighted its rigorous processes of determining inherently governmental responsibilities. DISA also has a high percentage of contractor support but manages its workforce effectively based on workload and enterprise T&E services. The DON shows a relatively balanced workforce, which is attributed to the variation in SYSCOM organizations. The Air Force has the highest percentage of developer T&E support. This percentage can be attributed to space developmental testing in which the Government does not usually possess the required test facilities and capabilities in the highly specialized field.



(0% indicates a number less than 1%)

**Figure 3-2. FY 2012 T&E Personnel Breakdown**

Figure 3-3 shows the comparison of data from FY 2009 through FY 2012. Overall, the data show a continued reliance on support contractors and non-T&E-coded personnel supporting DT&E efforts. The overall T&E-coded workforce remained the same in FY 2012; the ratio of organic T&E resources (civilian and military T&E coded) remained at 20 percent of the overall T&E workforce. DASD(DT&E) will continue to request these data and monitor the comprehensive breakdown of T&E personnel.



(0% indicates a number less than 1%)

**Figure 3-3. Comparison of T&E Workforce Data from FY 2009 to FY 2012**

### 3.3.2 Key Leadership Positions (Chief Developmental Testers)

**Background.** In accordance with section 835 of Public Law 112-81, the Secretary of Defense shall require that each MDAP and MAIS program be supported by a Chief Developmental Tester. The Chief Developmental Tester is responsible for the following:

- Coordinating the planning, management, and oversight of all DT&E activities for the program.
- Maintaining insight into contractor activities under the program and overseeing the T&E activities of other participating Government activities under the program.

- Helping PMs make technically informed, objective judgments about contractor DT&E results under the program.

The USD(AT&L) memorandum regarding Government performance of critical acquisition functions identified KLPs for all MDAPs and MAIS programs. The program lead for T&E was included in the mandatory list of MDAP and MAIS program positions when the function is required based on phase or type of acquisition program.

In FY 2012, there was progress in implementing the Chief Developmental Tester as the KLP on MDAPs and MAIS programs. The DoD Components continue to ensure that positions are being coded for a KLP/Chief Developmental Tester for each MDAP and MAIS program and that qualified individuals are entered into the AT&L Workforce Data Mart. As shown in Table 3-3, the number of KLPs/Chief Developmental Testers continued to increase during FY 2012. Data is taken from the AT&L Workforce Data Mart as of the end of FY 2012. Currently, less than 50 percent of MDAPs and MAIS programs have a KLP/Chief Developmental Tester identified in the AT&L Workforce Data Mart.

**Table 3-3. T&E KLPs in FY 2012**

4 <sup>th</sup> Estate	Army		DON		Air Force		Total
	Civilian	Military	Civilian	Military	Civilian	Military	
3	12	0	39	0	6	2	62

Next Steps. DASD(DT&E) will continue to monitor DoD Component progress in designating Chief Developmental Testers as T&E KLPs for MDAPs and MAIS programs. DASD(DT&E) will update requirements and training curriculum to ensure that Chief Developmental Testers are properly qualified. Future annual reports will document progress, as needed.

### 3.3.3 Lead DT&E Organizations

Background. In accordance with section 835 of Public Law 112-81, the Secretary of Defense shall require that each MDAP be supported by a governmental test agency, serving as Lead DT&E Organization for the program. The Lead DT&E Organization shall be responsible for:

- Providing technical expertise on T&E issues to the Chief Developmental Tester for the program.
- Conducting DT&E activities for the program, as directed by the Chief Developmental Tester.
- Assisting the Chief Developmental Tester in providing oversight of contractors under the program and in reaching technically informed, objective judgments about contractor DT&E results under the program.

In FY 2012, DASD(DT&E) requested that each DoD Component provide a list of its MDAPs and identify the Lead DT&E Organization for each. The Army, DON, Air Force, and MDA identified the Lead DT&E Organization for each of their MDAPs. DISA does not have responsibility for MDAPs.

Next Steps. DASD(DT&E) will monitor DoD Component progress in designating Lead DT&E Organizations for their MDAPs. Future annual reports will document progress, as needed.

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## 4. ADDITIONAL REPORTING REQUIREMENTS

The FY 2013 NDAA, signed on January 2, 2013, includes additional requirements for the DT&E annual report to Congress. The FY 2013 NDAA requires a separate section that addresses the adequacy of resources available to the DASD(DT&E) and the Lead DT&E Organizations of the Military Departments to carry out their responsibilities.

### 4.1. Adequacy of Resources for DASD(DT&E)

DASD(DT&E) resources addressed are the FY 2012 budget and associated staff allocated to carry out assigned responsibilities.

The FY 2012 budget, shown in Table 4-1, provides funding for the responsibilities prescribed by law and assigned in DoDI 5134.17, “Deputy Assistant Secretary of Defense for Developmental Test and Evaluation (DASD(DT&E)).” The additional funds provided in FY 2012 allowed DASD(DT&E) to fund the establishment of the STAT in T&E COE, described in Section 2.5.5.

**Table 4-1. DASD(DT&E) FY 2012 Budget (\$K)**

Program Element	FY 2012 President’s Budget	FY 2012 Appropriation
0605804D8Z	\$15,805	\$18,389

DASD(DT&E) executes its statutory responsibilities with a professional staff of 16 Government personnel. Table 4-2 provides the Government workforce and contractor support at the end of FY 2012. Organic staff of the DASD(DT&E) office is one SES Principal Deputy, one Military Staff director, five senior civilian (GS-15 level) Deputy Directors, and two civilian staff specialists. The DASD(DT&E) augments its Government staff with personnel detailed from the TRMC. These include three Military Service members and three civilians to provide additional Government representation in program engagements. DASD(DT&E) is weighing the merits of a potential permanent realignment of the military billets from the TRMC to DASD(DT&E). At the current FY 2012 staffing levels, DASD(DT&E) remains selective in its level of oversight of MDAPs, MAIS programs, and USD(AT&L)-designated special interest programs.

**Table 4-2. DASD(DT&E) Workforce and Contractor Support, End of FY 2012**

DASD(DT&E) Workforce Staffing (Government and Contractor)	End of FY 2012
Government	12
Military	4
Contractor/FFRDC Support	54
Total	70*

\*Includes detailees from TRMC

## **4.2. Adequacy of Resources for DoD Component Lead DT&E Organization**

DoD Components are identifying the Lead DT&E Organization. The Army assigned Lead DT&E Organizations to all MDAPs that have not yet reached FRP. The DON is identifying a Government test activity or related command office as the Lead DT&E Organization that provides assistance to the Chief Developmental Tester. The Air Force reported that the Lead DT&E Organization concept is similar to its Responsible Test Organization (RTO) structure. The Air Force is replacing the term RTO with Lead DT&E Organization. In addition, the Air Force reported that the Lead DT&E Organization is critical for ensuring that all necessary T&E disciplines are participating and implementing integrated testing principles. MDA assigned a single internal organization as the Lead DT&E Organization for the BMDS program.

In preparation for the FY 2012 Annual Report development, DASD(DT&E) requested information from the DoD Components that included the identification of a Lead DT&E Organization for each MDAP. DASD(DT&E) received the responses in the November 2012 timeframe.

The FY 2013 NDAA, enacted on January 2, 2013, included a requirement to address the adequacy of the Lead DT&E Organizations. As such, the DoD Components did not have adequate time to plan, collect the data, and provide that data for DASD(DT&E) to make an assessment of the adequacy of resources of the Lead DT&E Organizations in carrying out their responsibilities for this submission.

As an initial step to assessing the adequacy, this annual report addresses the identification of the Lead DT&E Organization by the DoD Components. The next step is for DASD(DT&E) to work with the DoD Components to determine an approach that provides DASD(DT&E) with the data to assess whether the Lead DT&E Organizations have adequate resources to carry out their responsibilities.

DoD Components have identified the Lead DT&E Organizations for each MDAP. DASD(DT&E) assesses that the organizations listed meet the requirement of having a Government organization serve as a Lead DT&E Organization. At this time, DASD(DT&E) does not have sufficient information to fully assess the adequacy of the Lead DT&E Organizations' resources.

As part of the FY 2013 Annual Report, DASD(DT&E) will assess the resources, which include funding, capabilities, and professional staff, and will identify any gaps or limitations.



## **5. DOD TEST RESOURCE MANAGEMENT CENTER**

### **5.1 Introduction**

#### **5.1.1 Background**

In FY 2012, the TRMC provided advocacy, oversight, and guidance for all matters pertaining to assessment of and strategic planning for the MRTFB. These responsibilities include annual certification of the Service and Defense Agency T&E budgets and development of the congressionally directed biennial Strategic Plan for DoD T&E Resources. Also in 2012, at the direction of the USD(AT&L), the TRMC conducted the Comprehensive Review of T&E Infrastructure and produced a report detailing its findings and recommendations.

#### **5.1.2 Mission, Goals, and Vision**

Section 196 of Title 10, U.S.C., and DoD Directive (DoDD) 5105.71, “Department of Defense Test Resource Management Center (TRMC),” established the TRMC as a DoD Field Activity under the authority, direction, and control of the USD(AT&L) to:

- Review and provide oversight of proposed DoD budgets and expenditures for the MRTFB.
- Develop a biennial strategic plan reflecting the needs of DoD with respect to T&E facilities and resources.
- Review the proposed T&E budgets of the Military Departments and Defense Agencies with T&E responsibilities for adequacy and certify that they provide balanced support to the current strategic plan.
- Administer the CTEIP and the T&E/S&T Program.

The TRMC mission, as stated in DoDD 5105.71, is to plan for and assess the adequacy of the MRTFB, as defined by 10 U.S.C. 196 and as described in DoD Directive 3200.11, “Major Range and Test Facility Base (MRTFB),” to provide adequate testing in support of development, acquisition, fielding, and sustainment of defense systems; and maintain awareness of other T&E facilities and resources, within and outside the Department, and their impacts on DoD requirements. In addition to the above statutory requirements, the TRMC also is responsible for administering the JMETC program and managing the National Cyber Range.

The TRMC vision is that the DoD T&E workforce, infrastructure, and funding will be fully capable of supporting the Department with quality products and services in a responsive and affordable manner. The TRMC goal is to provide robust and flexible T&E capabilities in support of the Warfighter.

## **5.2 State of the T&E Resources**

### **5.2.1 Strategic Plan**

The TRMC produced the 2012 Strategic Plan for DoD T&E Resources (hereafter “Strategic Plan”), which responds to 10 U.S.C. 196, enacted by section 231 of the Bob Stump NDAA for FY 2003, Public Law 107-314. The Strategic Plan articulates a comprehensive review of the DoD T&E infrastructure; a strategic vision to support modernization and sustainment of Service, joint, and Defense Agency test capabilities; and a review of DoD T&E resource needs by providing an appraisal of DoD T&E resources in terms of the T&E infrastructure, investment, and workforce necessary to achieve desired T&E capabilities.

As a result of continuous process improvement, the TRMC now uses the Tri-Service Reliance panels as the basis of the Strategic Plan. The report provides a detailed assessment of the challenges facing the T&E community and establishes solutions to address capability shortfalls. The plan is the result of significant collaboration with the Military Departments and Defense Agencies to transform DoD T&E resources within the confines of strategic guidance, policy, and fiscal constraints.

Next Steps. Once final Departmental review is complete, the TRMC will submit the 2012 Strategic Plan to Congress.

### **5.2.2 Budget Certification**

In 2012, the TRMC produced a report on T&E Budget Certification for FY 2014, satisfying the requirements of 10 U.S.C. 196 with respect to the certification of adequacy of proposed FY 2014 Service and Defense Agency T&E budgets. Section 196(e)(2) of Title 10, U.S.C., requires the TRMC Director to review and certify the proposed T&E budgets of each Military Department and Defense Agency with T&E responsibilities for adequacy. Following the review, the TRMC Director submits a report analyzing all the proposed Service and Defense Agency T&E budgets to the Secretary of Defense. In 2012, the TRMC produced a preliminary report on T&E Budget Certification for FY 2014 based on the FY 2014 budget estimate submission and known resource management decisions.

Next Steps. Once the Department has finalized the proposed defense budget, the Acting Director, TRMC, will conduct a final review of the Service and Defense Agency T&E budgets for sufficiency. In turn, the report on T&E Budget Certification for FY 2014 will then be provided to the Secretary of Defense.

## **5.3 Investment Programs**

### **5.3.1 Central Test and Evaluation Investment Program (CTEIP)**

The CTEIP invests in T&E capabilities that will meet the test requirements of more than one DoD Component. In addition, CTEIP allocates a portion of its resources annually to the Resource Enhancement Project (REP), which addresses high-priority near-term operational test needs. With an

average annual budget of \$145 million, CTEIP funds about 50 projects or subprojects at any given time, all of which are in various stages of development. These projects range from quick assessments of new technologies to full-scale efforts to develop new test capabilities. Funding varies from several hundred thousand dollars to as much as \$300 million over the life of a project. Although CTEIP operates under the oversight of the TRMC, the Services and Defense Agencies propose and execute CTEIP projects. CTEIP provides a coordinated process for funding T&E investments that leverage DoD Component investments and encourage joint development and use of new test capabilities.

During FY 2012, CTEIP continued to make significant progress in the development and deployment of test infrastructure capabilities. This year, 35 projects continued in execution and 11 projects successfully completed development to begin supporting test activities across the MRTFB and other ranges. The CTEIP 2012 Annual Report will be published in early 2013 and contains detailed information on all CTEIP projects. Summarized below are the highlights of the 2012 CTEIP.

#### Fielded T&E Capabilities

- The Gulf Range Mobile Instrumentation Capability (GR-MIC) project developed a transportable instrumentation capability that provides a platform for remote test, command and control, collection, storage, and relay of various data types.
- The Joint Gulf Range Complex Upgrade (JGRCU) project expanded the simulation capability at the Eglin AFB Guided Weapons Evaluation Facility (GWEF) to support network-enabled weapons system-of-systems (SoS) testing, such as aircraft weapons and targeting systems, in an LVC test environment at the Gulf Range.
- Joint Installed System Test Facility (JISTF) Pre-Planned Product Improvement (P3I) – Advanced Radar Environment Simulator (ARES) project provided the Navy JISTF, Air Combat Environment Test and Evaluation Facility (ACETEF), Patuxent River, Maryland, and the Air Force JISTF, Benefield Anechoic Facility (BAF), Edwards AFB, California, with a generic radar stimulator integrated with other mission models in these facilities that is capable of presenting dynamic, multiple angle-of-arrival target returns to a system under test (SUT).
- The Pacific Region Interoperability Test and Evaluation Capability (PRITEC) project provided test and training facilities in the Pacific with improved connectivity, flexibility, interoperability, and reliability of network-distributed test data, simulations, and situational awareness information.
- The Savannah Combat Readiness Training Center Training Enabled Maneuver Instrumentation project provided the Joint Gulf Range Complex (JGRC) with a more realistic and robust environment to test Net-Enabled Weapons and Link-16 systems.
- The Space Threat Assessment Testbed project reached initial operational capability (IOC) in FY 2012. The testbed provides Arnold Engineering Development Center (AEDC), Arnold AFB, Tennessee, with a ground test satellite component simulation capability that replicates the space environment supporting early design and performance assessments. Full operational capability will be reached during FY 2013.
- The Tri-Service Signals Library Study (TSSLS) was conducted as a precursor to the proposed FY 2013 Synthetic Battlefield Emitter System (SBES) project.

- The Distributed Timing Instrumentation Environment (DTIE) project provided JITC with a distributed network capability to capture specific database update events to accurately evaluate KPPs relating to critical timing issues, and provided scenario generation, data collection, and data reduction capability.
- The Lightweight Alternative Power Source (LAPS) project provided the Army with smaller, lighter weight methanol-based fuel cells for operating test instrumentation on ground vehicles.
- The Threat Model Assessment Program for Operational T&E (TMAP for OT&E) provided the Air Force with a set of validated threat models that represent the most current adversary threats for operational testing in the F-22 Air Combat Simulation (ACS) and F-35 Verification Simulation (VSIM), and supports ongoing operational testing at those facilities.
- The Prototype Radar Digital Signal Processor (PRDSP) developed a prototype of a threat surface-to-air missile (SAM) system signal processor and related signal processing of subsystems to support the T&E of major acquisition programs. PRDSP provided the technological platform on which Naval Air Warfare Center Weapons Division (NAWCWD) Electronic Combat Range (ECR) radars will be rehosted for enhanced threat realism.
- The Scurry Cyber Tools Integration (SCTI) project increased the utility of the Network Exploitation Test Tool (NETT) and the Flying Squirrel (FS) Wireless Discovery/Mapping Application cyber test tools by providing a seamless means to share (in real-time or post-process) the 802.11 wireless devices discovered by FS with NETT.
- The Threat Communications Capability (TCC) project provided a single-point capability to conduct multiband communications between Threat Vehicles and Operational Units conducting operational tests. TCC will be used by red force personnel in a variety of Army T&E events, including the NIE.

#### Future Investment Areas

- In FY 2011, CTEIP completed the Tri-Service Electronic Warfare Test Capabilities Study (TEWTCS) to address multi-Service requirements in all electronic warfare test environments from laboratory through open air testing. Results of the Airborne Electronic Attack component of this study resulted in the addition of an accelerated Block A to the Next-Generation Electronic Warfare Environment Generator (NEWEG) project to address near-term requirements to test active electronically scanned array (AESA) based jamming and radar systems for the Next Generation Jammer system at the ACETEF at Patuxent River Naval Air Station (NAS), Maryland. The Block A accelerated development successfully completed its Critical Design Review (CDR) in FY 2012 and is on schedule to reach full operational capability in the 2nd quarter FY 2014.
- CTEIP also participated in a major DoD study to address a broad range of test capability issues related to electronic warfare threats. The CTEIP work on the TEWTCS and NEWEG Blocks A and B allowed it to make major contributions to the study's assessment of current gaps and to make recommendations for executable development strategies to address them. CTEIP expects to play a continuing role in the development of capabilities to test our current and future electronic warfare systems. CTEIP will place immediate priority on development of advanced radio frequency (RF) threat simulators suitable for use on the Department's Open Air Test Ranges.

- The Common Range Integrated Instrumentation System (CRIIS) project provides the MRTFB with the capability to collect highly accurate time, space, position information (TSPI) and selected aircraft data bus information needed for advanced weapon systems testing. During FY 2012, the CRIIS project successfully completed its CDR and started component development and testing. The project plans to complete subsystem testing and confirm its readiness to start system testing in FY 2013.
- The Objective Helicopter Icing Spray System (OHISS) project will provide test ranges with the capability to conduct in-flight aircraft icing and rain testing. The project will provide two distinct capabilities: the Cloud Generation System (CGS) and the Cloud Characterization System (CCS). These capabilities will be delivered in the form of kits that can be installed on non-dedicated aircraft. Each capability will have a minimal A-kit (equipment permanently installed on the aircraft) as well as a B-kit (removable mission package). This concept will allow OHISS to be shipped and installed on test support aircraft at the test site or installed at Redstone Test Center (RTC), Redstone Arsenal, Alabama, and then ferried to the test site. The project is currently conducting component design.
- The Joint Urban Test Capability (JUTC) project will provide a realistic, reconfigurable, instrumented “slice” of an urban environment to replicate the aggregate urban effects sufficient to support testing of systems or systems of systems. The first capability increment is being fielded at White Sands Missile Range (WSMR), New Mexico. Increment 1 will provide modular representations of urban structures, electromagnetic effects, video and audio data collection, net-centric connectivity through the Defense Research and Engineering Network (DREN)/Secret Defense Research and Engineering Network (SDREN), and test planning and control. DOT&E stated in its 2012 annual report to Congress that the physical surface area of Increment 1 is not large enough to support adequate operational testing of company size or greater. The urban core modular design is scalable and can be reconfigured and/or expanded as required to create larger operating areas in the future. This expansion is not currently funded.
- The Joint Distributed Infrared Countermeasures (IRCM) Ground System (JDIGS) project enables high-fidelity, low-cost ground testing of installed missile warning systems (MWS) and IRCM systems at the ACETEF, Patuxent River, Maryland, and at the Avionics Systems Test and Integration Lab (AV-STIL) test facility, RTC, Alabama, and the GWEF, Eglin AFB, Florida. JDIGS will provide an end-to-end ground-test capability, including missile response after a countermeasure is activated. The project is currently conducting component development.
- Joint Unmanned Aircraft Systems Mission Environment (JUAS-ME) will provide the ACETEF, Naval Air Warfare Center Aircraft Division (NAWCAD), Patuxent River, Maryland; the U.S. Army RTC and Joint Systems Integration Laboratory, Redstone Arsenal, Alabama; and the U.S. Air Force Simulation and Analysis Facility (SIMAF), Wright Patterson AFB, Ohio, with an immersive test capability for testing and evaluating UASs and their sensors, weapon systems, and command and control systems in simulated operational mission environments, including a representation of the National Airspace System. The project is currently conducting Block 1 development.
- The integrated Network Enhanced Telemetry (iNET) project will provide test ranges with an enhanced test telemetry capability that will support testing of increasingly complex weapons systems despite growing constraints on RF spectrum availability. Edwards AFB, California, and the NAS, Patuxent River, Maryland, have been designated as IOC sites. iNET builds on the

current legacy airborne telemetry system with one-way telemetry downlinks (serial streaming telemetry (SST)) from test aircraft to ground antennas. The long-term vision is a network design serving future ground, air, and maritime telemetry customers. Block 1 is currently in component development.

- The Subminiature Flight Safety System (SFSS) project will provide DoD with a flight termination system (FTS) small enough to fit into the limited space available in many new missiles and other flight munitions. The design of SFSS is modular and reconfigurable, with separate components for TSPI, telemetry, encryption, and flight termination. The project is currently conducting component design and development in preparation for its CDR in FY 2013.
- The Advanced Range Tracking and Imaging System project will develop a lower cost, remotely operated, day/night, interoperable optical tracking and imaging system with significantly improved tracking performance over existing systems. The project is currently developing its acquisition strategy and updated cost estimate.
- The Next Generation Range Control and Data Distribution (NGRC&DD) Capability project will develop range control and data distribution applications that support (1) real-time missions in the Pacific, (2) real-time interconnection and data exchanges with other DoD ranges, and (3) the introduction of new sensors and support systems to the DoD range environment. The Pacific Missile Range Facility in Kauai, Hawaii, will lead the development, testing, and implementation of the NGRC&DD in cooperation with other DoD ranges. The project is currently conducting initial design activities.
- The Hostile Fire Indicator Site will upgrade the Navy's existing Weapons Survivability Laboratory Remote Test Site to enable live simultaneous hostile fire engagements from multiple locations presenting more realistic operational test scenarios for the SUT.
- The Mobile Flight Mission Simulator Advanced Electronic Attack project will develop and integrate realistic electronic attack capabilities into PATRIOT Flight Mission Simulators and will support the PATRIOT Post-Deployment Build (PDB)-8 DT&E, PDB-8 IOT&E, as well as Army Integrated Air and Missile Defense (AIAMD) testing.
- The Precision Target Signatures (PTS) – Reflective Performance Mover project will increase the threat representation of the currently fielded PTS systems by adding a low-cost mover for select targets, as well as a reasonably representative RF signature augmentation capability.
- The Ascot Wren Threat Simulator will implement a validated high-fidelity real-time high-volume simulation of the Ascot Wren threat using the proven Threat Signal Processor-in-the-Loop Advanced Optical Convolver architecture.

### **5.3.2 Test and Evaluation/Science and Technology (T&E/S&T)**

The T&E/S&T Program seeks out and develops test technologies to keep pace with evolving weapons technologies. Funded within the Advanced Technology Development Budget Activity, the T&E/S&T Program is critical to ensuring that DoD has the ability to adequately test advanced systems that will be fielded in the future. T&E/S&T technology development projects typically begin at Technology Readiness Level (TRL) 3 and mature to TRL 6; deliverables include test technology prototypes and demonstrations in relevant test environments. The T&E/S&T Program

also performs risk reduction for the development of test capabilities by CTEIP and DoD Component Improvement and Modernization (I&M) efforts.

The TRMC centrally manages the T&E/S&T Program. The program employs a decentralized execution process, through eight Test Technology Areas, each of which is led by an Executing Agent from one of the Services and based at a test organization in the field. Moreover, each Executing Agent leads a working group composed of representatives from the DoD T&E and S&T communities, with expertise related to the respective test technology. The eight Test Technology Areas are as follows:

- **Electronic Warfare Testing** (Lead: Army, U.S. Army's Program Executive Office for Simulation, Training, and Instrumentation (PEO-STRI), Orlando, Florida)
  - Major Test Challenge: Adequately stimulating and testing next generation sensors
- **Cyberspace Testing** (Lead: Air Force, 96th Test Wing, Eglin AFB, Florida)
  - Major Test Challenge: Testing network defense and cyber vulnerabilities in systems
- **Net-Centric Systems Testing** (Lead: Navy, Naval Air Systems Command (NAVAIR), Point Mugu, California)
  - Major Test Challenge: Testing mission performance of net-enabled SoS
- **High Speed Systems Testing** (Lead: Air Force, AEDC, Tullahoma, Tennessee)
  - Major Test Challenge: Replicating true flight hypersonic conditions in ground facilities
- **Directed Energy Testing** (Lead: Army, PEO-STRI, Orlando, Florida)
  - Major Test Challenge: Measuring effectiveness of counter-improvised explosive device (C-IED) and area denial systems
- **Unmanned and Autonomous Systems Testing** (Lead: Navy, NAVAIR, Patuxent River, Maryland)
  - Major Test Challenge: Testing autonomy and learning behaviors of intelligent systems
- **Advanced Instrumentation Systems Technology** (Lead: Navy, Naval Undersea Warfare Center (NUWC), Newport, Rhode Island)
  - Major Test Challenge: Testing systems in urban scenarios and GPS-denied environments
- **Spectrum Efficient Technology** (Lead: Air Force, Air Force Flight Test Center, Edwards AFB, California)
  - Major Test Challenge: Maximizing usage of RF spectrum allocations at DoD test ranges

The T&E/S&T Program also advances OSD Science, Technology, Engineering, and Mathematics (STEM) initiatives for the T&E community by involving academic institutions in projects initiated by response to broad agency announcements and by supporting intern activities within the TRMC and at DoD test ranges and facilities.

### Recent Successful Technology Transitions

- **Improving High-Power Microwave (HPM) Weapon Testing.** The Directed Energy Test Technology Area developed a network of 12 sensor packages capable of measuring HPM energy on target, storing the data in a system capable of surviving an HPM environment, and then transferring the data to a central data collection point for analysis. This system of field sensors successfully collected performance data for the Counter-Electronics High-Power Microwave Advanced Munitions Program (CHAMP) Joint Capability Technology Demonstration (JCTD) flight tests in 2012. The instrumentation has been transitioned to WSMR for testing of C-IED systems.
- **Improving Space Access and Hypersonic Vehicle Testing.** The High-Speed Systems Test Technology Area designed and prototyped an autonomous flight safety system that performs the flight termination decision process onboard the vehicle using preprogrammed flight path and keep-out areas, along with flight deviation allowances and related safety rules. The benefits of this test technology include (1) faster response time (continue to fly vs. flight termination decision in milliseconds vs. seconds); (2) reduced equipment, maintenance, and labor costs associated with range infrastructure (instrumentation, radar systems, data relay systems, etc.); and (3) improved mission assurance and reliability. The technology has been transitioned to the Operationally Responsive Space (ORS) Program, which has built and flight-qualified five additional systems for integration into the Minotaur rocket. (High-Speed Systems Test)
- **Improving Quality of DoD Range Telemetry.** The Spectrum Efficient Test Technology Area developed hardware implementations of High-Speed Forward Error Correction (HFEC) coding schemes to reduce Bit Error Rate (BER) and improve legacy SST links. Enhancing link reliability, the HFEC technology reduces or eliminates telemetry data dropouts due to multipathing and fading. The HFEC technology has been transitioned to the Air Force Flight Test Center at Edwards AFB, California, to support testing of DoD manned and unmanned aircraft.

### Significant Ongoing Technology Developments

- **Improving Hypersonic Propulsion Systems Testing.** The Hypersonic Aeropropulsion Clean Air Testbed (HAPCAT) development will better replicate a realistic flight profile in a wind tunnel with clean air at the required temperatures and with the ability to vary Mach number from 5 to 8 on the fly to adequately test scramjet engine performance and operability. The HAPCAT technology will advance DoD efforts to reduce developmental and acquisition risks by enhancing the utility of ground facilities for testing High-Speed Strike Weapons.
- **Improving Infrared Countermeasure Systems Testing.** The Electronic Warfare Test Technology Area is developing a superlattice light-emitting diode to more realistically test IRCM systems in DoD installed systems test facilities. The new infrared (IR) source will provide high-temperature scenes with a frame rate fast enough to stimulate next-generation IRCM and MWS.
- **Expanding the Test Opportunities for High Energy Lasers.** The Directed Energy Test Technology Area is developing a High-Energy Laser (HEL) predictive avoidance tool for open air test ranges. Consistent with DoD standard probabilistic-based practices (MIL-STD-882D), this test tool will generate a risk assessment to personnel, aircraft, sensors, and satellites for the HEL test event, identifying safe test time windows for a given test configuration.



- **Improving Reentry and Boost-Glide Vehicle Testing.** Critical to the design of Reentry and Boost-Glide vehicles is the design and performance of the thermal protection system. The High-Speed Systems Test Technology Area is developing technology to expand the operational envelopes of the arc heaters at the AEDC in Tullahoma, Tennessee. This technology will improve the durability of the electrodes and reduce maintenance costs, as well as reduce the risk for the Department to develop a mid-pressure arc heater better suited to test maneuvering reentry vehicles.
- **Improving Large Footprint Weapons Testing.** The Spectrum Efficient Test Technology Area is prototyping a multi-band (L/S/C-Bands), beam-forming phased array antenna system suitable for mounting on an aircraft to support over-the-horizon test operations. Designed to support long-range missile defense tests, this prototype will reduce the risk for a CTEIP-developed next generation range support aircraft at the NAWCWD at Point Mugu, California.

#### Areas of Emerging Significance or Greater Emphasis

Beyond the ongoing test technology development in all eight Test Technology Areas, the T&E/S&T Program is refining test technology road maps in response to expanded DoD emphasis on electronic warfare, cyberspace, and autonomous warfighting capabilities, which exceed our current test infrastructure capabilities. Further requirements analysis is being conducted to discern the test infrastructure necessary to replicate future threat cyberspace attacks required to assess IA vulnerabilities in weapon systems. Potential integrated cross-domain solutions (CDS) for test facilities are also being explored, especially to enhance interoperability testing with coalition partners at multiple levels of security classifications. In addition, the T&E/S&T Program is developing a strategy to expand the STEM activities in the T&E community, involving students at major universities working on test technology problems.

### **5.3.3 Joint Mission Environment Test Capability (JMETC)**

Since its establishment in FY 2007, the JMETC Program has proven to be a cost-effective, time-saving, DoD-wide infrastructure capability for linking distributed facilities and enabling customers to test and evaluate warfighting capabilities in a joint context. Having completed its sixth year, the program has provided the T&E community with an infrastructure capability that supports testing across the full spectrum of the acquisition process. JMETC has supported developmental testing, operational testing, interoperability certification, and Joint Mission Capability Portfolio testing.

JMETC provides readily available, persistent connectivity between testing facilities with standing network security agreements, common integration software for linking sites, and accredited test tools for distributed testing. JMETC underwrites this capability with a dedicated customer support team for all JMETC products and testing activities. JMETC also provides a test capability aligned with the Joint National Training Capability (JNTC) in that both use the Test and Training Enabling Architecture (TENA) and have an established capability to peer the JMETC network infrastructure to the JNTC Joint Training Enterprise Network. Further, JMETC resource planning considers investments with the Joint Staff J-7 as well as other existing DoD and industry SE, test, and training capabilities. These investments work to achieve consistent compatibility between the test and the training distributed infrastructures while leveraging each other's investment and development activities.

In FY 2012, JMETC continued to make significant progress in accomplishing the objectives of the “Testing in a Joint Environment Roadmap.” Summarized below are the FY 2012 highlights of JMETC contribution toward achievement of the objective to create a persistent corporate capability for testing in a joint environment.

- Supported 444 test days (defined as JMETC support to one customer test event for one day) in the execution of 131 distinct customer distributed LVC test activities for DoD programs and events. Major distributed test events were MQ-4C Triton Environment Integration, Aegis Accelerated Mid-Term Interoperability Improvement Program (AMIIP), Joint Integrated Air and Missile Defense Organization (JIAMDO) Correlation/De-correlation Interoperability Test (C/DIT), JIAMDO C/DIT Coalition Event, JITC Joint Interoperability Tests (four actual events), B1-B Fully Integrated Data Link (FIDL), B-52 Combat Network Communications Technology (B-52 CONECT), Air-to-Ground Layer Exploration (two actual events), Joint Track Management Capability-Demonstration/Composite Track Management (JTMC-D/CTM), Ground/Air Task Oriented Radar (G/ATOR) DT1-B1, InterTEC Cyber Event (ICE), JDIGS Event 2, and NAVAIR Integrated Warfare Capability (IWC) Event. In addition, the JMETC infrastructure supported activity by its customers for smaller events, in several cases running as many as five concurrent tests.
- Increased its customer base to include the Apache Block III (AB3), Common Aviation Command and Control System (CAC2S), G/ATOR, Joint Tactical Networking Center (JTNC) Joint Reference Implementation Laboratory (JRIL), B-52 CONECT, Distributed Common Ground System–Army (DCGS-A), Dismounted Detection Radar, Joint Operational Test Approach (JOTA-2), Joint Track Management Capability/Composite Track Management (JTMC/CTM), AIAMD PEO, and the Indiana Test Bed (Naval Surface Warfare Center (NSWC) Crane and Indiana National Guard).
- Expanded the JMETC network infrastructure adding six sites (72 total) and three new peering points to industry and academia partners. In addition, numerous local infrastructure issues were resolved and devices reconfigured for optimal performance at several sites through on-site and remote assistance by JMETC personnel.
- Continued efforts to consolidate and converge T&E networks onto the JMETC infrastructure. Joining the Air Force Integrated Collaborative Environment (AF-ICE) convergence to JMETC in FY 2009, the Army migrated the ATEC Test Integration Network (ATIN) to JMETC in FY 2012.
- Partnered with the Marine Corps Systems Command (MARCORSYSCOM) in the development of a mobile, wireless, data collection and analysis capability (ARORA). The ARORA is a state-of-the-art wireless, TENA-enabled, and InterTEC-equipped distributed testing resource that will support the developmental testing of the G/ATOR (Acquisition Category (ACAT) 1D) program in FY 2013. The wireless connection capability is a reuse of JMETC equipment purchased for a previous event and reflects JMETC continued efforts to expand the nation’s distributed T&E infrastructure in an efficient and cost-effective manner.
- Collaborated with the JTNC (formerly PEO-JTRS)/JRIL) to conduct future RF waveform testing. In support of the restructured Joint Tactical Radio System (JTRS) program, JMETC began planning to stand up four new sites in support of the JRIL mission. JMETC also provided network engineering analysis and resources to support the prototyping of an RF over Internet

Protocol (RFOIP) capability that will enable remote radio operations across geographically separated sites.

- Enabled the test-analyze-fix-test process of the Aegis baselining software during multiple iterations of the Aegis Mid-Term Interoperability Improvement program as risk reduction for verification during at-sea operational testing.
- Continued to execute on the actionable recommendations generated by the DoD Information Assurance Certification and Accreditation Process (DIACAP) Tiger Team, which was focused on addressing the impact of IA on the RDT&E community's ability to meet its mission. JMETC established an RDT&E specific forum on the DIACAP Knowledge Service (DKS) for the socialization of best practices, reference material, and templates. JMETC also actively participated in the DoD DIACAP Technical Advisory Group (TAG), composed of senior Service and Defense Agency IA personnel, in order to enact changes in upcoming revisions of IA policy to address the unique challenges posed by the dynamic nature of the RDT&E community's mission.
- Continued collaboration with the Service and Defense Agency T&E communities via the JMETC Advisory Group, which has members from the Services, Defense Agencies, and the Joint Staff.
- Conducted two JMETC Users Group meetings. These meetings are with technical representatives from across the T&E community. The Users Group provides a forum for JMETC users to share information, provide feedback, identify problems and solutions, and address requirements. The major focus of these meetings is on user requirements, networking, data management, security/IA, and distributed test tool topics. Two new topic areas were added in 2012: Threat Representation and Cyber T&E. The JMETC Users Group continued to be a critical component of the JMETC overarching strategy of addressing the JMETC customer requirements and solutions.
- Implemented a Tools Assessment initiative, in coordination with the distributed test community. This effort is focused on providing evaluations of distributed test tools in order to assist the community in the selection of tools in various categories as well as to provide lessons learned and best practices.
- Enhanced the Web-based Reuse Repository including the User Interface and content. The JMETC Reuse Repository provides the distributed test community with the JMETC schedule, JMETC processes and procedures, lessons learned from previous distributed test events, and the ability to download TENA Middleware, distributed test tools, utilities, and test metadata.
- Made significant progress in collaborating with the training community via the JMETC dedicated, full-time liaison to the Joint Staff J-7 and J-6. The intent is to continue to achieve consistent compatibility, synchronize investments, and prevent duplication between the organizations in FY 2012, especially in light of the disestablishment of U.S. Joint Forces Command (USJFCOM). In support of the Joint Staff J-6, JMETC continued to participate in the planning meetings for both the Bold Quest/JOTA-2 Mode V Identification Friend or Foe (IFF) and the Digitally Aided Close Air Support (DACAS) initiative.
- Completed a study to develop requirements for Distributed Data Management and Distributed Analysis. The requirements were developed in coordination with a cross section of the distributed test community to assess capabilities needed to improve the efficiency of data

management to support near-real-time test-analyze-fix-test while addressing the complexities associated with correlating and analyzing distributed data sets. Follow-on Pilot efforts are under consideration to address solutions and gaps to these requirements.

### Cyberspace T&E

In FY 2012, JMETC participated in assessments of the adequacy of T&E resources to address the nation's cyber threats across four major thrust areas, including T&E policy, T&E methodologies, T&E infrastructure, and workforce qualifications.

- JMETC initiated planning efforts to build and sustain the infrastructure to support cyberspace T&E requirements to include cyber test and assessment tools, data collection, and distributed testing.
- JMETC partnered with the CTEIP to conduct an ICE using the infrastructure of JMETC and the Joint Staff J-7 JIOR in order to assess the infrastructure requirements for testing the vulnerability of C2 and weapons systems to cyber threats in a mission context. The lessons learned will be used to plan more complex cyber T&E environments as JMETC continues to develop additional requirements and infrastructure solutions.
- As part of a TRMC effort to assess the adequacy of cyber T&E infrastructure, JMETC conducted visits to existing cyber capabilities across DoD, industry, and academia as potential candidates for integration with the cyber T&E infrastructure. Site visits included the Army TSMO, Redstone Arsenal, Alabama; National Cyber Range (NCR), Orlando, Florida; DoD IA Range, Quantico, Virginia; Army Research Laboratory (ARL), WSMR, New Mexico; Air Force 346th Test Squadron and Det 2 of the 46th Test Squadron, San Antonio, Texas; Northrop Grumman's Cyber Security Systems Group, Millersville, Maryland; and MIT/Lincoln Labs, Massachusetts.
- On August 28, 2012, the USD(AT&L) assigned responsibility for the NCR to the TRMC effective October 1, 2012. The Director, TRMC assigned responsibility for the NCR to JMETC.

## **5.4 Other Significant Activities**

### **5.4.1 Science, Technology, Engineering, and Mathematics (STEM) Initiative**

The TRMC is furthering its national leadership role in STEM for the T&E community. The TRMC STEM Initiative strives to bring inspiration and opportunity to America's next generation of technologists. The TRMC objective is to expand the pipeline of highly qualified professionals into the T&E workforce. The program facilitates strategic partnerships with the DoD Component T&E communities, academic institutions, and industry through targeted programs in research, internships, and scholarships that lead to immediate entry into the national and DoD T&E workforce.

Through investments made principally from the T&E/S&T Program, the TRMC STEM Initiative seeks opportunities to advance the T&E discipline at universities and fosters critical talent by investing in targeted technologies, researchers, and students through participation in the development of test technology. In addition, the initiative utilizes agreements with DoD Component test organizations, to include ATEC, where the TRMC provides funding for undergraduate/graduate internships, while ATEC leverages the Student Career Experience Program (SCEP) to identify

STEM student candidates to work at ATEC. ATEC then works in coordination with the TRMC to develop individual program development plans for the students and sets aside billets within T&E for students to be hired upon graduation. The TRMC has also entered into a partnership with the NAVAIR, Patuxent River, Maryland, to provide funding that complements and extends their STEM activities.

The TRMC focuses many of its STEM initiatives at historically black colleges and universities (HBCUs) and minority-serving institutions (MSIs) in order to expand the T&E community's research base and talent pool from academic institutions that have not traditionally been included in DoD T&E S&T and recruiting activities.

During this fiscal year, the TRMC conducted outreach with Morgan State University (MSU), Florida International University (FIU), and North Carolina Agricultural and Technical State University (NC A&T). This outreach resulted in proposals from MSU and NC A&T to the TRMC T&E/S&T investment program. MSU was awarded a contract to perform research in the Spectrum Efficient Test Technology Area.

Also ongoing is the effort to develop an enterprise-level program, partnering with DoD Labs, National Aeronautics and Space Administration (NASA), and academia (e.g., STEM), to develop and sustain a highly trained national hypersonics workforce specifically targeted to reduce risk to current and future hypersonics acquisition programs. The program would involve institutional funding to conduct tests that level the workload across the critical ground facilities, sustain the current workforce, and provide real-world T&E opportunities for science and engineering students to earn master's and doctoral degrees that prepare them to go directly into T&E jobs upon graduation. The tests to be conducted would address relevant technical problems currently being faced in hypersonic weapons development and testing. A sequence of tests and eligible test facilities for each of the major test types has been preliminarily identified.

Next Steps. The TRMC will institutionalize the TRMC STEM Internship Program with upcoming internships at both Government and commercial T&E organizations. The Director, TRMC will chair the International T&E Association Academia Day.

#### **5.4.2 Comprehensive Review of T&E Infrastructure**

On March 9, 2012, the USD(AT&L) tasked the TRMC to “assemble an objective expert team to conduct a study to determine how T&E resource costs can be significantly reduced to provide adequate and robust testing....” The USD(AT&L) specifically tasked the TRMC to:

- Identify the most promising areas for further study in order to reap potential savings.
- Determine T&E infrastructure requirements and where the capabilities should reside.
- Develop capability gaps and the investments needed to satisfy those gaps.
- Identify alternatives for operation and support of test facilities.
- Assess potential funding policy alternatives to the MRTFB.

The TRMC formed a study group to investigate these concerns and delivered a final report detailing the findings and recommendations of the group to the USD(AT&L) on December 27, 2012. The study conducted 16 deep dives into actions thought to have the potential for significant and quantifiable savings with a reasonable likelihood of being implementable, and conducted five observations into potential actions for which savings were regarded as likely but could not be readily quantified. The analyses of these potential actions yielded more than 50 specific recommendations.

Next Steps. The TRMC will conduct follow-up work with the DoD Components to begin implementation of the appropriate recommendations and findings.

## **6 PROGRAM ENGAGEMENT AND ASSESSMENTS**

The FY 2012 Annual Report highlights the engagement activities and assessments of 46 programs that have reached a significant milestone or had significant DT&E activities. Significant activities include DT&E assessments, first test flight, completed system integration lab testing, completed ground testing, and initiation of DT&E. For those programs that received a DT&E assessment during the fiscal year, a separate paragraph highlighting the findings and recommendations of that assessment is included. None of the programs in this report requested a deviation or a waiver from the TEMP. Assessments are as of the end of FY 2012 (September 30, 2012); however, some assessments may include information on program status through the 1st quarter FY 2013 (December 31, 2012).

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## 6.1 Army Programs

This section includes summaries of the following 14 programs:

- Apache Block III (AB3) Upgrade
- Distributed Common Ground System–Army Mobile Basic (DCGS-A MB)
- Excalibur M982E1 Precision Engagement Projectiles
- Ground Combat Vehicle (GCV) – Infantry Fighting Vehicle (IFV)
- Guided Multiple Launch Rocket System–Alternative Warhead (GMLRS-AW)
- Joint Land Attack Cruise Missile Defense Elevated Netted Sensor System (JLENS)
- Joint Tactical Radio System (JTRS) Handheld, Manpack, and Small Form Fit (HMS) (AN/PRC-155)
- Joint Tactical Radio System (JTRS) Handheld, Manpack, and Small Form Fit (HMS) Rifleman Radio (RR) (AN/PRC-154)
- M109 Family of Vehicles, Paladin Integrated Management (PIM) Self-Propelled Howitzer (SPH) and Carrier, Ammunition, Tracked (CAT) Vehicle
- MQ-1C Gray Eagle Unmanned Aircraft System (UAS) Increment I
- Phased Array Tracking Radar to Intercept of Target (PATRIOT)
- Precision Guidance Kit (PGK) XM-1156
- Stryker Family of Vehicles – Double V-Hull (DVH)
- Warfighter Information Network–Tactical Increment 2 (WIN-T Inc 2)

## Apache Block III (AB3) Upgrade

**Executive Summary:** AB3 is a twin-engine, four-bladed, tandem-seat attack helicopter with 30-millimeter cannon, 2.75-inch rockets, and laser and radio frequency Hellfire missiles. AB3 is a modernized version of the AH-64D attack helicopter intended to provide the capability to simultaneously conduct (or quickly transition between) close combat, mobile strike, armed reconnaissance, security, and vertical maneuver missions across the full spectrum of warfare, from stability and support operations to major combat operations, when required in day, night, obscured battlefield, and adverse weather conditions. The Army intends to organize the AB3 in attack/reconnaissance battalions assigned to combat aviation brigades. Each battalion will have 24 aircraft. With the AB3, the Army intends to sustain the Apache fleet through 2040.



AB3 will enable the joint air/ground maneuver team to dominate the battlespace by providing air-ground synergy through real-time intelligence, surveillance, and reconnaissance (ISR) information and responsive precision fires. AB3 will be linked to joint and combined arms air/ground maneuver teams via enhanced digital communications, unmanned aircraft system (UAS) data links, and joint networking waveforms. The AB3 is an Apache attack helicopter modified as required to effectively and efficiently integrate the Longbow Apache well into the 21st century by providing improvements to make it relevant in Future Modular Force operations. It provides a significantly enhanced warfighting capability over the AH-64A and AH-64D.

The program entered the Production and Deployment (P&D) phase in September 2010. The AB3 program continued DT in FY 2012 and conducted IOT&E from March to April 2012. In preparation for IOT&E, the program conducted about 4 years of DT that included analysis, M&S, component qualification testing, testing in extreme environments, system-level flight testing, weapons qualifications, and live-fire testing. In January 2012, DASD(DT&E) completed an AOTR to provide the Army with an independent readiness assessment for IOT&E. The AOTR concluded that the AB3 program was ready to proceed to IOT&E. In August 2012, the AB3 program had an FRP DAB review. Subsequently, the aircraft designation was changed to AH-64E. The program is now beginning DT to support development of Lot 4 capabilities.

### Summary of FY 2012 DT&E Activities

- The AB3 program conducted nearly 600 flight hours in FY 2012 as part of DT, initial operational test (IOT) training, and IOT&E.
- Handling Qualities testing continued through early FY 2012 and completed prior to the IOT&E start in March 2012.
- Helicopter performance testing continued through early FY 2012 and completed prior to the IOT&E start in March 2012.
- JTTC testing for IA was completed in conjunction with IOT&E in April 2012.

- UAS interoperability testing was completed with final flight tests in December 2011 and February 2012.
- Integrated helmet and display sight subsystem (IHADSS) testing was completed prior to the start of IOT&E in March 2012.

#### **Summary of FY 2012 DT&E Program Engagement and Assessments**

- Flight performance was assessed throughout the fiscal year and included an assessment of likely performance for IOT&E. The aircraft offers a significant increase in capability over the baseline AH-64D.
- AB3 meets the hover out of ground effect (HOGE) requirement only with a new engine with a high engine torque factor (a measure of engine health); meeting this requirement long term will be challenging as engines accumulate hours and the engine torque factor declines or if the aircraft weight increases over time. Regardless, the increased HOGE performance represents a significant improvement over the legacy AH-64D.
- A critical new AB3 capability is the ability to control the Gray Eagle UAS; however, development and software integration challenges in the MQ-1C Gray Eagle program delayed testing of this capability from September 2011 to just prior and during IOT&E. Although this capability was sufficiently tested on the ground and in dynamic flight of both air vehicles during phase II interoperability testing prior to IOT&E, this complex capability was not fully tested in an end-to-end engagement, to include weapons launch, until IOT&E in March–April 2012. Although the initial delay had the potential to result in new discoveries during IOT&E, the capability was successfully demonstrated during IOT&E.

#### **Assessment of Operational Test Readiness**

- In January 2012, DASD(DT&E) completed an AOTR to support the Army’s IOT&E readiness review process and recommended that the program proceed to IOT&E contingent upon the program successfully completing the remaining scheduled DT prior to IOT&E:
  - Software version baseline testing.
    - Aircraft performance testing to clear the Air Worthiness Release to allow all IOT&E mission profiles.
    - IHADSS testing.
- The DT events were successfully completed and no major issues were noted during IOT&E.
- DASD(DT&E) also noted that although mission reliability was showing continued improvement, it was slightly below the RGC with a demonstrated value of 16.7 hours mean time between failure (mission) (MTBF(M)) prior to IOT&E. A supporting measure, mean time between essential maintenance actions (MTBEMA), realized significant improvement increasing to a total combined value of 2.36 hours, meeting the IOT&E entrance criteria of 2.3 hours.
- The program successfully incorporated fixes during its test program. Both MTBF(M) and MTBEMA continued to show improvement leading up to IOT&E and were assessed as met with high confidence during IOT&E.
- The AB3 program conducted a rigorous and robust DT program that supported entry into IOT&E. DOT&E rated the system as operationally effective, suitable, and survivable.

## Distributed Common Ground System–Army Mobile Basic (DCGS-A MB)

**Executive Summary:** DCGS-A MB is the Army’s primary system for ISR sensor tasking, data posting, information processing, and consolidating threat intelligence, weather, and terrain. The system continuously acquires and synthesizes data from joint, interagency, intergovernmental, and multinational sources, which provides for a current and detailed view of the operational environment. The program’s agile acquisition structure provides for early operational release of new capabilities and accommodates changes driven by battlefield missions.



DCGS-A MB Increment 1 was structured with four software releases designated as DCGS-A MB Software Baseline (DSB) 1.0, 1.1, 1.2, and 1.3. DSB 1.0 consists of four components. Three components make up the system’s “Low Side”: the ISR Fusion Server 3.1.6, DCGS-Enabled Common Ground Station, and DCGS-Enabled Digital Topographic Support System-Light, which operate on a Secret-level network. The fourth component, or the “High Side,” operates on Top Secret Sensitive Compartmented Information-level networks. The scope of DSB 1.1 begins to integrate capabilities offered by the DCGS Standard Cloud (DSC).

The PMO received a MS C decision in March 2012, which allowed the system to conduct IOT&E. ATEC conducted the IOT&E on DSB 1.0 during May–June 2012. Due to discovery of major problems during IOT&E, the Army modified its approach by restructuring DSB 1.0 to include only “Low Side” components and renamed it Release 1. The program completed a corrective action plan to fix “Low Side” shortfalls and deferred “High Side” components, the source of many of the IOT&E problems, to Release 2 to allow for additional corrective actions.

The Defense Acquisition Executive (DAE) approved the Full Deployment Decision (FDD) in December 2012, which authorized deployment of Release 1 capabilities, but directed the program to obtain DASD(DT&E) and DOT&E approval of a Release 2 T&E strategy and to return with test results prior to Release 2 fielding.

### Summary of FY 2012 DT&E Activities

- DASD(DT&E) coordinated the DCGS-A TEMP, dated November 16, 2011. This TEMP supported the March 2012 MS C decision and conduct of the 3rd quarter FY 2012 IOT&E, which led to a 1st quarter FY 2013 Increment 1 FDD.
- The PMO executed regression testing at the PMO facility at Fort Hood, Texas, to address old software issues and issues identified during the FY 2011 DT/Early User Test (EUT) event:
  - September 27–October 6, 2011, DSB 1.0 Regression Test #1:
    - Focused on testing fixes to the fusion capability failures observed during the August–September 2011 DT/EUT.
    - System successfully demonstrated all significant fusion, resulting in the elimination of related DT/EUT issues.

- ATEC assessed the Fusion KPP Initial Minimum Capability requirement as being “met.”
- November 3–9, 2011, DSB 1.0 Regression Test #2:
  - Tested resolution of system issues prior to or encountered during DT/EUT, plus a signals intelligence (SIGINT) focus, including communications intelligence related functionality.
  - Demonstrated fusion functionality maturity, which helped verify the Fusion KPP.
  - Demonstrated software fixes addressing DT/EUT Test Incident Reports.
- December 14–21, 2011, Regression Test #3:
  - Demonstrated resolution of 20 of 21 expected Test Incident Reports.
  - Demonstrated all but one planned user priority fix.
  - Collected additional data for geospatial, SIGINT, and fusion functional areas.
- The PMO verified interface requirements with JITC by testing 359 of 367 joint information exchange requirements (IERS). The PMO has deleted, has deferred to future DSBs, or is reassessing the remaining eight joint IERS.
- The PMO verified fixes to Release 1 “Low Side” IA shortfalls during October–November 2012 laboratory DT and deferred fixes to “High Side” IA shortfalls to Release 2. The program conducted additional regression testing in November–December 2012 to verify fixes to remaining IOT&E issues.

### **Summary of FY 2012 DT&E Program Engagement and Assessments**

- February 2012 MS C Information Technology Acquisition Board (ITAB): DASD(DT&E) assessed moderate risk to enter IOT&E based on the following:
  - Effectiveness – Low risk:
    - Improved effectiveness during regression testing but still required verification of IERS.
    - Program worked to integrate capabilities provided by other Service DCGS programs, which were not synchronized with the DCGS-A development timeline.
  - Suitability – Moderate risk:
    - Availability and maintainability requirements were on track for IOT&E.
    - Reliability requirement was not met; corrective actions were ongoing.
    - Operational availability was validated and verified at near 100 percent, overshadowing the unmet reliability thresholds.
  - Survivability – Low risk: No known unresolved issues; on track for IOT&E.
- December 2012 FDD ITAB: DASD(DT&E) assessed Release 1 as low risk and supported full fielding but assessed Release 2 as moderate risk and recommended an updated T&E strategy to ensure mature capabilities prior to fielding.
  - Release 1. The “High Side” component deferral to Release 2 removed the most significant issues discovered during IOT&E. The Army demonstrated fixes to the majority of the IOT&E issues attributed to the “Low Side” components.
  - Release 2. The Army needs to demonstrate “High Side” component fixes as a part of Release 2 testing. Additionally, the architectural evolution and integrated testing of DSC over time is unclear, including whether it replaces, complements, or deletes other current DCGS-A capabilities.
- DASD(DT&E) recommends that the Army update the TEMP to reflect the integrated testing required to mitigate the risk associated with the modified phasing of capabilities across releases.

## Excalibur M982E1 Precision Engagement Projectiles

**Executive Summary:** Excalibur is a cannon-delivered, precision engagement, extended-range family of indirect-fire artillery projectiles that are self-guided to a preprogrammed aim point. The Block I variant is a unitary projectile composed of three major subsystems: base, warhead, and guidance section. Block I, Increment Ia is currently in FRP and is forward deployed providing precision fires capability in operational theaters at a 90-percent reliability rate. The Increment Ib makes updates to the guidance and navigation control section and the fuze, safe, and arm (FS&A) component.



Increment Ib is intended to fill current and future force capability gaps for the brigade combat team (BCT) while improving theater agility and munitions efficiency. Increment Ib is intended to provide precision engagement at extended ranges, capable of eliminating the shortcomings of current area engagement munitions by enabling the maneuver commander to engage critical targets, including fleeting and short-dwell targets, with increased precision, range, and lethality while minimizing collateral damage in the target area. The Excalibur is fired from the joint lightweight 155-millimeter howitzer with towed artillery digitization (M777A2), Paladin (M109A6), and the Paladin Integrated Management (PIM) (M109A7).

The Increment Ib is an ACAT IC program that entered Engineering and Manufacturing Development (EMD) in June 2011. In March 2012, the Army reverted back to the Increment Ia-2 base and warhead design because of problems with the Increment Ib base assembly and warhead section. Changes to the configuration delayed the TEMP and DT began without an OSD-approved TEMP. The FRP decision is scheduled for 1st quarter FY 2015.

### Summary of FY 2012 DT&E Activities

- In October 2011, persistent design problems discovered in the Design Verification Test required extensive failure analysis and mitigation efforts that delayed completion of the TEMP and the start of Government DT&E.
- In January 2012, the program and DASD(DT&E) reached general agreement on the proposed strategy for DT that would support MS C and requested that the Army provide the Service-approved TEMP prior to the start of Government DT&E. Programmatic and design changes continued to delay completion of the TEMP and the start of Government DT&E.
- In May 2012, DASD(DT&E) requested that the Army provide the Service-approved TEMP prior to the start of the Sequential Environmental Test–Safety (SET-S1) test series (August 2012). This allowed the program to begin DT while completing the TEMP before the start of SET-S1.
- The Army eventually began Government DT&E in June 2012 without an approved TEMP. The program completed the TEMP in September 2012, but the Army decided to submit the TEMP to OSD in late November 2012 to support MS C. This strategy resulted in the Army submitting a TEMP that documented completed EMD testing rather than planned DT&E.
- In June 2012, the Army conducted the Increment Ib gun hardening–phase 2 (GH-P2) DT. This test evaluated the integration of the Increment Ia base and warhead with the Increment Ib guidance section and demonstrated software integration and performance in extreme environmental conditions.

- The Army conducted Increment 1b SET-S1 testing in September 2012 and Sequential Environmental Test for Performance (SET-P1) in October 2012. SET-S1 confirmed that all safety criteria were met prior to SET-P1. SET-P1 evaluated projectile performance and reliability after being subjected to temperature and vibration test extremes. SET-P1 also included a series of test shots to evaluate the NATO Armaments Ballistic Kernel (NABK).

### **Summary of FY 2012 DT&E Program Engagement and Assessments**

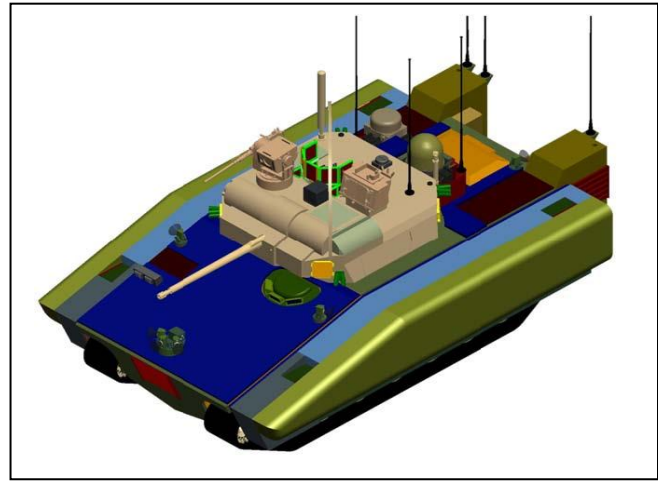
- DASD(DT&E) assesses that the technical changes the Army made to the program will result in a lower risk integration effort and that the Increment 1b program is meeting four of five KPPs, with system reliability slightly below the predicted value on the RGC.
- During the GH-P2 test, all six Increment 1b environmentally conditioned projectiles fired from worn howitzer tubes successfully guided to the target and detonated in the correct fuze mode.
- Emerging data from the SET-S1 test series show that all 12 projectiles fired at permissible maximum pressure safely exited the muzzle and maintained structural integrity during flight. Ten of the 12 rounds guided to the target; nine of the 10 successfully detonated and one failed to detonate. Two of the 12 rounds failed to power up and continued on a ballistic trajectory and impacted in the Ballistic Impact Point (BIP). Preliminary analyses of the 10 projectiles that successfully guided to the target indicate an average miss distance of 3 meters, exceeding the KPP requirement of less than 10 meters circular error probable (CEP) for unjammed accuracy. Preliminary results from an ongoing fuze function failure investigation revealed that interaction between the flight software and the FS&A may have caused the failed detonation.
- Emerging data from phase 1 of the SET-P1 test series show that all 11 Increment 1b projectiles guided accurately to the target; however, three of the projectiles failed to detonate. The failure investigation determined that two rounds failed to satisfy the second arming condition required by the FS&A assembly, and according to recorded telemetry data, one of the two projectiles also encountered a GPS-related anomaly. The program has revised the Operational Flight Software (OFS) to more effectively satisfy the second arming criteria under the firing conditions in which this problem occurred. The revised OFS successfully completed software functional qualification testing (FQT) and was uploaded into the SET-P1 phase 2 projectiles. The third round suffered a fuze function failure. The root cause for the fuze function failure and the GPS-related issue remain under investigation.
- Emerging data from phase 1 of the NABK verification test show that all 11 Increment 1b projectiles guided accurately to the target and properly functioned in the height-of-burst fuze mode.
- Emerging data from phase 2 of the SET-P1/NABK test series show that 10 of 13 Increment 1b projectiles guided accurately to the target. Three projectiles did not guide to the target, and the program is investigating the anomalies.
- In November 2012, DASD(DT&E) provided the Army with an assessment of DT conducted during EMD to support the Army's MS C decision. The assessment concluded that the system is on track to meet four of five KPPs and recommended that the system continue to low-rate initial production (LRIP). The assessment noted that the Increment 1b reliability point estimate is slightly below the program's planned RGC, with a demonstrated reliability of 79 percent with an 80-percent confidence interval from 65 to 90 percent. The program is aggressively pursuing the failures, but due to schedule compression, the SET-S2 and SET-P2 rounds have already been built and the program is not sure how many material fixes they will include in those rounds. DASD(DT&E) recommended that the program either modify the SET-S2 and SET-P2 rounds to incorporate results from the ongoing failure investigations or plan for a delta DT event to confirm fixes prior to IOT&E.

- DASD(DT&E) will prepare a DT&E assessment to support the Army’s decision to enter IOT&E in 2nd quarter FY 2014.



## Ground Combat Vehicle (GCV) – Infantry Fighting Vehicle (IFV)

**Executive Summary:** The GCV-IFV is intended to be a highly mobile, protected combat vehicle, designed to carry a nine-man infantry squad and three crew members (driver, gunner, and commander). The GCV-IFV requires growth capabilities over time in terms of size, weight, power, and cooling. The GCV-IFV will likely include a medium-caliber primary weapon system, secondary coaxial-mounted machine gun, commander's independent weapon station, and a reconfigurable armor package. The design concept (pictured here) is a notional depiction of the GCV design and requirements.



The GCV-IFV is intended to fill the Bradley role within the current fleet of combat vehicle capabilities, with greater lethality, force protection, survivability, and connectivity. It is intended to fulfill capability gaps in mobility, reliability, and operational flexibility within a wide range of terrain and environments and across a wide spectrum of joint forces ground combat operations.

In August 2011, the USD(AT&L) authorized GCV to enter the Technology Development (TD) phase and directed a three-pronged approach to refine program requirements that included the following parallel activities: TD phase contractor efforts, Non-Developmental Vehicle (NDV) assessments, and an updated Analysis of Alternatives (AoA) (including requirements trades). The USD(AT&L) also directed periodic Knowledge Point (KP) reviews to track program progress. In December 2011, the two competing developers commenced their design work and have since conducted initial contractor tests of their early subsystem prototypes.

### Summary of FY 2012 DT&E Activities

- October 2011, the Army submitted an NDV assessment strategy (including T&E events), as directed by the MS A ADM, to inform the GCV requirements update process during TD.
- The Army began collecting technical and engineering analysis data for multiple NDVs (including the Israeli Namer, German Puma, and Swedish CV-90xx); a prototype design concept vehicle (the “turretless Bradley,” a redesigned vehicle based on the Bradley with a remote weapon station); and current Stryker and Bradley vehicles. This data collection (spanning multiple months) included foreign service data, test events, and exercises to assess capabilities and limitations.
- December 2011, after resolution of a contract protest, the Army began executing the TD TES approved by DASD(DT&E) and DOT&E.
- May 2012, the Army conducted a live, comparative exercise using the Israeli Namer, the Swedish CV-90, the Stryker, the turretless Bradley, and a current Bradley IFV. The exercise used operational crews and identical training scenarios of varying missions to assess capabilities and limitations of the vehicles.
- July 2012, the program office hosted a comprehensive requirements review to consider potential changes identified during the AoA and NDV assessments.

- July 2012, the program conducted an underbelly test of an NDV to assess survivability and force protection capabilities. Also, the TD contractors conducted initial underbelly and armor protection testing on subsystem prototypes.
- September 2012, the Army briefed the USD(AT&L) on the status of its assessments, changes in GCV requirements, and its strategy to reach MS B. The Army proposed changes to the TD and/or EMD schedules to reduce the risk of concurrent design and engineering tasks. In January 2013, the USD(AT&L) directed the Army to extend the TD phase by 6 months so the Army could incorporate requirement changes into the designs.

### **Summary of FY 2012 DT&E Program Engagement and Assessments**

- The NDV assessment strategy initially submitted in October 2011 was poorly organized and lacked clarity in collecting and analyzing the information. DASD(DT&E) made several comments to improve the plan, and the program adopted some of the comments including the use of a table or source matrix to organize data. As information was collected, the source matrix proved useful in maintaining assessment status/insight.
- The abbreviated timeline for the TD phase (and the overall program timeline) creates concurrency in the efforts instead of completing them sequentially; AoA findings should identify requirements criticality, analysis should lead to changes, and those changes should then be adopted and incorporated by developers in their TD designs.
- The periodic KP reviews provided valuable insight into program changes. Following the second KP review with the USD(AT&L), DASD(DT&E) provided a memorandum identifying concerns with TD phase prototype testing (an inability to incorporate changing requirements into the TD subsystem prototypes), potential reduction of prototypes in EMD, and lagging NDV assessment data. The program is tracking the first concern as a program risk; the second is to be determined as the program updates its strategy for EMD; and the third was addressed by greater access/insight to NDV information.
- During development of the EMD TEMP, DASD(DT&E) identified two issues with respect to program reliability: a high-risk strategy that requires large-step improvements in reliability, and the exclusion of Government-furnished equipment (GFE) such as radios and weapons from the reliability calculation. Excluding GFE supports assessment of the vehicle developer but not “system” reliability. The program drafted an alternate strategy to reduce reliability risk but has not yet addressed the system reliability calculation issue.
- Initial contractor testing showed good progress in achieving GCV requirements for force protection. DASD(DT&E) is concerned that the developers may not be able to incorporate requirement changes into the design process and Preliminary Design Review (PDR).
- The comparative exercise using the diverse vehicles in similar environments with varied operational crews demonstrated the context of GCV requirements in a readily understood venue and highlighted some findings from the AoA update and requirements trade analysis.
- Consistent with the approved test strategy in the TES, DASD(DT&E) recommends that the Army include sufficient time/test articles in the program schedule and test strategy to support an iterative design process and a rigorous test-fix-test strategy in DT prior to MS C.
- DASD(DT&E) recommends that the Army adopt the lower risk reliability strategy and account for system and vehicle reliability with and without GFE.

## Guided Multiple Launch Rocket System–Alternative Warhead (GMLRS-AW)

**Executive Summary:** The GMLRS-AW is a solid propellant artillery rocket deployed from the M270A1 Multiple Launch Rocket System (MLRS) or the lighter wheeled M142 High Mobility Artillery Rocket System mobile launch vehicle launchers as well as, potentially, the European Fire Control System-equipped MLRS launchers. GMLRS-AW uses an inertial measuring unit with GPS assistance to guide the rocket to a specific point to deliver effects on a target. GMLRS-AW is transported and fired from a launch pod container that holds six rockets. The GMLRS-AW is intended to satisfy the same requirements as the M30 (GMLRS Dual-Purpose Improved Conventional Munitions), while significantly decreasing the probability of unexploded ordnance (UXO). The Alliant Techsystems (ATK) designed GMLRS-AW is a conventionally shaped enhanced 200-pound fragmentation assembly filled with PBXN-110 high explosive. Upon detonation, the explosive accelerates two layers of preformed tungsten fragments that are optimized to defeat required targets.



The mission of the GMLRS-AW is to attack/neutralize/suppress/destroy targets using rocket-delivered indirect precision fires, while decreasing the probability of UXO. GMLRS-AW provides field artillery units with medium- and long-range fires while supporting brigade, division, corps, joint/coalition forces, and Marine air-ground task forces in full, limited, or expeditionary operations.

### Summary of FY 2012 DT&E Activities

- November 2011, OSD approved the initial MS B TEMP (without a selected vendor).
- March 2012, the Army awarded a contract to Lockheed Martin to serve as the GMLRS system integrator, and in May 2012, the Army also awarded ATK the contract to produce the GMLRS-AW rocket.
- November 2012, OSD approved the updated MS B TEMP containing the selected vendor.

### Summary of FY 2012 DT&E Program Engagement and Assessments

- The GMLRS-AW rocket successfully completed the TD phase culminating with the warhead down-select decision in May 2012.
- The program entered the EMD phase in February 2012, and contractor DT is scheduled to begin in the 2nd quarter FY 2013.
- Government DT is well planned and is scheduled to begin in the 4th quarter FY 2013.

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

**Executive Summary:** JLENS provides elevated, persistent, over-the-horizon surveillance and fire control quality data on Army and joint networks to enable protection of U.S., allied, and coalition forces as well as critical geopolitical assets from cruise missiles and aircraft, unmanned aerial vehicles, tactical ballistic missiles, large-caliber rockets, and surface moving targets (SMTs).



The JLENS program experienced a critical Nunn-McCurdy cost breach due to an FY 2012 budget decision to eliminate procurement of all production systems. The USD(AT&L) restructured the program to direct the use of the two existing developmental JLENS systems to complete the scheduled EMD T&E that concludes in 4th quarter FY 2013 but not plan for MS C or production.

### Summary of FY 2012 DT&E Activities

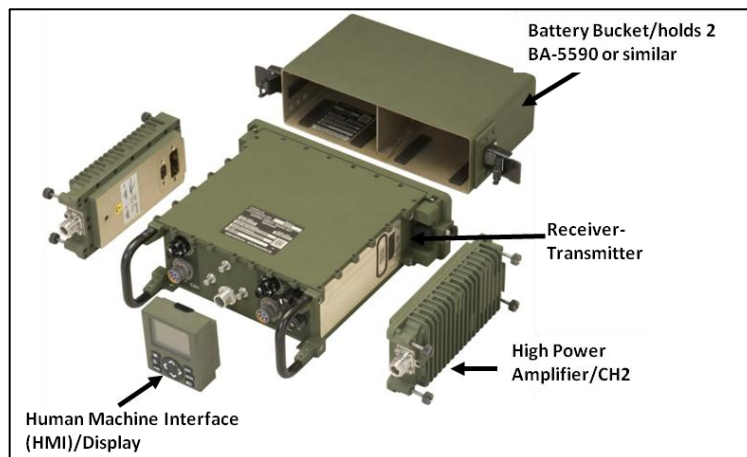
- November 7–December 17, 2011, JLENS conducted DT&E-1 with the fire control radar installed on its aerostat system to independently detect, identify, and track airborne targets.
- April 25, 2012, JLENS conducted an Integrated Fire Control mission with a Patriot Advanced Capability-3 Cost Reduction Initiative missile engagement flight test to demonstrate the tactical digital information link interface against an air-breathing target (ABT).
- August 27–September 27, 2012, JLENS conducted DT&E-2 of the surveillance radar and fire control radars as an orbit to assess the following: performance against ABTs, SMTs, and electronic countermeasures against ABTs; interoperability; tactical voice communication; and combat identification capability.
- September 21, 2012, JLENS conducted a Naval Integrated Fire Control–Counter Air (NIFC-CA) live-fire demonstration to demonstrate end-to-end NIFC-CA system-of-systems capability with JLENS.
- October 29, 2012, ATEC initiated a JLENS EUT to support the Nunn-McCurdy certification ADM-directed 3rd quarter FY 2013 DAB.

### Summary of FY 2012 DT&E Program Engagement and Assessments

- A draft TEMP was developed and coordinated up to but not including OSD approval. This TEMP was used to identify necessary T&E activities as the foundation for the restructured program. The functionality identified in the Nunn-McCurdy ADM involves those capabilities requiring assessment prior to fielding the system.
- The JLENS system exceeded technical requirements for fixed and rotary wing ABTs and provided fire control solutions that were sufficient to support missile engagements; however, fire control radar software and track stability problems exist. These issues are being addressed; fixes have been implemented and will continue to be assessed through the restructured T&E program.
- The reliability of the system continues to be an issue. It has improved but only to 21 hours (from 15 hours) mean time between system aborts (MTBSA). The reliability growth goal was 70 hours MTBSA. DASD(DT&E) recommends that hardware and software reliability be addressed prior to fielding.

## Joint Tactical Radio System (JTRS) Handheld, Manpack, and Small Form Fit (HMS) (AN/PRC-155)

**Executive Summary:** Increment 1, Phase 2 of the JTRS HMS program focuses on development of a two-channel radio called Manpack that will operate with Type 1/Type 2 encryption and integrated GPS/selective availability anti-spoofing module (SAASM). The Manpack radio requires National Security Agency Type 1 encryption certification. The Manpack radio provides the Warfighter with a software-programmable, networkable, multimode radio to implement simultaneous voice, data, and video/imagery communications down to the platoon level. The Manpack radio is also designated as the lead tactical ground terminal for the Mobile User Objective System (MUOS). The Manpack radio is used in both mounted and dismounted configurations and includes a handset, batteries, antennas for each waveform, power adapters, key and configuration loading devices, and a dismounted carrier or vehicle installation kit.



The DAE approved the Manpack radio to enter LRIP via the June 17, 2011, ADM authorizing the procurement of 100 radios for testing and demonstration of technical maturation. The Army delayed a major Government developmental test (GDT) to allow for additional software upgrades, leaving insufficient time for data analysis or fixes to issues prior to the start of multi-Service operational test and evaluation (MOT&E) in May 2012 under the U.S. Army's Network Integration Evaluation (NIE) event designated NIE 12.2. DASD(DT&E) published an AOTR just prior to the start of MOT&E, recommending that the Army consider Manpack participation in NIE 12.2 as an operational assessment (OA) and allow the program to complete additional corrective actions and DT before proceeding into MOT&E at a later date. The radio experienced major issues during MOT&E including poor performance using the single-channel ground and airborne radio system (SINCGARS) waveform and low reliability. The DAE hosted an LRIP II DAB in July 2012 to consider an Army request to procure approximately 3,900 additional LRIP articles. The DAE directed the Army to validate fixes to MOT&E issues at a formal GDT and deferred the LRIP II decision until availability of test results. The Army conducted GDT 3 in September 2012 and demonstrated fixes to most of the MOT&E failure modes as well as significant improvement in performance using the SINCGARS waveform. DASD(DT&E) presented emerging results to the DAE in October 2012, at which point the DAE authorized the Army to procure approximately 3,700 radios as part of the deferred LRIP II decision and directed the PM to conduct a full and open competition for the FRP contract(s), open to non-program-of-record vendors, not later than 4th quarter FY 2013.

### Summary of FY 2012 DT&E Activities

- February–April 2012, ATEC conducted GDT 2 at the Electronic Proving Ground (EPG), Fort Huachuca, Arizona, to demonstrate performance requirements, reliability, availability, maintainability, and resilience to electronic warfare using threshold waveforms (Soldier radio waveform (SRW), SINCGARS, and satellite communications (SATCOM)).



- May 2012, DASD(DT&E) published an AOTR prior to the MOT&E.
- June 2012, ATEC assisted the PMO in conducting GDT 2a as a customer test at White Sands Missile Range (WSMR), New Mexico, to explore fixes to the SINCGARS issues from MOT&E.
- September–October 2012, ATEC conducted GDT 3 at EPG to demonstrate fixes to MOT&E issues in order to support a deferred LRIP II decision.

### **Summary of FY 2012 DT&E Program Engagement and Assessments**

- GDT 2 at EPG, February–April 2012. Manpack demonstrated a significant improvement in technical maturity compared with previous DT but was still unable to meet key requirements. Voice call completion rates for SRW (75 percent on Channel 1 and 47 percent on Channel 2) and SINCGARS (33 percent) fell short of the 90-percent requirement, while SATCOM exceeded the requirement with 95 percent. SRW provided accurate position location information (PLI) with 99 percent of PLI reports within the 20-meter threshold requirement, but the SRW data message completion rate was assessed at 79 percent against the threshold requirement of 90 percent. System reliability continued to lag significantly behind the threshold requirement of 477 hours mean time between essential function failures (MTBEFF) – SRW was 100 hours, SINCGARS was 191 hours, and SATCOM was 171 hours. Manpack partially demonstrated simultaneous operation and route and retransmission of threshold waveforms – SRW-SRW simultaneity, and SRW-SINCGARS and SRW-SRW (data) route and retransmission.
- GDT 2a at EPG, June 2012. Demonstrated fixes to improve the poor SINCGARS range and voice call completion rate experienced during MOT&E.
- GDT 3 at EPG, September–October 2012. Although the test conditions were relatively benign (limited movement, optimal radio line of sight, minimal data traffic), the Manpack demonstrated improvements to technical issues discovered during MOT&E. SINCGARS met or exceeded the voice call completion rate requirement (90 percent) at threshold ranges – 93 percent between stationary mounted nodes at 11 kilometers and 90 percent between stationary dismounted nodes at 5 kilometers. None of the fixed MOT&E failure modes recurred during GDT 3, but the duration of record test was insufficient to fully validate the fixes.
- The Army needs to submit an updated TEMP to OSD that outlines the T&E strategy to reach a successful FRP decision including support for the program’s competition strategy.

### **Assessment of Operational Test Readiness**

- DASD(DT&E) published an AOTR in May 2012. Testing indicated that the Manpack radio promised significant advancement over the current legacy tactical radios; the program greatly improved system technical maturity since the June 2011 MS C DAB and partially met all KPPs.
- DASD(DT&E) assessed the Manpack radio as not sufficiently mature to enter MOT&E for the following reasons:
  - Reliability that remained far below the requirement with significant new failure discovery during GDT 2.
  - Poor performance using the SINCGARS waveform.
  - Inadequate testing of multichannel, simultaneity, and route and retransmission operations.
  - Network management capabilities that were not sufficiently mature to support tactical combat operations.
  - Very little DT to assess platform integration or a new system configuration designed to address recently discovered failure modes.
- DASD(DT&E) recommended that the Army consider Manpack participation in NIE 12.2 as an OA and allow the program to complete additional corrective actions and DT before proceeding into MOT&E at a later date.

## Joint Tactical Radio System (JTRS) Handheld, Manpack, and Small Form Fit (HMS) Rifleman Radio (RR) (AN/PRC-154)

**Executive Summary:** Phase 1 of the RR program focuses on one- and two-channel radio sets that require National Security Agency Type 2 encryption. The RR is designed to provide tactical military commanders with the flexibility to command, control, and communicate with platoons and squads, both mounted and dismounted, via voice, video, and data media. The RR consists of a receiver-transmitter (RT), antenna, battery, headset or handset, and associated cables. The system includes an embedded commercial-grade Global Positioning System (GPS) receiver that provides situational awareness through position location information (PLI) either audibly through the headset upon user request or visually through integration of an external end-user device (EUD), which is a separate system.

The Defense Acquisition Executive (DAE) authorized RR to enter LRIP following a June 2011 MS C decision review. There are two vendors for the RR: General Dynamics and Thales. In early FY 2012, the RR entered an initial operational test (IOT) under the U.S. Army's Network Integration Evaluation (NIE) event. DASD(DT&E) published an AOTR in October 2011. Late changes in phasing of the program's tests caused the remaining RR Government developmental test (GDT) to occur after IOT, which diverged from OSD guidance and the Army-approved TEMP. The program executed GDT 2.3 and GDT 2.3a from February through early May 2012 to address continuing RR reliability, power, and thermal rise issues. The program initially planned for an FRP approval in May 2012 but postponed it to accommodate changes to the acquisition strategy and competition plan. In lieu of an FRP DAB, a second LRIP DAB was held on May 23, 2012, with approval granted for procurement of 13,077 RR units, which brings the total LRIP production to 10 percent of the total planned procurement of 193,279 units. The Army has completed the majority of originally planned DT for Phase I RR and is updating the TEMP to reflect the additional testing required to support the new competitive acquisition strategy for FRP.

### Summary of FY 2012 DT&E Activities

- DASD(DT&E) published an AOTR in October 2011.
- March–April 2012, ATEC tested the production-representative radio in GDT 2.3 at the Electronic Proving Ground (EPG), Fort Huachuca, Arizona, to assess improvements to system reliability, power, and thermal rise issues identified in IOT.
- April 17–21, 2012, ATEC conducted a field experiment (FE) as a customer test for the PMO at EPG to address new failure modes identified in GDT 2.3 for self-initiated radio reboots and high-density transmit/receive failures.
- April–May 2012, ATEC conducted GDT 2.3a at EPG to validate the software fixes that addressed the high-density failure modes identified in GDT 2.3.
- May 2012, the DAE hosted an LRIP II DAB.



- August 2012, ATEC conducted extreme hot weather testing at Yuma Proving Ground (YPG), Arizona.

### **Summary of FY 2012 DT&E Engagement and Assessments**

- DASD(DT&E) published an AOTR in October 2011 prior to the start of IOT and recommended delaying entry into IOT&E until completion of planned DT and resolution of issues. Additional details are in the AOTR section below.
- GDT 2.3 at EPG, March–April 2012. RR reliability was improved over previous DT but still short of the requirement: 0.86 probability of completing a 24-hour tactical mission without an essential function failure (requirement is 0.90). Software fixes to previous issues introduced a new failure mode that caused the RR to frequently self-reboot under certain operating conditions. Digital message completion rate for the RR using SRW averaged 67 percent (below the 85 percent requirement). Voice call completion rate for the RR using SRW averaged 89 percent (just below the 90 percent requirement). The radio successfully supported three voice talk groups within a platoon.
- GDT 2.3a at EPG, April–May 2012. The program demonstrated fixes to the self-reboot fault and low SRW performance identified in GDT 2.3. Digital message completion rate for the RR using SRW increased to an average of 84 percent (just below the 85 percent requirement). Voice call completion rate for the RR using SRW averaged 95 percent (exceeding the 90 percent requirement). RR also successfully demonstrated core required capabilities (voice and PLI) using SRW in a platoon-sized network (40 nodes).
- The DAE hosted an LRIP II DAB for RR in May 2012. DASD(DT&E) recommended support for the LRIP quantities requested by the PM based on the technical maturity and reliability growth demonstrated in GDT 2.3 and GDT 2.3a.
- Results from extreme hot weather testing at YPG in August 2012 are not yet available.
- The Army needs to submit an updated TEMP to OSD to account for additional testing necessary to resolve issues discovered during DT and IOT&E and to support the program's competition strategy.

### **Assessment of Operational Test Readiness**

- An AOTR was conducted in October 2011.
- RR demonstrated its core required capabilities for voice communication and PLI.
- DASD(DT&E) assessed moderate to high risk to enter IOT&E for the following reasons:
  - Late changes in phasing of the program's tests caused 67 percent of RR DT to occur after IOT, which diverged from OSD guidance and the Army-approved TEMP.
  - Limited GDT of LRIP articles showed estimated reliability at 25 percent of the requirement; the PM applied a fix to the highest frequency failure mode, but there was no time for verification testing.
  - Soldiers were unable to effectively initialize the RR network using designated tools due to complex processes and inadequate training.
  - Testing for IA and electronic warfare was incomplete.
- DASD(DT&E) recommended that the Army resolve reliability issues, fully demonstrate planned network management capabilities with Soldiers, and complete planned GDT prior to entering IOT&E.



## M109 Family of Vehicles, Paladin Integrated Management (PIM) Self-Propelled Howitzer (SPH) and Carrier, Ammunition, Tracked (CAT) Vehicle

**Executive Summary:** The PIM program consists of two individual platforms: an SPH and a CAT vehicle. The SPH is an aluminum armored, full-tracked 155-millimeter SPH, capable of carrying a minimum of 39 projectiles and a minimum of 31 modular artillery charge system canisters. The CAT supplies the SPH with ammunition as it provides tactical and operational fires during both offensive and defensive operations. The CAT will be capable of carrying a 12,000-pound (5,454 kilogram) ammunition payload and can be configured for various ammunition needs and specifications. Both the SPH and CAT incorporate a newly designed hull, a modified Bradley fighting vehicle (BFV) power train and suspension system, the future BFV track, a modernized 600-volt electrical system, and a microclimatic conditioning system intended to improve sustainability over the current Paladin/field artillery ammunition support vehicle fleet. The SPH also includes an automated fire control system.



The primary mission area for PIM is force application-engagement. PIM supports combined arms maneuver, wide area security, and other full-spectrum operations as part of the land component of a joint task force. PIM is planned to be employed as part of a fires battalion in the Armored Brigade Combat Team and the fires brigades, but it will be fully capable of supporting any brigade combat team. Targets include the full range of materiel, personnel, and structures.

As an ACAT II program, the Army Acquisition Executive approved entry into EMD in September 2009. As a result of program restructure and cost increases, the USD(AT&L) designated PIM as an ACAT ID program in April 2011. DT&E started in May 2011 at Yuma Proving Ground, Arizona, and Aberdeen Proving Ground, Maryland, in accordance with the draft TEMP and ATEC detailed test plans. During FY 2011, the program completed most of its first phase of a three-phase DT plan. The first phase of DT used four prototype SPH platforms and one prototype CAT platform to conduct the first segment of the SPH reliability growth program, SPH firing performance, automotive performance, and a 1,500-mile (of the planned 2,400 miles) reliability, availability, and maintainability (RAM) demonstration conducted on the prototype CATs.

### Summary of FY 2012 DT&E Activities

- DASD(DT&E) and DOT&E approved the TEMP in March 2012 for EMD testing, and the program generally executed the FY 2012 test program in accordance with the approved TEMP.
- During FY 2012, the program completed phase 1 of DT and entered into phase 2. Phase 2 of DT began with refurbishment and upgrades to the vehicles to incorporate known configuration changes that required long lead times to procure, and fixes to problems identified during phase 1 and earlier contractor testing. Phase 2 used four prototype SPH platforms and one prototype CAT platform to complete the second segment (1,040 rounds, 180 hours, 588 miles) of the SPH reliability growth program, SPH firing performance, and 4,000 miles of automotive operations on

the SPHs. The remaining DT phase 2 testing including a 1,100-mile RAM demonstration conducted on the prototype CATs will be completed in FY 2013.

### **Summary of FY 2012 DT&E Program Engagement and Assessments**

- During FY 2012, the program successfully executed an aggressive test schedule driven by concurrency of the prototype design refinement and DT&E, but there is limited time for applying and verifying corrective actions identified during EMD before LRIP.
- Although OSD approved the TEMP for EMD testing, DASD(DT&E) assessed the program's P&D test strategy as high risk due to an aggressive, highly concurrent program schedule leading to IOT&E in FY 2016 and the FRP decision in FY 2017. DASD(DT&E) highlighted that the production qualification testing (PQT) would not be completed in time to inform the Army's IOT&E readiness decision. As a result, the TEMP was approved with the caveat that the Army develop a revised, lower risk test schedule for the P&D phase. The Army adjusted the LRIP build schedule to ensure that PQT results would be available to inform the IOT&E readiness decision. DASD(DT&E) and DOT&E approved the TEMP revision in October 2012.
- The program completed the second segment of the SPH reliability growth program in September 2012. Consistent with the majority score from the Reliability Scoring Conference (RSC), the PM assessed two system aborts during the second segment resulting in an SPH demonstrated reliability of 90 hours mean time between system abort (MTBSA) versus the 60 hours projected on the RGC. DASD(DT&E) identified four system aborts during the same period resulting in an SPH demonstrated reliability of 45 hours MTBSA consistent with the minority score from the RSC. Despite falling below the predicted value on the RGC (as assessed by DASD(DT&E)), PIM did show a significant decrease in the number of essential function failures (EFFs) during the second segment of the SPH reliability growth program, which is consistent with improved reliability.
- In January 2012, the program terminated the DT phase, one 2,400-mile CAT RAM demonstration, at approximately 1,500 miles due to drivetrain-related failures, the inability to complete the test in the time allotted before the scheduled CAT refurbishment, and known major configuration changes occurring in the refurbishment. The CAT demonstrated a point estimate reliability of 53 hours MTBSA versus the required 103 hours. The program added a 1,100-mile RAM demonstration during phase 2 DT in January 2013 to demonstrate reliability of the new CAT configuration and in accordance with the new Operational Mode Summary/Mission Profile (OMS/MP).
- At the limited user test (LUT) Operational Test Readiness Review (OTRR) 2 in August 2012, DASD(DT&E) recommended that the SPH was not ready to participate in the LUT and that the risk to the SPH successfully completing the test was high. This assessment was driven by the lack of DT data available (caused by a slip in DT phase 2 RAM testing) and a review of the limited emerging RAM test data. The Army scheduled OTRR 2A in October 2012 to allow for completion of DT phase 2 RAM testing. DASD(DT&E) provided an updated assessment and recommended that the SPH was ready to participate in the LUT with moderate to high risk that the SPH would successfully complete the test due to the number of EFFs (41) experienced during DT RAM testing and their potential impact on LUT execution and results. DASD(DT&E) noted that although the program demonstrated progress in the reduction of EFFs and experienced operators were able to work through the EFFs during DT, Soldiers may experience problems with them. In response to this concern, the PM inserted failure recognition/action training into the LUT individual training agenda to mitigate risk.

## MQ-1C Gray Eagle Unmanned Aircraft System (UAS) Increment I

**Executive Summary:** The MQ-1C Gray Eagle UAS consists of unmanned aircraft (UA) equipped with multi-mission payloads, ground control stations (GCSs), and the appropriate communication systems and data terminals. It is intended to provide dedicated mission-configured UAS support to assigned division combat aviation brigade, fires brigade, battlefield surveillance brigade, brigade combat teams, and other Army and joint force units.



The MQ-1C Gray Eagle UAS company executes reconnaissance, surveillance, security, attack, and command and control missions. The UA threshold payload is an electro-optical/infrared sensor with a laser range finder/laser designator. Each UA may be equipped with up to four Hellfire missiles.

The Gray Eagle program entered the P&D phase in February 2010 resulting in LRIP for 26 UA and associated ground support equipment (GSE). Poor reliability led to delays in IOT&E and resulted in a second LRIP decision in March 2011 for an additional 29 UA and associated GSE. Continuing program delays, coupled with an air vehicle crash in March 2011, resulted in another delay to IOT&E from October 2011 to August 2012 and a third LRIP decision in July 2012 for the procurement of an additional 29 UA and associated GSE. In June 2012, DASD(DT&E) completed an AOTR and recommended that the program complete remaining DT prior to entry into IOT&E. In July 2012, DASD(DT&E) completed an update to the initial AOTR that concluded the system was still in development and still not ready for IOT&E. The system began IOT&E in August 2012. The FRP decision is scheduled for 3rd quarter FY 2013.

### Summary of FY 2012 DT&E Activities

- From August to November 2011, the Army conducted Production Prove-out Test (PPT) 2 to collect data to support the system safety confirmation and to demonstrate integrated performance of the UA, GCS, and common sensor payload (CSP). It also demonstrated the ability to engage targets with Hellfire P+ missiles, employ an automatic takeoff and landing system, and meet endurance requirements in two of three required configurations.
- In October 2011, the USD(AT&L) approved the Army's request to delay IOT&E from October 2011 to 4th quarter FY 2012. The Army made this request for two reasons: the March 2011 UA crash led to delays in system testing and Soldier training, and the program needed time to mature system software and grow system reliability.
- From March to June 2012, the Army conducted PPT3 to demonstrate integrated performance of the UA, GCS, and both the CSP and STARLite sensors. PPT3 also included testing of air data relay capabilities for the first time and retested aircraft endurance in the reconnaissance mode.
- In April 2012, OSD approved the Gray Eagle FRP TEMP to support IOT&E and directed the Army to prepare an updated TEMP to support follow-on operational test and evaluation (FOT&E) that includes any changes to the subsystem reliability requirements and an updated strategy for the balanced platoon concept and Warfighter Information Network–Tactical (WIN-T) communications payload integration.
- In June 2012, the Army conducted OTRR #2 to assess system readiness for IOT&E.

### **Summary of FY 2012 DT&E Program Engagement and Assessments**

- In April 2012, DASD(DT&E) noted that system reliability continued to fall short of the predicted growth needed to meet the requirements and recommended that the Army delay the LRIP III DAB until the completion of PPT3.
- To support the LRIP III decision in June 2012, DASD(DT&E) assessed system performance based on PPT2 and emerging data from the first 176 hours of PPT3 flight testing and identified that the system was meeting four of seven KPPs and partially meeting two others but was not on track to meet the sustainment KPP or reliability requirements. Both UA and GCS reliability were well short of the predicted growth needed to meet reliability requirements. Emerging results from PPT3 also showed that the system continued to experience system aborts across all three subsystems with the majority concentrated in the UA and sensor. As a result, the program introduced unplanned software builds and additional testing in the weeks prior to IOT&E.
- At that time, DASD(DT&E) recommended that the Army pursue the following actions:
  - Stabilize the system configuration and implement a focused reliability effort.
  - Review system requirements and the OMS/MP to determine whether the current performance is adequate and affordable and if the full performance is required, limit LRIP III to the minimum quantities needed to maintain the production line, and determine a strategy that achieves the required reliability.
  - Complete PPT3 and resolve critical issues prior to IOT&E.
- Ultimately, the program extended PPT3 by 3 weeks. Further analysis of PPT3 results showed that although the CSP IR sensor performance did not meet the KPP requirement for probability of detection, it demonstrated significant improvement in limited testing compared to PPT2.

### **Assessment of Operational Test Readiness**

- In June 2012, DASD(DT&E) completed an AOTR to support the Army's IOT&E readiness review process and recommended that the system not proceed to IOT&E until an event-based plan provides sufficient DT&E to ensure readiness for IOT&E.
- DASD(DT&E) assessed system performance based on PPT2 and emerging data from the first 176 hours of PPT3 flight testing and identified that the system was meeting four of seven KPPs and partially meeting two others but was not on track to meet the sustainment KPP or reliability requirements. Both UA and GCS reliability were well short of the predicted growth needed to meet reliability requirements.
- Emerging results from PPT3 also showed that the system continued to experience sensor integration anomalies and system aborts. These anomalies resulted in the program introducing unplanned software builds and additional testing (3 weeks) prior to IOT&E. The program introduced software build 4.2.0 Rev G in mid-May that showed promise in resolving sensor integration issues, but the system continued to experience system aborts.
- DASD(DT&E) recommended that the Army complete PPT3 and extend DT&E as needed to verify the corrective actions needed to ensure readiness for IOT&E. Given that PPT3 was not yet complete, DASD(DT&E) offered to provide an updated AOTR at the end of DT, prior to IOT&E.
- In July 2012, DASD(DT&E) completed an update to the June AOTR that considered the remaining DT and the changes to the OMS/MP that the Army was considering.
- During the remainder of PPT3, the program accumulated an additional 176 flight hours on software build 4.2.0 Rev G. Emerging test results showed that although the system demonstrated improved sensor performance during the remainder of PPT3, the system continued to demonstrate poor reliability and was not yet ready for IOT&E.

- The CSP showed improvement in reliability during testing with Rev G, but the UA and the GCS did not. The CSP reliability point estimate improved to 176 hours mean time between system abort (MTBSA) versus the required 500 hours. The UA demonstrated a reliability point estimate of 20 hours MTBSA versus the required 100 hours. The GCS demonstrated a reliability point estimate of 32 hours MTBSA versus the required 150 hours. This poor reliability was expected to adversely impact mission capabilities. In late July, the Army released a revised OMS/MP that reduced the number of flight hours required for a company to satisfy the wartime Operational Tempo (OPTEMPO) and adjusted the scoring methodology for the system. The old methodology measured the operational availability (Ao) of three individual mission strings, with the lowest value representing system Ao. The new OMS/MP takes the aggregate of the three mission strings to determine system Ao. DASD(DT&E) expected that these changes would improve the likelihood the system would meet the Ao requirement despite the reliability shortfalls. In August, the Army deferred the subsystem reliability requirements pending IOT&E results and an analysis to determine what reliability is required to support the Ao requirement.
- The AOTR highlighted several shortfalls in technical performance demonstrated during DT and DASD(DT&E) concluded that despite some improvement, poor system reliability would result in the system being found not suitable and that the system would require post-test corrective actions to improve reliability.
- Ultimately, the system entered IOT&E with the same configuration. Technical performance and reliability during IOT&E were consistent with that demonstrated during DT and evaluated in the AOTR. The operational assessment found that these performance shortfalls did not significantly affect operational effectiveness or suitability as assessed during IOT&E.

## Phased Array Tracking Radar to Intercept of Target (PATRIOT)

**Executive Summary:** The PATRIOT program consists of software and hardware upgrades to respond to the evolving threat, component obsolescence, and deficiencies identified in the field. Software upgrades are being accomplished incrementally in a series of post-deployment builds (PDBs). The PATRIOT system consists of C-band phased-array radars for target detection, tracking, classifying, identifying, and discrimination; battalion and battery battle management elements; information coordination central and engagement control station; communications relay groups; antenna mast groups; and a mix of missiles. Missile variants identified in this report are the Patriot Advanced Capability (PAC)-3 Baseline, PAC-3 Cost Reduction Initiative (CRI), Guidance Enhanced Missile (GEM), GEM-C, GEM-T, and Missile Segment Enhancement (MSE) variants.



The MSE missile variant is a hardware subprogram to enhance the PAC-3 missile capability in the PATRIOT program and had been selected for use in the tri-national Medium Extended Air Defense System (MEADS) program. The PATRIOT program completed all DT&E of the latest PDB (PDB-7) software. Nine MEADS flight tests using the MSE variant had been planned, but the MEADS program has curtailed that T&E effort. Two flight tests are scheduled with PDB-7 software to support the MSE low-rate production decision, and appropriate re-planning is being accomplished to assess the MSE with PDB-8 software to support the MSE FRP decision.

### Summary of FY 2012 DT&E Activities

- July 25–November 9, 2011, PATRIOT conducted PDB-7 software DT&E to ensure system performance, demonstrate backward compatibility, and demonstrate no degradation to the current fielded system.
- November 1, 2011, PATRIOT conducted a PDB-7 Missile Flight Test (MFT), a PAC-3 CRI missile and PAC-3 Baseline missile ripple-fire engagement against a tactical ballistic missile (TBM) target.
- November 4, 2011, PATRIOT conducted a PDB-7 MFT, a GEM-T ripple-fire engagement against a TBM target.
- November 9, 2011, PATRIOT conducted a PDB-7 MFT, two GEM-T (1st interceptor) and GEM-C (2nd interceptor) ripple-fire engagements against two short-range ballistic missile targets.
- March 1, 2012, PATRIOT conducted a PDB-7 MFT, with a GEM-T engagement (shoot-look-shoot) against a low-altitude, low radar cross section ABT in clutter, and with GEM-C engagement (shoot-look-shoot) against a low-altitude ABT.
- March 6–9, 2012, PATRIOT conducted PDB-7 72-hour endurance testing to demonstrate continuous operations.
- April 25, 2012, PATRIOT conducted an Integrated Fire Control Mission with a PAC-3 CRI missile engagement and the Joint Land Attack Cruise Missile Defense Elevated Netted Sensor



System (JLENS) flight test to demonstrate PDB-7 software tactical digital information link interface against an ABT.

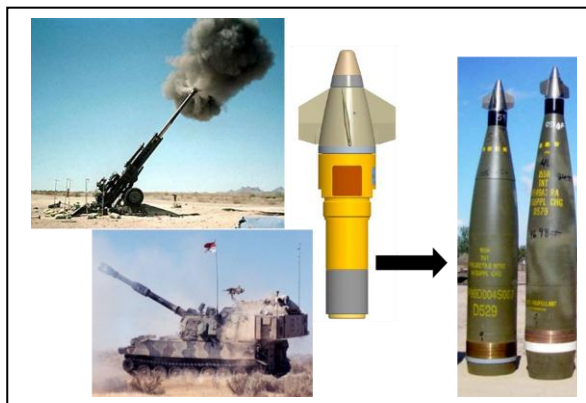
- August 29, 2012, ATEC conducted a PDB-7 flight test campaign with near-simultaneous engagements of two TBMs, followed by an engagement of a cruise missile (CM) surrogate in the presence of debris from the first two intercepts. A GEM-T (1st interceptor) and PAC-3 CRI (2nd interceptor) mixed ripple-fire was conducted against the first TBM, a PAC-3 CRI ripple-fire against the second TBM, and a GEM-T engagement (shoot-look-shoot) against the CM surrogate target in the presence of debris from the first two intercepts.
- October 23, 2012, PATRIOT conducted, as a portion of a larger missile defense flight test, a tactical ripple-fire engagement of two PAC-3 CRI missiles against a TBM followed by another PAC-3 CRI missile engaging an air-breathing threat target flying a threat-representative profile in the presence of debris from upper-tier intercepts.

### **Summary of FY 2012 DT&E Program Engagement and Assessments**

- A TEMP covering PDB-7 is approved. Due to the changes in the MEADS program, the Army will identify, prior to the MSE LRIP decision, the required PDB-8 and MSE T&E to support an FRP decision, update the TEMP, and receive OSD approval. DASD(DT&E) and other PATRIOT T&E stakeholders held a flight test matrix review to identify the required missiles, targets, and infrastructure resources for the PDB-8 and MSE T&E program.
- Integration of the PDB-8 and Army Integrated Air and Missile Defense (AIAMD) hardware and software is required to achieve the benefits of integrated air and missile defense. Both PDB-8 and AIAMD T&E programs require many of the same assets. The risk of concurrent T&E and integration is formally identified within the AIAMD Program Office but is managed within the PEO Missiles and Space. DASD(DT&E) recommends continued tracking by the PEO, Lower Tier Project Office, and AIAMD organizations.
- System instability during PDB-7 DT&E resulted in increased operator workload. Additional Soldier training and time are required to keep the system operational. Training and operational workload were identified as issues during PDB-6.5 T&E. DASD(DT&E) recommends continued monitoring to ensure that tactics, techniques, and procedures, and operator training and workload do not affect system performance evaluation.

## Precision Guidance Kit (PGK) XM-1156

**Executive Summary:** PGK is a GPS guidance kit with fuzing functions for M795 and M549A1 artillery rounds (155 millimeter), employed from M777A2 lightweight artillery and the M109A6 Paladin self-propelled howitzer (SPH). It is programmed with GPS, fuze mode, and reference data using the currently fielded Enhanced Portable Inductive Artillery Fuze Setter; attached using a simple, unique hand tool; and then loaded and fired using normal artillery firing procedures. PGK includes GPS capability and fixed canards that allow it to correct the projectile trajectory to a programmed target with improved accuracy. Program requirements include 50 meter accuracy, point detonation, and proximity fuze functions, and safety features that preclude detonation if the round determines a miss distance outside acceptable limits. Future increments will add GPS anti-jam capabilities. The Army Acquisition Executive delegated Milestone Decision Authority to the Program Executive Office, Ammunition. PGK is an ACAT II program on oversight for DT&E and OT&E.



In 2009–2010, PGK testing demonstrated the potential for high accuracy but poor reliability. In January 2011, the Army directed changes to the PGK program to improve reliability and provide a new acquisition baseline and TEMP. In May 2011, the Army directed a strategy that included fielding an early capability in FY 2013 if the program could achieve 83 percent reliability (with 80 percent confidence) by August 2011. The strategy also directed the program to pursue its overall requirements of 92 percent reliability and 50 meter accuracy for initial operational capability in FY 2014.

### Summary of FY 2012 DT&E Activities

- May–August 2011, PGK completed a number of developmental tests, including cover vibration and water leaks tests, detonation properties verification, electrostatic discharge, and powered vibration.
- August 2011, PGK completed a 48-shot series of tests that demonstrated 84 percent reliability (at 80 percent confidence).
- May–July 2012, PGK completed test shots and ground tests to verify additional fixes and producibility changes, all intended to improve reliability.
- July 2012, PGK successfully completed the Sequential Environmental Test–Safety (SET-S) test series to verify safety functions and features. The shots were fired after extreme temperature conditioning and vibration aging of fuzes.
- August 2012, PGK successfully completed a series of environmental conditioning tests to continue correction verification and prepare fuzes for completion of the Sequential Environmental Test–Performance (SET-P) test series planned for October and December 2012.
- October 2012, PGK successfully completed the initial SET-P test series, including an Early User Assessment to support an early capability fielding decision planned for February 2013. The Army approved PGK for early fielding in March 2013.
- December 2012, PGK successfully conducted GPS selective availability anti-spoofing module (SAASM) laboratory testing and identified key deficiencies in fuze programming data transfer.



### **Summary of FY 2012 DT&E Program Engagement and Assessments**

- As part of the 2011 program re-baseline, the program developed a reliability growth strategy that relied on potentially high-risk assumptions for fix effectiveness and management strategy.
- The August 2011 testing verified that the program greatly improved reliability and accuracy from 2010. The results exceeded the required growth strategy at that point and met Army-directed reliability criteria (83 percent with 80 percent confidence) to pursue the early fielding capability.
- The May–July 2012 tests attempted to verify multiple corrections with a minimum number of shots. This success-oriented test series helped the developer verify some but not all corrections, but provided little information about overall program reliability due to varied configurations.
- The July 2012 SET-S tests series met the safety function and reliability requirements for the program; however, it also identified new failure modes with performance and safety implications.
- The SET-P test series confirmed that under certain conditions (elevation angle and charge size), PGK performs well with better accuracy than required. The testing repeated some uncorrected failure modes from previous testing and identified new failure modes. Analysis of test data shows there are errors within the firing solution data used by current users, which reduces PGK accuracy. The Army is investigating corrections to the firing data.
- Development of full capability, concurrent with early capability production will result in the Army fielding multiple configurations as the system is updated to correct deficiencies. Multiple production configurations can lead to uncertainty in the performance of the fielded capability.
- The program conducted SAASM laboratory testing as recommended by DASD(DT&E) to characterize GPS performance and SAASM functionality in a developmental environment. The testing confirmed SAASM functions not available in the open air test range environment and the program identified data transfer deficiencies. The program is pursuing solutions that should avoid costly corrections later in production.
- The program has continued testing for more than 2 years without an approved TEMP. The program completed several TEMP iterations to account for the early fielding effort and programmatic changes, but the Army never submitted an updated TEMP to OSD, and EMD testing was conducted without an approved TEMP. The Army submitted the MS C TEMP to OSD for approval in January 2013, but it was returned to the Army to update the P&D developmental test plan. This strategy resulted in a TEMP that documents only completed EMD testing rather than planned testing and reflects an inability to complete adequate planning prior to testing.
- PGK performance to date indicates improved reliability (about 85 percent) with some remaining issues requiring attention in order to grow reliability to the program requirement of 92 percent. Based on the growth strategy assumptions, the program may have difficulty reaching 92 percent with the available resources (schedule/funding).
- The demonstrated accuracy (with reliability fixes and updated firing solution data) will likely exceed the program requirement of 50 meters. DASD(DT&E) recommends that the Army review previous PGK accuracy and reliability analysis and reconsider the reliability requirement given the demonstrated greater accuracy. The higher accuracy combined with current reliability could provide the same or better capability to prosecute targets than the original program requirements (92 percent reliability, 50 meter accuracy) intended.
- DASD(DT&E) remains concerned that concurrent development and early capability production has the potential for introducing multiple production configurations, leading to variations in system performance. DASD(DT&E) is also concerned with the Army's inability to complete an EMD TEMP in advance of testing and recommends that the Army submit the MS C TEMP in advance of DT&E during the P&D phase.

## Stryker Family of Vehicles – Double V-Hull (DVH)

**Executive Summary:** The Stryker DVH program is intended to provide improved survivability against improvised explosive devices (IEDs) and blast threats, beyond the protection provided by current Stryker vehicles with Operation ENDURING FREEDOM (OEF) armor kits. The DVH configuration consists of a redesigned lower hull, energy attenuating seats, and an up-armored driver's station. Upgraded suspension, driveline, and steering systems are incorporated because of the additional weight associated with the redesigned hull.

The Stryker DVH infantry carrier vehicle (ICVV) is the base configuration for seven additional configurations: the antitank guided missile vehicle (ATVV), commander's vehicle (CVV), engineer squad vehicle (ESVV), fire support vehicle (FSVV), mortar carrier (MCVV), medical evacuation vehicle (MEVV), and ICVV with installed scout kit (ICVV-S). At present, the Army does not plan to field Stryker DVH versions of the nuclear, biological, and chemical reconnaissance vehicle (NBCRV); the reconnaissance scout vehicle (RV); or the mobile gun system (MGS) in the OEF theater of operations.



The DVH-equipped Stryker brigade combat team (SBCT) has the same mission profile as a non-DVH-equipped SBCT. Beginning with the ICVV configuration, the Army began deploying Stryker DVH vehicles for OEF in the 3rd quarter FY 2011.

The DVH DT program was specifically tailored to support the OEF operational needs statement and not scoped or intended to support a worldwide fielding of Stryker DVH. DVH DT began in the 3rd quarter FY 2010 and concluded in the 3rd quarter FY 2012. DT included RAM, manpower and personnel integration (MANPRINT), automotive performance, and tactical mobility. M&S supplements automotive performance and tactical mobility testing. The evaluation of DVH includes a comparison to Stryker baseline or "flat-bottom" configurations as currently operated in OEF.

### Summary of FY 2012 DT&E Activities

- The program completed the third phase of a three-phased test program designed to support the multiple decision points in the DVH acquisition strategy. Phase 1 (3rd quarter FY 2010 to 2nd quarter FY 2011) supported DVH production decisions in the 3rd quarter FY 2011. Phase 2 (2nd quarter FY 2010 to 3rd quarter FY 2011) supported the fielding decision in the 3rd quarter FY 2011 for the high-density ICVV and the ESVV. Phase 3 (4th quarter FY 2010 to 1st quarter FY 2013) supports the fielding decisions for the low-density Stryker DVH configurations (CVV, MCVV, MEVV, ICVV-S, FSVV) in FY 2012 and the ATVV in FY 2013.
- In FY 2012, DASD(DT&E) focused on assisting the program office and ATEC in developing adequate test strategies to support DVH production decisions for each of the six remaining low-density Stryker DVH configurations to be fielded to OEF in FY 2012.

### **Summary of FY 2012 DT&E Program Engagement and Assessments**

- The program effectively executed a medium-risk test strategy driven by concurrency in production and testing to support the urgent operational need. The program mitigated schedule risk by increasing the number of test vehicles and intensive management/coordination of testing at Yuma Proving Ground, Arizona; Aberdeen Proving Ground, Maryland; the Electronic Proving Ground, Fort Huachuca, Arizona; and White Sands Missile Range, New Mexico.
- Test results support the Army fielding decisions for the low-density Stryker DVH configurations (CVV, MCVV, MEVV, ICSV-S, FSVV) in FY 2012 and the ATVV in FY 2013. DASD(DT&E) assessed that these DVH configurations afford greater force protection against IEDs in Afghanistan than the Stryker OEF-kitted baseline configurations they are replacing. The DVH modifications provide significantly improved protection to the driver and crew over OEF baseline (fully kitted and combat-ready) Stryker vehicles currently deployed to Afghanistan. It is important to note that in previous testing, the Stryker baseline vehicles were assessed as partially meeting their overall force protection and survivability requirements. Because the U.S. Army Training and Doctrine Command (TRADOC) Capabilities Manager considers these force protection and survivability deficits as low-risk vulnerabilities, they were not addressed within DVH. Consequently, the Stryker DVH testing was scoped to support the urgent materiel release and did not fully readdress these partially met requirements.
- Test data and modeling for the DVH configurations confirmed that the additional weight of the DVH modification causes a minor trafficability and mobility degradation compared with the OEF baseline (fully kitted and combat-ready) Stryker.
- The energy absorbing (EA) seats have demonstrably improved survivability against underbody blast events. In response to suitability issues with the EA driver's seat, the Army designed a new driver's EA seat, driver's station enhancements, phase 2 kit (DSE2). The Army completed testing in July 2012 and the seat is suitable and survivable. The Army introduced the DSE2 upgrade as an engineering change to the fleet beginning in FY 2012 with the second SBCT production build of 292 DVH vehicles. The Army plans to retrofit the first DVH SBCT set with DSE2 during reset pending availability of funding.

## Warfighter Information Network–Tactical Increment 2 (WIN-T Inc 2)

**Executive Summary:** WIN-T is the primary backbone communications system linking divisions, brigades, battalions, and companies. It provides voice, data, and video to the tactical edge of the battlefield. Inc 2 provides initial on-the-move capabilities and network planning, monitoring, and control tools. It utilizes a combination of satellite (military and commercial) and line-of-sight transmission systems using the highband networking waveform (HNW) for line of sight and the network-centric waveform (NCW) for satellite. WIN-T Inc 2 consists of multiple vehicle configuration items including the Tactical Communications Node (TCN) (pictured), the Network Operations and Security Center (NOSC), Point of Presence (PoP), and the Soldier Network Extension (SNE), among others.



WIN-T Inc 2 is an ACAT ID program in LRIP. It completed Production Qualification Testing–Government (PQT-G) at Aberdeen Proving Ground, Maryland, and White Sands Missile Range, New Mexico, in FY 2011 and an IOT&E as part of the Army’s NIE based at White Sands Missile Range in May 2012. The DOT&E beyond low-rate initial production report found the majority of the system to be effective with the exception of the SNE, HNW, and Tactical Relay–Tower (TR-T); not operationally suitable due to significant reliability and maintainability shortfalls; and not survivable due to significant IA vulnerabilities. As a result, the DAE limited additional procurement to Lot 3 and deferred the FRP decision until the program demonstrates improved performance and reliability in FOT&E.

### Summary of FY 2012 DT&E Activities

- No significant DT&E occurred in FY 2012.
- May 2012, ATEC conducted an IOT&E at White Sands Missile Range.

### Summary of FY 2012 DT&E Program Engagement and Assessments

- March 2012, DASD(DT&E) provided an AOTR to the DAE, Army Service Acquisition Executive (SAE), and ATEC and recommended entry into IOT&E based on moderate risk.
- September 2012, DASD(DT&E) supported approval of Lot 3 procurement at the DAB with the following recommendations:
  - Validate fixes to known issues in a representative developmental environment prior to future operational testing.
  - Leverage lab-based test bed activities to mature HNW and continuously identify and fix software bugs.
  - Improve technical integration of SNE and mission command applications.
  - Close IA vulnerabilities identified in IOT&E.
- DASD(DT&E) is working with the PMO, ATEC, and DOT&E to develop, document, and approve an updated T&E strategy that proves out fixes to issues and supports an FRP decision.

### Assessment of Operational Test Readiness

- DASD(DT&E) prepared an AOTR in March 2012 for the IOT&E based on test data from PQT-G and earlier testing conducted during EMD.

- The system met KPPs for throughput, speed of service, and network management; IA vulnerability scans identified no major unresolved issues, but penetration testing was not planned until IOT&E. DASD(DT&E) assessed moderate risk for demonstrating effectiveness and suitability at IOT&E due to the following concerns:
  - The system had limited effectiveness when trying to transmit through foliage or other blockage. This limitation was expected due to the frequency band of these transmissions but could prove problematic under more stressful conditions in operational environments.
  - The system demonstrated poor reliability across all configuration items during PQT-G. However, the PM executed a corrective action period following PQT-G and demonstrated improved but not fully achieved reliability during regression testing at the contractor facility.
- DASD(DT&E) assessed moderate overall risk and recommended entry into IOT&E.

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## 6.2 Navy Programs

This section includes summaries of the following 16 programs:

- Air Intercept Missile-9X (AIM-9X) Block II
- Consolidated Afloat Networks and Enterprise Services (CANES)
- E-2D Advanced Hawkeye (AHE)
- GERALD R. FORD Class Nuclear Aircraft Carrier (CVN 78)
- Global Combat Support System–Marine Corps (GCSS-MC)
- Joint High Speed Vessel (JHSV-1)
- Littoral Combat Ship (LCS) Mission Modules (MMs)
- Littoral Combat Ship (LCS) Seaframes (SFs)
- Mobile User Objective System (MUOS)
- Multi-Mission Maritime Aircraft (P-8A Poseidon)
- Naval Integrated Fire Control–Counter Air (NIFC-CA) Using Aegis Modernization, Cooperative Engagement Capability (CEC), and Standard Missile-6 (SM-6) Programs
- OHIO Replacement
- Ship-to-Shore Connector (SSC)
- Vertical Takeoff and Landing Tactical Unmanned Aerial Vehicle (VTUAV) MQ-8B Fire Scout
- VIRGINIA Class Submarine (SSN 774)
- ZUMWALT Class Destroyer (DDG 1000)

## Air Intercept Missile-9X (AIM-9X) Block II

**Executive Summary:** The AIM-9X is the latest generation short-range, air-to-air, heat-seeking missile employed by the U.S. Navy (USN), the U.S. Air Force (USAF), and U.S. allies (through foreign military sales). The AIM-9X Block II program developed from a preplanned product improvement initiative designed to address AIM-9X Block I obsolescence.



Testing began with the AIM-9X-2 configured missile, with redesigned electronics, a new battery, a new ignition safety device, a radio frequency (RF) data link, and the DSU-41 fuze. Capability was further expanded to the Block II with advanced software (OFS 9.3X). The Block II missile hardware has roughly 85 percent commonality with that of the AIM-9X Block I and is a separate program.

### Summary of FY 2012 DT&E Activities

- Six of the 11 developmental and integrated live-fire flight tests and 1,290 of 3,711 total captive-carry flight hours were completed in FY 2012 using the Block II hardware with developmental software.
- The final software load (OFS 9.311) was demonstrated in the last four DT/integrated testing events (March 2012).
- DASD(DT&E) released its AOTR report in April 2012. Operational testing is ongoing with USN F/A-18 and USAF F-15 and F-16 aircraft.

### Summary of FY 2012 DT&E Program Engagement and Assessments

- DASD(DT&E) was actively engaged in Test Planning Working Group sessions to help the program resolve technical issues and efficiently execute the final four DT flight tests.
- DASD(DT&E) advocated the Navy to delay the OTRR to provide sufficient time for the program to review the final series of flight test results. The subsequent 2-week delay allowed for additional analysis to confidently support entry into IOT&E. This delay did not significantly affect program execution.

### Assessment of Operational Test Readiness

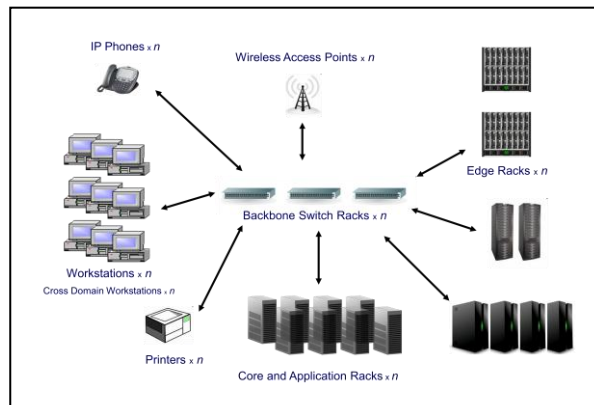
- The DASD(DT&E) AOTR report of April 2012 recommended proceeding to IOT&E.
- AIM-9X Block II met all applicable KPPs, though DASD(DT&E) noted a high risk of the system not achieving the reliability threshold by the end of IOT&E.
- The Helmetless High Off-Boresight (HHOBS) function key system attribute (KSA) was not met in DT/integrated testing. Software upgrades to address HHOBS performance will not be available until after IOT&E.



## Consolidated Afloat Networks and Enterprise Services (CANES)

**Executive Summary:** CANES is a complete scalable core afloat network infrastructure (inclusive of hardware, software, processing, storage, and end-user devices) that will provide all basic network services (e-mail, Web, chat, collaboration) to a wide variety of Navy surface combatants and submarines. It will replace the Integrated Shipboard Network System, Sensitive Compartmented Information (SCI), Combined Enterprise Regional Information Exchange System–Maritime, Submarine Local Area Network, and Video Information Exchange

System network systems with a single system that will support the Unclassified, Coalition, Secret, and SCI enclaves. CANES is a commercial off-the-shelf (COTS) systems integration effort that utilizes state-of-the-industry networking hardware and core services software.



The program recently completed an operational assessment of the unit-level configuration in the laboratory and is awaiting the test report. That report as well as the results of the integrated test in July 2012 will be the primary sources of data to inform a MS C decision currently scheduled for December 2012. The MS C TEMP update is still in progress and will present a schedule challenge to complete the document and staff it for signatures prior to the milestone decision. The limited scope of the testing completed so far and the aggressive installation schedule, which is driven by ship availability, contribute to a moderate level of risk for successful completion of the program's acquisition and test strategies.

### Summary of FY 2012 DT&E Activities

- November 2011–February 2012, the competing contractors completed contractor systems integration testing (CSIT) to demonstrate the basic functionality of the CANES network in their facilities.
- April–July 2012, the program office conducted integration testing of the CANES hardware as it transitioned from the contractor facilities to the Government laboratory. That transition delayed the start of the first Government test, which was scheduled to begin in April 2012.
- July 10–24, 2012, the program office completed the first integrated test (IT-B1) in the Enterprise Engineering and Certification Laboratory, Space and Naval Warfare Systems Center Pacific, San Diego, California.
- July 31, 2012, the program office conducted a demonstration of the Afloat Core Services software that will integrate with the CANES software and hardware to enable faster and easier integration of applications on the CANES infrastructure.

### Summary of FY 2012 DT&E Program Engagement and Assessments

- DASD(DT&E) evaluated the results from the CSIT effort and used the results to guide the scope and focus of IT-B1 planning and execution including coverage of a variety of requirements that CSIT was unable to verify.
- DASD(DT&E) reviewed the test results from IT-B1 to ensure that the PMO followed the test plan and that the results support entry into OT-B1:

- CANES demonstrated that it could support basic operations and the system managers could monitor, manage, and report on the network's health and stability.
- Test limitations prevented a full assessment of application integration, wireless capabilities, system management, reliability, availability, and security prior to OT-B1.
- DASD(DT&E) supported program entry into OT-B1 to enable the Commander, Operational Test and Evaluation Force to conduct an operational assessment for MS C in December 2012.

## E-2D Advanced Hawkeye (AHE)

**Executive Summary:** The E-2D AHE is an all-weather, carrier-based airborne early warning, command and control aircraft that provides enhanced surveillance and tracking capability against advanced threat aircraft and cruise missile systems in all environments. The APY-9 radar provides a generational leap in detection and tracking capability over the E-2C and includes glass cockpit and digital computer architectures. The E-2D AHE is a critical enabler for Strike Group air warfare and battle management missions, theater air and missile defense (TAMD), integrated fire control, and cooperative engagement.



The E-2D AHE program used an integrated T&E approach to complete its test program in January 2012. DASD(DT&E) released its AOTR report that same month with a recommendation to proceed to IOT&E. The program has since completed its operational test, and the DT and IOT&E results supported an FRP decision in January 2013.

### Summary of FY 2012 DT&E Activities

- The E-2D AHE completed DT during FY 2012. The DT period started in March 2007 and completed in January 2012.
- The program performed DT on its Cooperative Engagement Capability (CEC) segment in conjunction with E-2D AHE testing this year, completing its DT in June 2012. As a result, the CEC follow-on operational test and evaluation (FOT&E) followed the overall E-2D AHE IOT&E, starting in October 2012.

### Summary of FY 2012 DT&E Program Engagement and Assessments

- DT results showed that the E-2D AHE can execute the same mission as E-2C with improved performance. E-2D AHE detection ranges of tactical and small air targets significantly exceeded legacy radar performance for over-water, littoral, and over-land presentations.
- E-2D AHE met all KPPs but had limitations in the net-ready KPP due to CEC. The weapons system did not meet required probability of detection in an electronic attack environment (not a KPP).
- DT&E has assessed E-2D AHE as ready to proceed to FRP. The test program successfully revealed system deficiencies but produced no results that preclude producing aircraft.

### Assessment of Operational Test Readiness

- DASD(DT&E) released its AOTR report in January 2012, recommending that the E-2D AHE enter IOT&E. DASD(DT&E) noted risks in radar performance and CEC integration, as well as radar issues in high clutter and under electronic attack.
- At the completion of DT, DASD(DT&E) assessed the E-2D material reliability at 2.3 weapon system mean flight hours between failure, nearly three times the KSA threshold of 0.8 hours. The radar itself demonstrated a 71-hour mean time between failure (MTBF) rate versus a requirement of 81 hours. This reliability rate projection is an indicator of future potential based

on implementing a number of corrective actions, which have been coordinated with this office. These findings were the basis for assessing the overall E-2D reliability as sufficient to support mission accomplishment. As of September 2012, the projected radar reliability rate improved to nearly 83 hours.

- DASD(DT&E) assessed the ability to accomplish the TAMM mission as degraded due to radar performance limitations, CEC integration issues, and system resets. DASD(DT&E) noted that although the E-2D AHE largely met KPPs, the KPPs did not adequately capture threshold performance and suitability requirements for the TAMM mission.

## GERALD R. FORD Class Nuclear Aircraft Carrier (CVN 78)

**Executive Summary:** CVN 78 is being built at Huntington Ingalls Industries in Newport News, Virginia, with approximately 85 percent of the ship's structure erected in dry dock. Launch of CVN 78 is planned for summer 2013 with delivery and commissioning scheduled for September and October 2015, respectively.



Previous annual reports have emphasized the risks associated with the lack of a dedicated platform-level DT&E period and the reliance on individual Participating Acquisition Resource Manager (PARM) testing, as well as late-stage shipbuilding industrial tests and trials to discover and correct system and integration deficiencies. To mitigate those risks and assist PMS 378 in developing a proper test strategy, DASD(DT&E) has created a CVN 78 DT oversight plan that focuses on PARM testing of mission critical systems. An overview of those systems and related testing is contained in this report. At DASD(DT&E)'s recommendation, PMS 378 has included a period of integrated developmental testing in FY 2017. DASD(DT&E) has also expressed concerns regarding PMS 378's plan to remove the Multifunction Radar (MFR) array from Wallops Island, Virginia, in mid-2014 for use elsewhere. No replacement MFR array has been identified for Wallops Island, which could potentially impact continued combat system testing and verification of corrected problems found during testing. Development of the CVN 78 TEMP 1610, Revision C is in progress to support the FY 2013 IPR/CVN 79 Acquisition Decision DAB.

### Summary of FY 2012 DT&E Activities

- October 2011–September 2012, Electromagnetic Aircraft Launching System (EMALS) dead-load testing and associated component and software testing.
- October 2011–January 2012, EMALS Aircraft Compatibility Testing (ACT) Phase I completed.
- October 2011–September 2012, Advanced Arresting Gear (AAG) dead-load testing and associated component and software testing.
- September 2012, Air Traffic Control (ATC) with Dual-Band Radar (DBR): Initial interface tests between the Ship Self-Defense System (SSDS) and the air traffic control system (AN/TPX-42).
- Radio Communications Systems (RCS Turnkey): RCS Turnkey land-based test site activation began at the command, control, communications, computers, intelligence, surveillance, and reconnaissance (C4ISR) Test Integration Facility (TIF) in Charleston, South Carolina.

### Summary of FY 2012 DT&E Program Engagement and Assessments

- EMALS: System Functional Demonstration dead-load testing successfully demonstrated a capability across the full performance envelope of energy and end speed and confirmed the technical capability to achieve launch speeds for current and planned aircraft.
- EMALS ACT Phase I: Testing demonstrated the basic physical and electromagnetic compatibility with existing carrier-based aircraft for the heart of the energy-speed envelope. Lakehurst performed 135 launches using F/A-18E, T-45C, C-2A, E-2D, and one F-35C aircraft. Environmental suitability and high-cycle subsystems testing is ongoing. A more extensive set of ACTs across the entire energy-speed envelope (ACT Phase II) will begin in 2013.

- AAG: Dead-load tests were suspended in April 2012 due to structural failure of the Water Twister (WT) device, a major AAG subsystem. Testing resumed in August 2012 after the WT was redesigned. The testing program has nearly completed the commissioning dead-load tests and is preparing for a follow-up series of performance dead-load tests.
- ATC with DBR: Verification of the interface function was completed, but no track data were passed.
- RCS Turnkey: Testing is progressing as planned with no major issues discovered.

### **CVN 78 PARM Programs Contained in the DASD(DT&E) Oversight Plan**

#### **Sortie Generation Rate (SGR)**

- EMALS: Although EMALS has demonstrated the ability to safely launch required aircraft within all required energy-speed envelopes, demonstrated system reliability is currently low. A reliability growth plan is in place and has been briefed to DASD(DT&E), but it relies on optimistic assumptions that have not yet been validated. The next 6 months should provide much higher visibility into the level of potential reliability growth, with subsequent reassessment and exploration of additional risk-mitigation approaches if needed.
- AAG: The program is regaining time lost during the test suspension and should be able to complete performance dead-load tests in the next several months and begin testing with aircraft at the Runway Arrested Landing Site in 2013.
- Advanced Weapons Elevator: Testing of lead unit begins in early FY 2013.
- ATC with DBR integrated with AN/TPX-42: Track data testing is scheduled for mid-FY 2013 using a radar simulator system, in preparation for integration with DBR.
- CVN 78 Virtual Carrier (VCVN): DASD(DT&E) supports PMS 378's use of VCVN as an M&S program and an affordable alternative to live aircraft missions in assessing the CVN 78 SGR KPP. VCVN will be validated, verified, and accredited using live carrier test data.

#### **Combat Systems**

- SSDS: SSDS is the CVN 78 combat systems program. Site activation for land-based testing began in FY 2012 at Wallops Island, Virginia.
- DBR: The DBR consists of a Volume Search Radar (VSR) and MFR. Integration testing of the DBR with SSDS will occur at Wallops Island, Virginia, in FY 2013.
- DASD(DT&E) is closely monitoring planning for the CVN 78 program at Wallops Island, Virginia, and the impact on MFR testing for DDG 1000. Current plans call for removal of the MFR array at Wallops Island in FY 2014 in order to install it in the Self-Defense Test Ship (SDTS) for the DDG 1000 ITB1-120 Anti-Ship Cruise Missile self-defense test. The current plan allows minimal time for integration and testing of the MFR with the combat system, with concern there will not be sufficient time to verify corrections to deficiencies found using a live MFR at Wallops Island.
- As mentioned in the DDG 1000 assessment, DASD(DT&E) requested that PEO IWS provide the minimum data that must be collected at Wallops Island before removal of the MFR equipment.

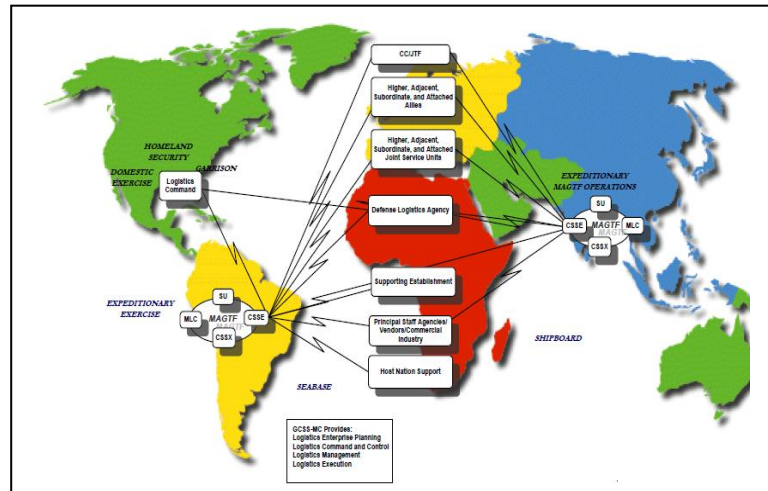
#### **C4ISR**

- Information Assurance (IA): DASD(DT&E) has participated in IA working groups for combat systems and C4ISR and will assist with PMS 378 compliance of future cyber test requirements.
- Consolidated Afloat Network and Enterprise Services (CANES): DASD(DT&E) will monitor system performance on two aircraft carriers prior to installation on CVN 78.
- RCS Turnkey: CVN 78 RCS TIF testing is planned to complete by 3rd quarter FY 2013.



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

**Executive Summary:** GCSS-MC provides request, order, capacity (maintenance, inventory), production (maintenance, inventory), and fulfillment execution functionality to Marine Corps units, in addition to financial fulfillment execution and enterprise system administration. The program is delivering capabilities in two major releases. Release 1.1 is the baseline enterprise capability that includes GCSS-MC enterprise NIPRNET, Enhanced Mobile Field Service (MFS), and a training capability called GCSS-MC Mobile Training Suites. Release 1.2 provides deployed functional capability to expeditionary Marine air-ground task forces (MAGTFs), Marine expeditionary forces (MEFs), and Marine expeditionary units (MEUs), as well as the data synchronization capabilities required for the multi-instance architecture at the MEFs and MEUs to sync back to the enterprise via NIPRNET access. It also provides additional interfaces to legacy applications.



In October 2011, the DAE authorized the Navy to field Release 1.1 to up to 36,000 users based on a favorable Marine Corps Operational Test and Evaluation Activity (MCOTEA) assessment of post-IOC fielding tests with III MEF in June 2011. The program has fielded Release 1.1 to more than 90 percent of the intended 32,000 users and expects to complete fielding in December 2012. The program reported a significant schedule change in December 2011 due to technical challenges associated with Release 1.2 task organization and data synchronization. GCSS-MC development and testing activities in FY 2012 focused on verifying fixes to issues from previous testing and merging the Release 1.1 and Release 1.2 software baselines to support deployed unit capabilities. Based on multiple technical issues associated with task organization and data synchronization discovered during Release 1.2 DT, the PMO is restructuring the release strategy to support deployed capabilities, which requires detailed coordination with the test community to ensure appropriate updates to the T&E strategy.

### Summary of FY 2012 DT&E Activities

- September 2011–November 2011: The program completed technical field integration tests with the 31st MEU.
- November 2011–April 2012: System developers requested tactical pause for multiple changes to the system's production code baseline and the COTS backend.
- June 4–July 14, 2012: The program conducted integrated DT at the PMO facility in Dumfries, Virginia, and the Marine Corps Tactical System Support Activity in Camp Pendleton, California, as a part of Government Acceptance Test (GAT) and Verification of Correction of Deficiencies (VCD).
- July 2012–August 2012: The program conducted Enterprise Task Organization demonstration tests and system validation at PMO facilities in Dumfries, Virginia.

### **Summary of FY 2012 DT&E Program Engagement and Assessments**

- GAT and VCD Test Readiness Review, June 2012: DASD(DT&E) informally recommended additional IDT focused on data synchronization to Enterprise and Unit Task Organization prior to entering VCD; the program implemented this action and also conducted additional testing of the MFS deployable system support component.
- MCOTEA Interim Assessment Report, August 2012: MCOTEA identified the following issues based on Release 1.2 DT:
  - Inconsistent execution against approved test plans; unable to evaluate many requirements.
  - RAM significantly short of requirements.
  - Unable to meet MAGTF Task Organization and Deployed Disaster Recovery requirements.
  - Multiple high-priority IA vulnerabilities.
- DASD(DT&E) rated the GCSS-MC program as a moderate risk for an August 2012 DAES review:
  - Release 1.1 is largely deployed and providing required enterprise capabilities.
  - FY 2012 DT indicates Release 1.2 deployed capabilities are not yet mature and require additional development and testing.
- DASD(DT&E) recommends that the PMO finalize Acquisition Strategy (AS) adjustments, update the T&E strategy to align with the program changes, and submit an updated TEMP to OSD for approval.



## Joint High Speed Vessel (JHSV-1)

**Executive Summary:** JHSV is a high-speed vessel used for intratheater transport of troops and vehicles. There are 10 vessels planned for construction by Austal USA and all will be operated by Military Sealift Command.



In FY 2012, the lead vessel, JHSV-1 successfully completed Builders Trials and Acceptance Trials (ATs) with DASD(DT&E) personnel present for ATs. In late FY 2012, the JHSV-1 Program Office received permission to reclassify the program from ACAT I to ACAT II as well as authorization for the tenth and final vessel. JHSV-1 is nearing the end of the EMD phase with delivery to the Navy scheduled for December 2012. Post-Delivery Test and Trials are scheduled from January 2013 through April 2013. DASD(DT&E) anticipates completion of a DT&E assessment in April 2013.

### Summary of FY 2012 DT&E Activities

- March 2012, Builder's Dock Trials conducted by Austal USA under PEO Ships oversight.
- April 10–19, 2012, Builder's At-Sea Trials conducted by Austal USA under PEO Ships oversight.
- August 13–17, 2012, ATs conducted by the Navy Board of Inspection and Survey.

### Summary of FY 2012 DT&E Program Engagement and Assessments

- Builder's Dock and At-Sea Trials were completed in April 2012. At DASD(DT&E) request, PEO Ships extended the procurement timeline accordingly to allow for proper correction of deficiencies identified during Builder's Trials; thus, all required DT events were preserved for FY 2013. Builder's Trials successfully identified and corrected deficiencies that led to successful ATs and delivery on major ship systems. The trials included satisfactory demonstrations of the traditional "big events" for ships, including full power, steering, quick reversals, and anchoring.
- ATs were successfully completed over a 5-day period, including 2 days of at-sea demonstrations. All major inspection categories received high scores with no critical items noted for future vessel production. The Navy Board of Inspection and Survey has recommended JHSV-1 acceptance. DASD(DT&E) was satisfied with the results of ATs and supports the Navy taking delivery of JHSV-1.

## Littoral Combat Ship (LCS) Mission Modules (MMs)

**Executive Summary:** Three mission packages (MPs) are currently under development for use on LCS platforms. They include the mine countermeasures (MCM), surface warfare (SUW), and antisubmarine warfare (ASW) MPs. All modules are being developed in incremental stages with the MCM and SUW packages currently in Increment 1. MCM and SUW modules have undergone various testing throughout FY 2012. The ASW MP is early in its development, and component-level testing is ongoing.



The MCM MM (Increment 1) currently consists of the organic airborne mine countermeasures (OAMCM) module and remote minehunting system (RMS) module. The OAMCM is composed of the airborne laser mine detection system (ALMDS), airborne mine neutralization system (AMNS), and the MH-60S helicopter. The RMS is composed of the remote multi-mission vehicle (RMMV) and the AN/AQS-20A variable depth sonar (VDS). Additional capabilities coming in later increments include the coastal mine reconnaissance module (an unmanned aerial vehicle with the coastal battlefield reconnaissance and analysis system), the sustained influence sweep module (an unmanned surface vessel towing an influence mine sweep module), and the unmanned undersea module for buried mine detection.

The SUW MM (Increment 1) currently consists of the following major elements: an aviation module that provides an armed helicopter with Hellfire missiles and multimode radar and infrared detection among other capabilities, two 30-millimeter gun mission modules, and a maritime security module for visit, board, search, and seizure operations. In FY 2013, the SUW MP will be the first package deployed on the USS FREEDOM (LCS-1) maiden deployment. As of early FY 2013, testing to support LCS-1's deployment was ongoing. Additional capabilities such as the surface-to-surface missile module and updates to the aviation and gun mission modules are future developmental system objectives.

Initial ASW MP integration and DT are planned for FY 2014. This MP is still being defined and engineered.

### Summary of FY 2012 DT&E Activities

- RMMV completed the first increment, Version 4.1, of planned reliability growth plan (RGP) testing.
- MCM DT-B2: First-ever integrated testing of RMS, ALMDS, and AMNS on USS INDEPENDENCE (LCS-2) over two phases from January through July.
- SUW DT-B1 Phase I: First formal DT of 30-millimeter guns and exercises with the MH-60R armed helicopter, as well as launch of an 11-meter rigid-hull inflatable boat in a simulated maritime security operation on LCS-1.

### **Summary of FY 2012 DT&E Program Engagement and Assessments**

- RMMV: Overall reliability of the RMS showed marked reliability improvements during the first increment of testing the RMMV Version 4.1. DASD(DT&E) will closely follow the reliability improvements planned during the second increment of verification testing, Version 4.2, in FY 2013. Reliability testing of RMMV Version 4.2 is scheduled to occur in February–May 2013.
- MCM DT-B2: The LCS-2 platform was used for this MCM MP integrated test. Test results revealed significant issues with MP materiel readiness, system development, training, tactics, concurrent airborne and surface operations, concept of employment gaps, and overall integration shortfalls. DASD(DT&E) provided independent at-sea observations to the program office. The Navy has incorporated DASD(DT&E) observations with its results and has developed plans to correct the issues.
- At DASD(DT&E)'s recommendation, the Navy has added a 6-week MCM MP DT period in FY 2013 on LCS-2. This testing period is required to validate fixes, evaluate new tactics, train crews, and continue to evaluate the MCM MP as it continues to evolve. DASD(DT&E) has also recommended that reliability improvements be made to the VDS component of the RMMV. The Navy has committed to more reliability testing, improved its quality assurance (QA) processes, and replaced poor-performing manufacturing subcontractors of the AN/AQS-20A system.
- SUW DT-B1 Phase 1: LCS-1 was the test platform used for DT-B1. The 30-millimeter guns had numerous casualties, both from within the gun mission module as well as from integration with the seaframe control systems that impacted aiming and firing from LCS-1. When the guns were operating and on target, they performed well and effectively destroyed targets. DT-B1 Phase 2 of the SUW MP is planned for summer 2013 and will use the LCS-3 platform, which is expected to have corrected many of the seaframe system issues identified in the lead ships.

## Littoral Combat Ship (LCS) Seaframes (SFs)

**Executive Summary:** The LCS SFs program has two high-speed hull configurations: the USS FREEDOM (LCS-1), a steel mono-hull with an aluminum superstructure, and the USS INDEPENDENCE (LCS-2), an all-aluminum tri-hull. Combined diesel and gas turbine water jets propel each ship. LCS-1 has completed its post-delivery tests and trials and is preparing to deploy to Singapore in March 2013. LCS-2 is executing its post-delivery tests and trials as planned. Both SFs are dealing with first-of-class issues that are being resolved during shipyard availability periods.



LCS SFs will operate in the littorals as a system of systems of both manned and unmanned mission reconfigurable packages focusing on these anti-access mission areas: mine countermeasures (MCM), antisubmarine warfare (ASW), and surface warfare (SUW). The SUW mission package (MP) includes maritime security operations for LCS prosecution of small boats and capability for visit, board, search, and seizure operations (as appropriate) of shipping. LCS also is being considered for support to special operations forces.

### Summary of FY 2012 DT&E Activities

- LCS-2 DT-B2: September–October 2011, January–March 2012, LCS-2 conducted various phases of MCM DT-B2. DT-B2 provided much discovery in terms of SF materiel readiness, hardware and software system immaturity, training, tactics, concurrent airborne and surface operations, concept of employment gaps, and integration. The Navy has initiated efforts to correct all deficiencies identified. DASD(DT&E) representatives were at sea during this test phase.
- LCS-1 DT-B1: May–June 2012, LCS-1 conducted SUW DT-B1 testing, employing SF systems, such as the 57-millimeter gun, testing simulated maritime security operations.
- LCS-2 DT-B2: July 2012, the Navy continued with DT-B2 using Phase III to collect data on LCS-2's wake field to evaluate changes to the SF twin-boom extensible crane and to evaluate a revised capture spine assembly for handling the remote multi-mission vehicle (RMMV) during launch and recovery.
- LCS-1 PSA: July–October 2012, LCS-1 had a post-delivery shipyard availability (PSA) that began in early July to correct problems encountered during DT-B1 and to prepare for 2nd quarter FY 2013 deployment.
- LCS-2 PSA: September 2012, LCS-2 began its first PSA, which lasts until March 2013 when LCS-2 continues SF DT that will lead up to a 4th quarter FY 2013 MCM DT period. LCS-2 has a Technical Evaluation (TECHEVAL) in FY 2014.

### Summary of FY 2012 DT&E Program Engagement and Assessments

- DASD(DT&E) recommended and the Navy added an SF-MP DT event prior to TECHEVAL and OT. MCM DT-B2 demonstrated limited capability and MP immaturity. Further DT is needed to verify fixes, evaluate newly developed tactics, train crews, and seek possible new discovery items. The Navy concurred and added DT-B2 Phase IV in FY 2013 and another DT phase in

FY 2014 before TECHEVAL. Integrated SF and MP operations are linked to successful test operations for both programs.

- DASD(DT&E) had limited opportunity for SUW DT-B1 observations. Items observed and reported on LCS-1 included a ship service diesel generator and other power and propulsion failures, plus 57-millimeter gun misfire problems. The shipyard availability offered an opportunity to correct these issues. DT-B1 Phase II offers a more promising opportunity to evaluate this configuration using LCS-3 in 3rd quarter FY 2013; LCS-3 is not expected to present lead ship issues observed with LCS-1.

## Mobile User Objective System (MUOS)

**Executive Summary:** MUOS provides worldwide ultrahigh frequency (UHF) beyond line-of-sight tactical SATCOM services to joint, allied, and coalition forces via mobile terminals. MUOS adapts the basic architecture of a commercial third-generation (3G) wideband code division multiple access (WCDMA) cellular phone system to military UHF SATCOM by using geosynchronous satellites in place of cell towers. The constellation of four operational geosynchronous satellites and an on-orbit spare will provide MUOS users with priority-based access to voice, data, and video services.



The MUOS capability will provide communications support for a wide range of DoD and Government operations, especially those operations involving highly mobile users. The system's planned accessibility to operating forces will establish it as the primary means for providing minimum levels of mobile command and control communications in ad hoc crisis situations. It will be available to meet the challenges associated with missions such as the initial stages of a theater nuclear war, major conventional war, regional conflicts, search and rescue, humanitarian or disaster relief (including severe weather events), homeland security, homeland defense, counter narco-terrorism, noncombatant evacuation operations, global reach-back service, very important person (VIP) travel, strategic reconnaissance, training, logistics support, and exercise support.

The MUOS program progressively continues its phased T&E approach toward demonstrating its objective capability. In 2012, the first MUOS satellite was successfully launched, completed on-orbit testing, and is now in operational orbit. A second satellite completed component-level testing and is scheduled to be shipped to Cape Canaveral, Florida, later this year. The program also conducted its first Government system technical evaluation (TECHEVAL-1) that was followed by its first multi-Service operational test and evaluation (MOT&E-1) to demonstrate legacy UHF communications with the on-orbit MUOS satellite.

### Summary of FY 2012 DT&E Activities

- February 24, 2012, the first MUOS satellite was successfully launched from Cape Canaveral, Florida.
- March 10–May 24, 2012, Lockheed Martin Space Systems Company completed contractor on-orbit test (OOT) with the first MUOS satellite to ensure the payload system was not degraded during launch.
- May 24–June 11, 2012, Lockheed conducted contractor on-orbit system validation (OSV-1) on the first satellite to demonstrate day-in-the-life usability and functionality. OSV-1 focused on satellite control and legacy communications to complete user validation of the deployed system, prior to contractor handover to the Government.
- July 2–August 1, 2012, U.S. Navy Communications Satellite Program Office (PMW 146) conducted TECHEVAL-1 to evaluate performance of available MUOS functionalities and certify readiness to proceed to MOT&E-1.

- August 15–29, 2012, Commander, Operational Test and Evaluation Force (COMOPTEVFOR) conducted MOT&E-1 to assess operational effectiveness and suitability of the UHF legacy payload on the MUOS satellite and to assess its capability to support UHF communications and evaluate the ground satellite control segment’s capability to command and control the satellite.

**Summary of FY 2012 DT&E Program Engagement and Assessments**

- DASD(DT&E) nonconcurred in the proposed Change 1 to the MUOS Acquisition Program Baseline (APB) because of its high-risk satellite on-orbit capability schedule. A revised Change 1 to the APB introduced a lower risk schedule.
- June 14, 2012, DASD(DT&E) participated in OOT exit review and concurred with no actions and no deferrals or waivers.
- OSV-1 demonstrated the first over-the-air legacy UHF communications and the first over-the-air WCDMA voice and data communications using an orbiting MUOS satellite.
- OSV-1 successfully demonstrated the ability for the primary Naval Satellite Operations Center (NAVSOC) in Point Mugu, California, to command and control the MUOS satellite over required frequencies. A planned failover of satellite control to NAVSOC Detachment-Delta in Colorado Springs, Colorado, also demonstrated ability for the backup satellite control facility to command and control MUOS over required frequencies.
- Geolocation test cases, executed for risk reduction only, demonstrated the MUOS capability to acquire, characterize, and locate test emitters within a predicted circular error probability using the UHF follow-on and MUOS satellites. The risk-reduction event validated the geolocation’s effectiveness and accuracy. However, there were suitability deficiencies revealed with the operational system that will be corrected and retested as part of the second OSV (OSV-2).
- The findings from TECHEVAL-1 indicated that MUOS supports legacy voice and data communications, satellite control, and satellite control maintainability. Five different legacy UHF SATCOM radio types located at shore sites and on U.S. Navy and U.S. Coast Guard afloat ships were able to successfully transmit and receive voice and data.
- August 8, 2012, DASD(DT&E) concurred in Navy PEO Space certification to proceed with MOT&E-1. Additionally, DASD(DT&E) concurred in approval of the program request to defer evaluation of system capacity, robustness, and operational link availability during MOT&E-1. Each of the deferred requirements was to be evaluated via M&S using the MUOS performance model. Evaluation of these measures was planned but not required for MOT&E-1. This M&S tool will be used to evaluate these measures during MOT&E-2.



## Multi-Mission Maritime Aircraft (P-8A Poseidon)

**Executive Summary:** The P-8A is a derivative of existing Boeing aircraft with design changes to support the Navy's maritime patrol mission. The P-8A is designed to have sufficient cabin volume, load-carrying capacity, attendant electrical power, and environmental control to accommodate six tactical aircrew and five workstations. The test program has been structured to address the balance necessary between a modified commercial aircraft variant and military mission systems.



The P-8A completed its Phase 1 DT&E in August 2012 in preparation for IOT&E. DASD(DT&E) completed an AOTR and recommended proceeding to IOT&E with moderate risk.

### Summary of FY 2012 DT&E Activities

- February to August 2012, the P-8A participated in six major operational exercises as part of integrated testing.
- August 2012, the P-8A completed Phase 1 DT&E, evaluating the ASW, unarmed anti-SUW, and ISR missions.

### Summary of FY 2012 DT&E Program Engagement and Assessment

- The electronic support measures (ESM), radar subsystems, and IOT&E software performance immaturity did not support entry to IOT&E in June 2012 as planned. Based on DASD(DT&E) recommendations, the Navy delayed the start of IOT&E for 3 months.

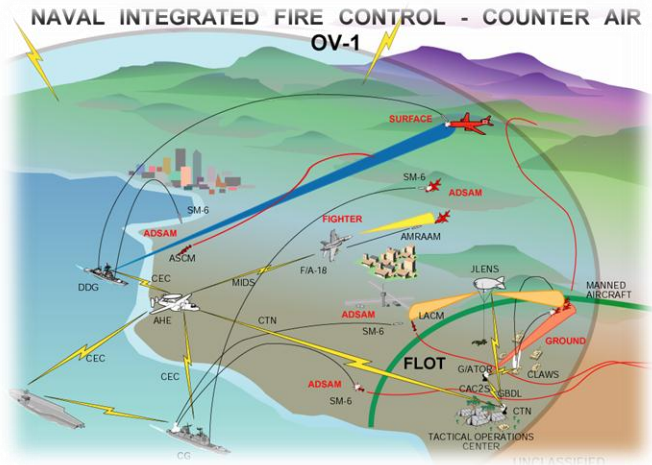
### Assessment of Operational Test Readiness

- The DASD(DT&E) signed an AOTR memorandum on August 24, 2012, assessing that the P-8A met or is on track to meet its KPPs and KSA, and recommended proceeding to IOT&E with moderate risk. The report cited the following:
  - ASW system performance was adequate during the six fleet exercises.
  - The ISR mission holds the highest risk due to high-resolution radar mode, common data link, and satellite communications performance.
  - ESM performance and video quality over the command data link negatively impact ISR performance. Overall, P-8A ISR capability remains comparable to a standard P-3C.
  - Although there are issues with fuel heating in some hot weather environments, inadequate weapons bay heating capacity, and incomplete takeoff performance data, the DASD(DT&E) does not believe these issues will affect the IOT&E results. The program has fixes planned and funded for these issues, some of which the program plans to remediate during IOT&E.



## Naval Integrated Fire Control–Counter Air (NIFC-CA) Using Aegis Modernization, Cooperative Engagement Capability (CEC), and Standard Missile-6 (SM-6) Programs

**Executive Summary:** The Navy is developing, testing, and planning to field a “From-the Sea” (FTS) based integrated fire control capability (NIFC-CA) that draws upon the combined capabilities from three surface Navy pillar program MDAPs (DDG-51 with its Aegis Advanced Capability Build (ACB), CEC, and SM-6) and one non-surface pillar program, E-2D Advanced Hawkeye (AHE). The current testing plan for the full system-of-systems (SoS) testing is incorporated under a NIFC-CA enterprise, which is controlled by PEO Integrated Warfare Systems (IWS) 7.0 and not the individual pillar programs. The SoS testing is currently not in the pillar program TEMPs and has not been evaluated or approved by OSD via any TEMP. DASD(DT&E) believes that this SoS testing is the key demonstration of the synergistic capabilities of each pillar system as part of the Navy’s Air Defense (AD) capability and requires OSD oversight and approval. DASD(DT&E) has requested the Navy to provide a TEMP for all NIFC-CA testing and is awaiting the Navy’s response.



### NIFC-CA

The NIFC-CA program was placed on the DOT&E and DASD(DT&E) Oversight List because it plays a unique role in integrating the pillar acquisition programs into an operational concept. The focus of the NIFC-CA test program needs to ensure that the Aegis Modernization ACB, CEC, E-2D, and SM-6 developmental and operational test programs are adequately integrated, coordinated, and resourced for testing this important capability.

### Aegis Modernization

The Aegis Modernization program consists of successive ACB upgrades to the Aegis Weapon System MK 7 (AWS), which is the automated segment of the Aegis Combat System (ACS). The ACB 12, now called Baseline 9 (B/L 9), upgrade provides Aegis CGs and DDGs with a comprehensive anti-air warfare (AAW) and ballistic missile defense (BMD) mission modernization of their combat system between 2013 and 2015. The B/L 9 T&E Strategy utilizes five test phases; Phase 1 consists of land-based tests (LBTs) to verify design requirements, Phase



2 consists of hardware/software tests where the system goes through installation and checkout onboard the ship, Phases 3 and 4 consist of tests on production hardware where system readiness for OT is verified, and Phase 5 is OT. B/L 9 is currently still in Phase 1.



#### Standard Missile-6

SM-6 combines the tested legacy of the SM-2 propulsion and ordnance with a repackaged advanced medium-range air-to-air Missile (AMRAAM) active seeker, allowing for enhanced performance at extended ranges. The SM-6 Block I missile will be able to increase the battlespace to the horizon using its autonomous active seeker mode either with Aegis in a stand-alone configuration or beyond the horizon with a CEC configuration. When the firing ship is employed with an integrated fire control architecture (e.g., NIFC-CA), SM-6 Block I will provide extended range AAW defense to the full extent of the missile's kinematic limit both above and below the radar horizon. The program conducted IOT&E in 2011 and as a result, a series of supplemental tests described below was scheduled to demonstrate corrections to the deficiencies discovered.

#### Cooperative Engagement Capability

CEC provides a sensor network that supports integrated fire control and improved situational awareness and results in a distributed AD weapon system among cooperating units such as Aegis CGs and DDGs, CVNs, LHAs, LHDs, LPDs, and E-2C and E-2D aircraft. CEC provides the means to share sensor and weapons data among individual ships in a closely coordinated and cooperative manner to counter increasingly capable and less detectable cruise missiles. CEC has multiple configurations including shipboard and airborne configurations. The shipboard version (AN/USG-2B) is currently being upgraded with the Aegis Modernization effort with testing on B/L 9 currently ongoing. The airborne version (AN/USG-3B) is currently being upgraded and tested as part of the E-2D AHE upgrade effort.



#### **Summary of FY 2012 DT&E Activities**

##### NIFC-CA

- NIFC-CA conducted SoS Tracking Exercises at Surface Combat Systems Center (SCSC), Wallops Island, Virginia, to demonstrate the integration of E-2D, CEC, and Aegis B/L 9 against various threat-representative targets in an operationally realistic environment with tactically representative systems.
- NIFC-CA conducted a WSMR Live-Fire Demonstration in September 2012 with JLENS as the above horizon targeting system to collect additional data to validate the NIFC-CA federated model.

##### Aegis Modernization

- Aegis Modernization conducted the Phase 1 series of tests in 2012 to provide an early evaluation of the system and to identify risk to mission areas and possible deficiencies prior to OT.

- The DT-B2B DT-Assist War-at-Sea Exercise (WASEX) was performed in January with the AD Cruiser baseline configuration at SCSC to evaluate system performance against the requirements in the Naval Capabilities Document (NCD).
- The DT-B2C DT-Assist WASEX for the IAMD Destroyer baseline configuration, originally scheduled for 2012, has been moved to 2013.

#### Standard Missile-6

- DASD(DT&E), DASD(SE), and DOT&E engaged the program to establish a series of supplemental tests to verify corrections to observed deficiencies in DT and OT testing. This supplemental testing included a Quartz Lamp test, a wind tunnel test, and three flight tests to verify the fix to the F&J antenna production design to prevent significant ablation and debris from the assembly gap filler material. Additionally, there was the requirement to complete the OT-2 test, which was not completed during DT/OT.
- SM-6 conducted a series of Quartz Lamp tests on three F&J assemblies to verify the robustness of the upgraded bonding material and process applied to the F&J antenna assemblies.
- SM-6 performed F&J Wind Tunnel Testing on five assemblies at the NASA High Temperature Tunnel facility in Langley, Virginia, in August to test the F&J antenna design in a high heat tactically representative environment.
- SM-6, JLENS, and NIFC-CA performed a JLENS Demonstration in September to exercise engagement capabilities unique to the NIFC-CA SoS. This test was performed at WSMR with an Aegis B/L 9 variant in a clear environment and satisfied one of the flight tests required to verify the F&J antenna fix.
- SM-6 conducted a series of two tests at WSMR in November as part of the F&J fix verification and to satisfy the completion of the OT-2 mission.

#### Cooperative Engagement Capability

- CEC conducted DT-IIID during ground and flight tests at SCSC and Naval Air Warfare Center (NAWC), Patuxent River, Maryland, to assess the integration and interoperability between CEC and the E-2D as well as across all versions of CEC and to certify CEC readiness for OT-IIIF.
- CEC conducted three test events during DT-IIIE to assess the integration and interoperability between CEC and Aegis B/L 9 as well as across all versions of CEC and to certify CEC readiness for OT-IIIG.

#### **Summary of FY 2012 DT&E Engagement and Assessments**

##### NIFC-CA

- The Navy successfully conducted the NIFC-CA/JLENS Demonstration at WSMR using JLENS targeting data to support a non-organic Aegis B/L 9 engagement of an SM-6 versus a subsonic target.
- **TEMP.** DASD(DT&E) sent a memorandum in August to the Navy requesting a detailed briefing of planned NIFC-CA testing through FY 2013 and to provide a NIFC-CA FTS TEMP that includes details regarding test scope/objectives, limitations, and resourcing required for all testing beginning with the FY 2014 at-sea testing and including all follow-on NIFC-CA FTS land-based, at-sea, and M&S testing efforts.

##### Aegis Modernization

- DASD(DT&E) observed the January DT-B2B WASEX DT-Assist for the AD Cruiser configuration, which was executed with the purpose of characterizing system performance

against requirements written in the NCD. This test used an early B/L 9 version that was pre-production representative. DASD(DT&E) observed some issues with interoperability, connectivity, and test flow, but they did not significantly impact the ability to characterize system performance once the full system configuration was initialized. Early testing provided insight into what issues need to be fixed in later baselines as the system approaches maturity.

- The DT-B2C DT-Assist WASEX was originally scheduled at the end of summer for the IAMD Destroyer configuration but was pushed until early 2013 because of time constraints and site stability issues.
- The results of the LBT DT tests performed are essential toward the verification of system requirements and system readiness for OT; however, they are not required for any decision milestone. The first At-Sea DT Event is currently scheduled for March 2013.
- TEMP. The Aegis Program TEMP 1669 is currently undergoing revisions to capture all the testing required for B/L 9. In addition, the Aegis Modernization test program is one of the programs selected for the pilot program of the STAT in T&E COE. The results of this effort will be that the DT Evaluation Framework for all future ACB testing will have increased scientific rigor during the planning and conduct of tests through the use of STAT. Future iterations of Aegis Modernization will also include the integration of the ACS with the Air and Missile Defense Radar (AMDR) and the requirement to verify that the future integrated Combat System will operate from the SoS perspective. Currently, the scope of SoS verification is not contained within each of the program's testing plans and DASD(DT&E) is ensuring that this essential testing is being captured through the addition of Integration and Test events and M&S integration into the TEMPs of both programs.

#### Standard Missile-6

- During the SM-6 Quartz Heat Lamp testing, the three production F&J antenna assemblies showed no de-bonding, and gap filler performance was assessed as being successful.
- During wind tunnel testing, the five F&J antenna assemblies successfully demonstrated no significant ablative debris during the high heat tactically representative environment.
- During the NIFC-CA JLENS Demonstration flight, no apparent ablation or debris was observed by the F&J antenna assembly.
- During the November series of two flight tests to demonstrate verification of the fix to the F&J antenna assembly and to complete the OT-2 mission, the SM-6 appears to have successfully completed one mission with no apparent ablation or debris observed from the F&J antenna assembly. The second mission flight (completion of OT-2) was unsuccessful due to the SM-6 missile becoming unstable and subsequently being destructed by range flight safety. A failure review board has been initiated and is expected to release its findings in early 2013.
- TEMP. The SM-6 TEMP is undergoing revisions to reflect additional SM-6 FOT&E. At the direction of DASD(DT&E), this TEMP update will also include test plans for the incorporation of SM-6's new capabilities using Aegis B/L 9 and NIFC-CA.

#### Cooperative Engagement Capability

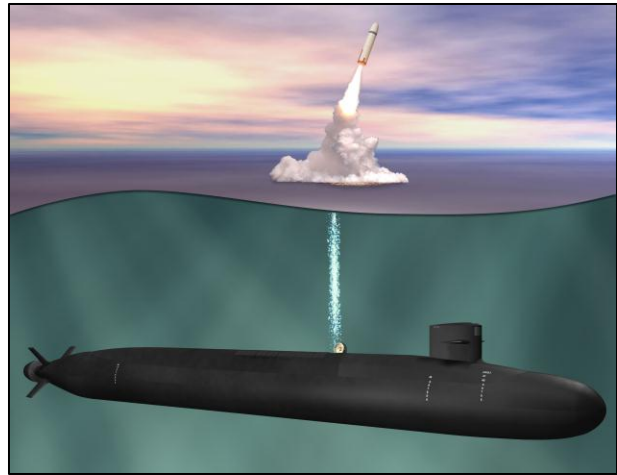
- During DT-IIIID, CEC demonstrated two test objectives and partially demonstrated four test objectives with one test objective not planned for execution during DT-IIIID. The overall demonstrated performance was comparable to the previous CEC airborne configuration. DDS Performance and Composite Tracking objectives were not fully demonstrated due to known deficiencies and gridlock discrepancies between CEC and the E-2D. The Composite Identification and Interoperability objective was not fully demonstrated and the issue is under

investigation. Finally, the Reliability, Maintainability, and Availability objective was only partially achieved and corrective action is ongoing.

- The CEC DT-IIIIE phase of testing is ongoing and results will not be available until completion in 2013.
- TEMP. The CEC TEMP was signed in May 2012 but will require updating to reflect the DASD(DT&E) directed inclusion of NIFC-CA specific testing and additional CEC FOT&E.

## OHIO Replacement

**Executive Summary:** The OHIO Replacement program, the follow-on submarine class to the current fleet of Trident II ballistic missile submarines, received MS A approval at a December 2010 DAB and is executing the TD phase in accordance with the January 2011 MS A ADM. The Navy signed the Service Capability Development Document (CDD) on August 2, 2012. The OHIO Replacement Service CDD is being used to guide and focus the TD phase as the program works to mature technologies and mitigate risk for MS B. To comply with the Budget Control Act of 2011, the Navy deferred procurement of the lead OHIO Replacement ship from FY 2019 to FY 2021, a 2-year shift from the MS A ADM. The program has adjusted and updated all schedules accordingly.



The major testing concern and risk of this delay are the development and testing of the common missile compartment (CMC) because the United Kingdom (UK) SUCCESSOR platform will be the lead platform to go to sea and test the CMC Trident II D5 Strategic Weapons System (SWS) as part of a collaborative United States and UK program. The primary risk mitigation for this effort is the SWS Ashore facility, which broke ground in November 2012 and is scheduled to be operational for CMC shore-based testing in FY 2020 to support CMC development, verification, and validation efforts.

The remaining TD efforts are proceeding in accordance with the program's key decision timeline. Major FY 2012 decisions included formalizing the maneuvering objectives for the platform, finalizing CMC pressure hull design requirements, finalizing CMC length, setting the platform's bow shape, and finalizing the forward control surface configuration. Key decisions that will be made in the near term include the stern control surface configuration, the platform's stern shape, sail configuration, torpedo room configuration, and overall ship length. The TD efforts and testing efforts accomplished in support of these decisions have been briefed to the T&E community at T&E WIPTs. In addition to the T&E community, the ADM signed out upon completion of the IPR DAB held on September 10, 2012, requires the Navy to provide OSD with an in-depth review of the program's TD effort and risk mitigation plans across the entire ship. The trade space in requirements versus affordability will be part of this discussion. The brief occurred in January 2013, providing a detailed overview of risks and development progress. The program office as well as the Director, Strategic Systems Programs and Naval Reactors provided inputs and updates for the brief.

The OHIO Replacement is preparing for a MS B decision in August 2016. The OHIO Replacement acquisition strategy is to use a "state of the force" concept for the majority of the non-propulsion and non-strategic subsystems such as sonar, fire control, radio, etc. As a result, the OHIO Replacement program will reduce risk and cost by using systems already in use and tested on VIRGINIA Class submarines. This concept also enables a reduction in the operating and sustainment costs across both programs. Additionally, the OHIO Replacement utilization of the TRIDENT II D5 missile currently

in the force reduces OHIO Replacement risk and negates the need to develop a new missile system coincident with a new ship design.

**Summary of FY 2012 DT&E Activities**

- August 2, 2012, the Service CDD was approved.
- August 2012, the initial meeting of the TEMP development focus group was held.

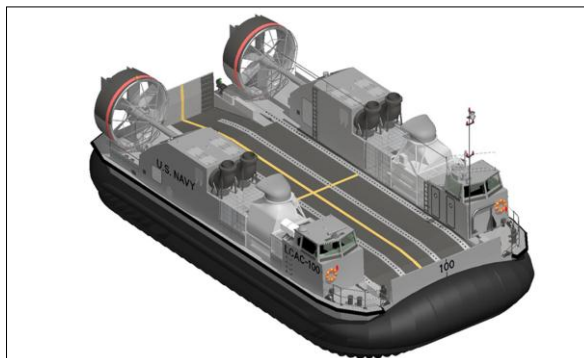
**Summary of FY 2012 DT&E Program Engagement and Assessments**

- The TES is being updated to provide more information on TD phase DT activities as directed in the MS A TES approval memorandum and to reflect the information contained in the approved Navy CDD. The TES update is expected to enter the review chain in early 2013.
- The TEMP focus group has developed a charter and is well represented by all stakeholders. The TEMP is being developed to support the pre-EMD DAB scheduled for August 2015. Through membership in this focus group and the WIPT, DASD(DT&E) is aiding the program in ensuring all documents will be ready and acceptable to move forward through MS B in FY 2016.
- The program office has an aggressive design for affordability program utilizing many efforts to reduce design, construction, operations, and sustainment costs. One such effort is a process the program office has termed “Learn from Experience.” This has been a 2-year process to collect ideas from fleet operators and maintainers on anything they would like to see included in the design of the OHIO Replacement submarine. PMS 397 is working through more than 1,700 recommendations to reduce the life cycle operating and sustainment costs of the program. DASD(DT&E) has been briefed on this process and remains involved in the outcomes, as understanding this effort will enable a better understanding of long-term test requirements early in the program development cycle.



## Ship-to-Shore Connector (SSC)

**Executive Summary:** SSC is an ACAT IC program currently in the EMD phase. As outlined in its approved CDD, SSC is intended to meet the need for a replacement system to the existing landing craft, air cushion (LCAC), which begins to reach end of service life in late 2014. The SSC program plans to deliver a total of 72 operational production craft beginning in FY 2017 and continuing through FY 2030. The program reaches initial operational capability in FY 2020 with five deployable craft and one training craft.



Of significance, SSC is a Government contract design, with a shipbuilder detail design. The intent of this design approach is to broaden competition and lower craft performance risk. SSC retains the same footprint as LCAC for embarkation aboard amphibious ships, but all major components have been redesigned or replaced for improved reliability, added payload, additional range, easier maintainability, and greater automation. The program received MS A approval on May 21, 2009. MS B approval, designation as an ACAT IC program, and LRIP approval occurred on July 5, 2012. The Navy awarded a fixed-priced incentive-fee contract for the detail design and construction of an SSC test and training (T&T) craft to Textron, Inc., New Orleans, Louisiana, on July 6, 2012. The contract also includes options for up to eight additional craft. MS C is planned for the 1st quarter FY 2015.

### Summary of FY 2012 DT&E Activities

- DASD(DT&E) approved the TEMP in June 2012.

### Summary of FY 2012 DT&E Program Engagement and Assessments

- In support of the MS B DAB, the T&E WIPT completed a TEMP, which was approved by OSD on June 28, 2012. Although testing as described in the draft TEMP was considered adequate, DASD(DT&E) believed the program schedule timeline was inadequate to support a MS C decision in the 1st quarter FY 2015 because full-up craft system-level testing does not start until late FY 2016. DASD(DT&E) considers SSC as moderate to high risk because it is a complete redesign of the LCAC. All major SSC systems are new and some have not been used in a marine environment. The Navy has identified SSC drivetrain integration; command, control, communications, computers, and navigation (C4N) system development; and main engine development as low to moderate probability of risk occurrence with significant consequences if the risk occurs. The SSC should have full-up craft system-level testing to support craft production decisions.
- DASD(DT&E) developed and presented a compromise solution to the Navy addressing the lack of system-level data at MS C. Because the Navy estimated a \$15 million cost to alter the production schedule of SSC crafts 2 and 3, DASD(DT&E) proposed allowing those craft to begin production but add an IPR DAB coinciding with conclusion of the production acceptance test and evaluation (PAT&E) events that support the delivery of the T&T craft to the Navy. The PAT&E period will be the first full-up system-level testing that includes 240 hours of on-cushion craft testing done by the prime contractor and will partially demonstrate seven of eight KPPs. Additionally, the IPR DAB will be scheduled at least 6 months before the start of construction of



SSC craft 4 so that any significant design modifications identified during PAT&E can be incorporated before the start of fabrication of craft 4. The T&T craft and crafts 1–3 have funds budgeted to accommodate defects and deficiencies for craft delivered and change order funds for craft still under construction. As a result of DASD(DT&E) efforts, language inserted into the approved TEMP and Acquisition Strategy states that an in-process DAB review is planned for the 2nd quarter FY 2017 in which the Navy will seek CAE authorization to proceed with procurement of crafts 9–13, the Navy will present its plan for Phase 2 contract(s) before contract award, and the Navy will present for review the test results to date.

- The USD(AT&L) approved an ADM on July 5, 2012, authorizing approval to enter the EMD phase. DASD(DT&E) collaborated with the program to determine what could reasonably be accomplished prior to MS C in the formulation of the following exit criteria related to test events.
  - Additional criteria related to T&E to be met for the MS C review before authorizing crafts 2 and 3:
    - Successfully complete drivetrain analysis.
    - Successfully complete first article test (FAT) plans.
    - Initiate gearbox FAT.
    - Initiate shafting FAT.
    - Initiate main engine Naval Vessel Rules (NVR) certification testing (NVR testing will be in progress for 5 months prior to MS C).
  - Additional criteria related to T&E to be met before authorizing crafts 4–8:
    - Complete all drivetrain FATs.
    - Complete main engine NVR certification.
    - Initiate drivetrain integration testing.
    - Demonstrated reliability of specific equipment and subsystems and assessment of reliability growth indicate that SSC will achieve its reliability threshold as stated in the CDD during initial test and evaluation.
    - Complete Software C4N Critical Design Review (CDR)/product baseline with no outstanding critical issues. Software coding and unit testing are on track to meet initial test and evaluation.

## Vertical Takeoff and Landing Tactical Unmanned Aerial Vehicle (VTUAV) MQ-8B Fire Scout

**Executive Summary:** The MQ-8B Fire Scout, or VTUAV system, provides a maritime reconnaissance, surveillance, and target acquisition capability to support any air-capable ship including the Littoral Combat Ship (LCS). In 2012, the VTUAV program was primarily focused on support of early Warfighter deployments, correction of deficiencies testing for the MQ-8B baseline program, and execution of rapid deployment capability (RDC) programs for weapons and radar. The VTUAV program is preparing for IOT&E in early FY 2014 to support transition of the MQ-8B system to the fleet.

The VTUAV program is at moderate risk for meeting the program schedule because of competition for resources between operational deployments, RDCs, and correction of deficiencies. Capability development on the baseline MQ-8B essentially ended in 2012, although IOT&E has been delayed until 2014, primarily because of suitability, voice communication relay issues, and sparing shortages due to higher priority support requirements for deployed forces. The Navy plans to truncate MQ-8B procurement. The system continues to experience operational mission reliability less than the requirement and unstable performance with its communications and control links. Current DT&E efforts are focused on correction of deficiencies and RDCs for weapons and radar.



### Summary of FY 2012 DT&E Activities

- The VTUAV program continued with software development and T&E throughout 2012 and supported several operational deployments including shipboard operations aboard USS KLAKRING and USS SIMPSON and expeditionary deployment to Afghanistan.
- MQ-8B DT&E activities focused on software regression for correction of deficiencies, concurrent dual air vehicle operations, and voice communication relay tests.
- DT&E began for integration of an advanced precision weapons capability as well as planning for a radar RDC.

### Summary of FY 2012 DT&E Program Engagement and Assessments

- DASD(DT&E) conducted multiple assessments of system maturity leading to a future IOT&E and the impact to the T&E strategy resulting from a program shift in focus to RDCs.
- The VTUAV program is at moderate risk for meeting the latest program schedule because of competition for resources between operational deployments, RDCs, and continuing performance issues with system reliability and communications link persistence.
- With the shift in program focus to RDCs, the 2007 TEMP is no longer adequate to support DT&E efforts. The T&E schedule remains optimistic, assuming a high deficiency correction rate and no new problems are discovered.
- Performance of the VTUAV system continued to improve in 2012. Dual air vehicle testing (two aircraft controlled from a single control station) was completed and the capability has been used

successfully by deployed forces aboard USS KLAKRING. The VTUAV is meeting the target identification range KPP and is partially meeting the operational availability, network interoperability, and automatic launch and recovery KPPs. The automatic launch and recovery KPP has been met for shipboard roll angles, but low sea states during at-sea testing have supported demonstration of only 2-degree pitch angles, which is short of the 3-degree threshold pitch requirement. The deck pitch angle for automatic launch and recovery has been demonstrated to 5 degrees at a land-based test site.

- The VTUAV demonstrated a reliability improvement to 23 hours by the end of 2012, which is still below the 30-hour requirement.
- Based on prior field tests and the at-sea demonstrations, there are lingering performance issues with voice communication relay and data link persistence.

## VIRGINIA Class Submarine (SSN 774)

**Executive Summary:** The VIRGINIA Class fast attack submarine was awarded MS III and FRP in September 2010. The class is being built in blocks. Block I (hulls 1–4) is complete, Block II (hulls 5–10) is under construction with the final hull scheduled for delivery/commissioning in FY 2013, and Block III (hulls 11–18) is also under construction with the first of the block scheduled for commissioning in FY 2014. This date is accelerated from last year's report as the Navy continues to deliver SSNs ahead of schedule because of lessons learned during the construction process. Block III has a number of changes from Blocks I and II in a design for affordability effort. The major changes in this effort are the following:



- Replacing the spherical-array sonar with a large-aperture bow array sonar that changes the system from an air-backed array of transducers to a water-backed array of separate passive receive hydrophones and active transmitters.
- Replacing the 12 vertical launch system tubes with two VIRGINIA payload tubes (six missiles per tube).
- Incorporating a number of other design features that have resulted in the cost per unit being lowered to the level required to approve the build rate of two per year.

VIRGINIA Class submarine is an ACAT ID program with a cost of just over \$2 billion per platform. DASD(DT&E) closely tracks this program due to the size, cost, and overall importance to the Navy. The proposed design changes for Block IV are intended to reduce the total ownership cost of VIRGINIA platforms while maintaining the production savings achieved in Block III. These changes will be finalized upon award of the Block IV contract in early FY 2014. DASD(DT&E) will work with the program office to determine the necessary follow-on developmental test and evaluation once the design is finalized.

### Summary of FY 2012 DT&E Activities

- October 2011, the DASD(DT&E) and members of the Naval Warfare staff spent 2 days underway on a VIRGINIA Class to receive firsthand knowledge of the capabilities of these platforms.
- January 2012, final report from DT-III A1 (Arctic Environment Testing) was released by the program office.
- May 2012, TEMP Rev G was approved by the DASD(DT&E).
- August 2012, tour of Quonset Point, Rhode Island, and Groton, Connecticut, construction facilities to include observing the Command and Control Systems Module Off-Hull Assembly and Test Site (COATS) testing facility.

### Summary of FY 2012 DT&E Program Engagement and Assessments

- DT-III A1 was completed in conjunction with a fleet Arctic Exercise and was designed to complete the Arctic Testing carried forward from IOT&E as well as look at the corrections

implemented based on the initial Arctic Testing completed in 2009. The event proved the VIRGINIA Class is an effective platform for operations in the Arctic environment.

- DASD(DT&E) concurred in the use of TEMP Rev G for all upcoming DT events. This TEMP continues to carry forward items from IOT&E that were not fully tested and corrected and deficiencies that require retest, as well as focus on testing items required due to the upcoming changes in Block III. The VIRGINIA Class program office placed high priority on designing tests that will verify that the changes to Block III support meeting all applicable operational requirements. Although agreement was again reached on wording for the TEMP, the lack of an agreed upon diesel submarine surrogate will remain a stumbling block to completing assessment of this measure of effectiveness (MOE).
- The trip to the construction facilities allowed DASD(DT&E) to witness how the Government/industry team building the VIRGINIA Class submarine has put much effort into reducing costs and increasing reliability of the platform. It also provided insight to the successful execution of the teaming agreement between General Dynamics Electric Boat and Huntington Ingalls Newport News. This agreement provides for each shipyard to build specific sections of the submarine, and then ship the sections to the final production shipyard, which alternates for each hull. This arrangement allows for efficiencies of construction while also providing for the capacity to build two ships per year. Construction lessons learned items of high interest include reducing the number of sections in the modular design of the submarine, the continued use of full-scale mock-ups for shock testing, and highlighting how each major section of the platform is placed through a rigorous test cycle prior to final installation in the hull. One example of this is the COATS facility, where the complete combat control system is tested and proven to work prior to inserting it into the completed hull section. This allows for detection of any failures while the system is still accessible and easier to fix. The COATS facility was part of the original program plan for reducing risk and maintaining schedule. The overall process has proven to be very impressive in the ability to aid in decreasing the construction time of these platforms. Additionally, the program has also made many strides in manufacturing, reducing the number of parts used in many of the fixtures on board. (A good example is the light hanger, which used to be 14 pieces of metal and require many welds; it is now 3 pieces of metal and requires two welds.) This has resulted in reduced labor costs, fewer failures, and continued early delivery as highlighted in the executive summary. As testers, understanding this construction process has allowed us to continue to look for ways to insert testing early and therefore help reduce long-term cost and increase reliability.

## ZUMWALT Class Destroyer (DDG 1000)

**Executive Summary:** The DDG 1000 ZUMWALT Class Destroyer program completed a Nunn-McCurdy certification in FY 2010, and the ADM directed the Navy to remove the Volume Search Radar hardware from the ship baseline and to revise T&E requirements for the program in the next update to the TEMP.



The PEO, Integrated Warfare Systems (PEO IWS) is preparing to modify both the DDG 1000 Multifunction Radar (MFR), in order to achieve a volume search (VS) capability, and the T&E strategy for the MFR VS. PEO IWS briefed the DASD(DT&E) regarding the T&E strategy for the MFR VS modification, and the DASD(DT&E) concurred in the top-level concept. PMS 500 drafted a TEMP update to document the MFR VS development and T&E strategy. DASD(DT&E), DOT&E, and other T&E WIPT stakeholders reviewed the TEMP revision, and a consensus was reached regarding the MFR VS development and testing strategy. The DDG 1000 TEMP Revision E is awaiting the COMOPTEVFOR-developed integrated evaluation framework for incorporation before submission for formal approval.

### Summary of FY 2012 DT&E Activities

- DASD(DT&E) requested and received a classified MFR VS capabilities and limitations briefing from PEO IWS.
- DASD(DT&E) conducted a site visit at Bath Iron Works (BIW) Maine in early FY 2013.
- The Long-Range Land Attack Projectile (LRLAP) completed four guided flight tests in August 2012.
- The DDG 1000 Test Team conducted TEMP event DTB2-260 Integrated Power System (IPS)/Engineering Control System (ECS) integration in early FY 2012 at the IPS land-based test site in Philadelphia, Pennsylvania.

### Summary of FY 2012 DT&E Program Engagement and Assessments

- DASD(DT&E) concurred in the development and testing strategy for the MFR VS capability, documented in the current draft DDG 1000 TEMP Revision E.
- DASD(DT&E) views some of the limitations of the MFR VS as increased risk in air warfare ship self-defense. DASD(DT&E) will closely monitor development of the capability to assess likelihood of achieving self-defense requirements.
- The hull of DDG 1000 is nearly complete. Representatives of the Supervisor of Shipbuilding and BIW worked closely to monitor quality and progress of construction.
- All LRLAP flights met accuracy requirements and impacted within 2 meters of the desired aim point. The projectiles were all configured with the tactical rocket motor and the guidance and control sections. Warhead anomalies were experienced in two of the tests. The Failure Review Board completed the investigation to identify the cause of a warhead fuzing failure. A solution was implemented and three of three shots were successfully executed during flight tests on January 30–31, 2013.

- TEMP event DTB2-260 was the first formal integration of the IPS being controlled by ECS software within the core Total Ship Computing Environment and demonstrated more dynamic performance than the steady-state full-power IPS stand-alone event conducted in FY 2011. The event was very successful and demonstrated the maturing IPS/ECS control technology.
- DASD(DT&E) is closely monitoring planning for the DDG 1000 program at Wallops Island, Virginia, and the Self-Defense Test Ship (SDTS) in Port Hueneme, California, and the impact on DBR testing for CVN 78. Current plans call for removal of the MFR array at Wallops Island in FY 2014 in order to install it in the SDTS for the DDG 1000 ITB1-120 Anti-Ship Cruise Missile self-defense test. The current plan allows minimal time for integration and testing of the MFR with the combat system, with concern there will not be sufficient time to verify corrections to deficiencies found using a live MFR at Wallops Island prior to installation and testing on SDTS. Failure to identify and correct MFR deficiencies may increase schedule risk for DDG 1000 testing on SDTS.
- As mentioned in the CVN 78 assessment, DASD(DT&E) requested that PEO IWS provide the minimum data that must be collected at Wallops Island before removal of the MFR equipment.

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### **6.3 Air Force Programs**

This section includes summaries of the following 9 programs:

- B-2A Extremely High Frequency (EHF) Satellite Communications (SATCOM) and Computer Upgrade Increment 1 (Inc 1)
- Global Positioning System (GPS) Enterprise
- HC/MC-130 Recapitalization
- Joint Space Operations Center (JSpOC) Mission System (JMS)
- KC-46A Tanker Modernization
- MQ-9 Unmanned Aircraft System (UAS) Reaper
- Small Diameter Bomb Increment II (SDB II)
- Space Fence
- Space-Based Infrared System High Component (SBIRS High)

## **B-2A Extremely High Frequency (EHF) Satellite Communications (SATCOM) and Computer Upgrade Increment 1 (Inc 1)**

**Executive Summary:** The EHF Inc 1 provides a growth path for future B-2A upgrades and modernization efforts. The modifications made in EHF Inc 1 included integrated processor units, disk drive units, and a fiber-optic backbone. The solid-state drive provided expanded mass storage capacity. The communications system functionality was unaffected but retained the same performance as the legacy fielded system.



Overall, general program and test objectives were met and the EHF Inc 1 performance was assessed as satisfactory. System functionality met mission requirements and retained legacy functionality with some exceptions.

### **Summary of FY 2012 DT&E Activities**

- MS C LRIP DAB was held November 3, 2011.
- B-2A completed EHF Inc 1 DT&E in February 2012.
- DASD(DT&E) conducted its AOTR in April 2012.

### **Summary of FY 2012 DT&E Program Engagement and Assessments**

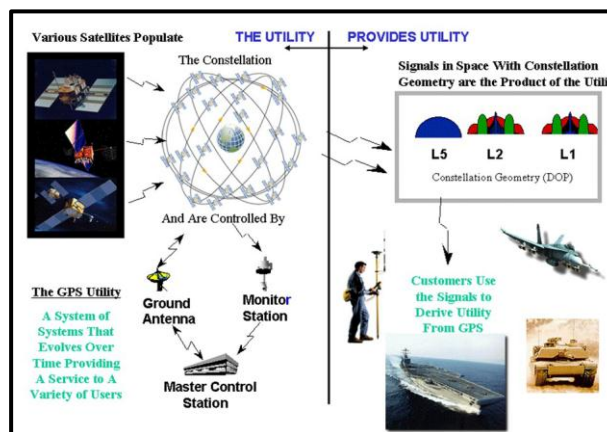
- The results of DT&E in support of the October 2011 production decision validated system maturity and progress toward meeting the KPPs with a low risk of major redesign. System integration and functionality were demonstrated for most of the modes, although some degradation was noted.

### **Assessment of Operational Test Readiness**

- DASD(DT&E) released its AOTR report in April 2012 and recommended proceeding to IOT&E. The report cited the following:
  - Both KPPs were assessed as met with limitations. The integrated functional capability was retained with some deficiencies, and the upgraded data processing system provided protection consistent with the classification of data being stored, processed, or transferred.
  - B-2A demonstrated system stability, overall maturity, and ability to perform the conventional and nuclear weapons delivery missions with the EHF Inc 1 upgraded data processing system.
- IOT&E was conducted from June through August 2012. IOT&E results documented in the Air Force Operational Test and Evaluation Center (AFOTEC) and DOT&E operational test reports confirmed the AOTR findings.

## Global Positioning System (GPS) Enterprise

**Executive Summary:** The GPS is a space-based positioning, navigation, and timing distribution system that operates through weather and electromagnetic environments (jamming, spoofing, etc.). The GPS Enterprise includes space, ground command and control, and user equipment segments. The GPS modernization program, referred to as Generation III, includes acquisition activities to improve capabilities for all three GPS segments. GPS III space vehicles (SVs) will replace the existing family of GPS II (II, IIF, IIM) satellites, with the first satellite available for launch in May 2014. The Next Generation Operational Control System (OCX) will replace the existing Advanced Evolution Program command and control system, with an initial operational capability planned for February 2016. Finally, the Military GPS User Equipment (MGUE) acquisitions will provide GPS-enabling cards for integration into platforms across all Military Services' GPS users, with initial delivery planned for 3rd quarter FY 2017.



All three modernization segments are early in their acquisition cycles (GPS III MS C, January 2012; OCX MS B, October 2012; MGUE MS B, FY 2015); therefore, most DT&E accomplished during FY 2012 was focused on low-level piece/box-level testing, simulator development, or technology assessments. The GPS III enterprise executed the following test events: GPS III and OCX successfully completed Launch and Checkout Capability (LCC)/Launch and Checkout System (LCS) Exercise #1, verifying the integration of the first GPS III with its ground command and control. GPS III developed, integrated, and tested the GPS Non-Flight Satellite Testbed (GNST), a mechanical and electrical simulator to be used in testing of the first SV. User equipment contractors corrected defects found during the functional qualification testing (FQT) of the first-generation Military User Equipment (MUE) cards. Independent Government exercises and testing supported technology readiness assessments in preparation for an MGUE MS B decision.

In addition to the test events, the GPS Enterprise has successfully developed an Enterprise TEMP (E-TEMP) that articulates a logical by segment DT&E evaluation framework and DT&E strategy, a thorough reliability growth assessment plan, and an evaluation against current and evolving threats. However, at the segment level, the program continues to struggle with schedule uncertainties and appropriate DT-Integrated Testing-OT phasing, as well as developing an appropriate analytical basis for program test planning. Additionally, enterprise synchronization issues include challenges in integrating cross-segment or enterprise-level test activities, developing schedules and phasing, and developing an analytical basis using DOE and M&S.

### Summary of FY 2012 DT&E Activities

- Cross-segment or GPS Enterprise:
  - August 22–23, 2012, GPS III – OCX LCC/LCS Exercise #1.

- August 16, 2012, all M-code capable GPS satellites were upgraded to the Modernized Navigational Signal Timing and Ranging Global Positioning System (NAVSTAR GPS) Security Algorithm; this upgrade will support future modernized GPS Enterprise testing.
- GPS III: The first system-level DT&E event is Integrated System Test (IST) 3-1 (FY 2015). Development, test, integration, and checkout activities focused on developing the GNST and early assembly, box-level, and component testing of SV-1 and SV-2.
- OCX: The first system-level DT&E event is IST 3-1 (FY 2015). OCX software is being developed and tested in three blocks. Software for Block 1 is approximately 50 percent complete; testing in FY 2012 focused on risk reduction integration and test for OCX Block 1, Iterations 1.3 and 1.4.
- MGUE: The first system-level DT&E event is IST 3-3 (FY 2017–2019). MUE prototype development and testing is being used as a risk reduction activity to inform both the MGUE MS B decision and future system development.

### **Summary of FY 2012 DT&E Program Engagement and Assessments**

- LCC/LCS Exercise #1 demonstrated basic GPS III commanding and telemetry in preparation for future exercises and, ultimately, GPS III SV-1 launch.
- Two of the three MUE contractors chose to participate in the Government-sponsored Navigation Festival in April/May 2012, demonstrating user equipment operation in an elevated electronic environment.
- MUE cards (prototype M-code receivers) processed M-code signal from space and demonstrated capability to generate M-code position, velocity, and timing solutions during Exercise GYPSY INDIA in an operationally relevant Navigation Warfare environment, reducing risk for the MGUE program. Initial analysis of results is positive; the final test report is expected in 2nd quarter FY 2013.
- DASD(DT&E) assessed the GPS E-TEMP to inform the GPS OCX MS B DAB and found the following: the T&E strategy and evaluation framework are well-defined; the schedule is compressed and event phasing is out of synchronization; analytical rigor (DOE, M&S) is missing from planning and evaluation; and a realistic, resource-loaded test schedule has yet to be fully developed due to budget and schedule uncertainties. DASD(DT&E) recommends that future program planning and TEMP revisions focus on articulating an analytically rigorous, adequately resourced and scheduled DT&E/Integrated T&E strategy geared toward informing critical program acquisition decisions.
- DASD(DT&E) has requested through the Integrated Test Team (ITT) that the GPS program office identify a Lead DT&E Organization outside the program office. The program office is serving as the Lead DT&E Organization.

## HC/MC-130 Recapitalization

**Executive Summary:** The HC/MC-130 Recapitalization Program will replace an aging fleet of HC-130P/N legacy aircraft incorporating the latest refueling, airdrop, and C2 communications technology to meet personnel recovery mission requirements. The primary mission of the HC-130J is helicopter air refueling and pararescue jumper deployment with rescue-related equipment. The MC-130J will incorporate the latest refueling, airdrop, and C2 communications technology to meet special operations mission requirements.



The HC/MC-130 successfully completed developmental flight testing and evaluation on schedule and under budget. It successfully demonstrated all KPPs and KSAs during DT&E, including reliability measures.

### Summary of FY 2012 DT&E Activities

- The HC/MC-130 Recapitalization Program completed all DT&E, including Increment 1 modifications, in February 2012.
- The program executed DT&E in accordance with the approved TEMP and finished DT&E on schedule and \$3.1 million under budget.

### Summary of FY 2012 DT&E Program Engagement and Assessments

- The DASD(DT&E) assessed that the HC/MC-130J met all KPPs and KSAs during DT&E.
  - The HC/MC-130J proved able to serve as a refueling tanker in the air and on the ground with multiple receivers.
  - Aircraft performance averaged 10 percent better than predicted.
  - Reliability, maintainability, and interoperability all met or exceeded requirements.

### Assessment of Operational Test Readiness

- The DASD(DT&E) signed an AOTR memorandum on January 4, 2012, recommending that the program proceed to IOT&E.
- The DASD(DT&E) assessed the HC/MC-130J system as low risk for favorably completing IOT&E.

## Joint Space Operations Center (JSpOC) Mission System (JMS)



**Executive Summary:** JMS is designed to provide space situational awareness (SSA) and C2 capability for the Commander, Joint Functional Component Command for Space. As the information hub of the space surveillance network (SSN), JMS enables an operator to process and analyze space observations from SSN sensors and other sensors to produce a comprehensive inventory/catalog of space objects. The satellite catalog provides position and relative motion information used to identify potential collisions, reentry, orbital debris, or other events of interest. JMS will also provide capabilities and applications to improve C2 of assigned space forces.

JMS is an unbaselined multi-increment MAIS program. The principal focus of Increment (Inc) 1 and Inc 2 is to provide capabilities necessary to allow transition from the legacy Space Defense Operations Center (SPADOC) system, which is no longer sustainable. Inc 1 consists of five service packs (SPs), SP1–SP5, and provides the initial service-oriented architecture (SOA) infrastructure and user tools that utilize the legacy system as data source. Inc 2 will be built upon Inc 1 and provide the high-accuracy catalog and associated computational capabilities to enhance catalog storage, processing, and analysis capabilities. Program content beyond Inc 2 has not yet been defined but will focus on satisfying remaining KSAs necessary to fully enable the SSA and space C2 missions. JMS is following Agile IT Acquisition Section 804 consistent with the New Approach for Delivering Information Capabilities in the Department of Defense from November 2010.

The DASD(DT&E) AOTR recommended entry into operational utility evaluation (OUE) after DT&E and IT demonstrated Inc 1 system performance sufficient to support operations. Following the reorganization in 2011/2012, the JMS Program Office is making steady progress in defining an EMD phase; Inc 1 DT&E and OT&E are now complete; and the program office has begun to identify and mature system performance, reliability, interoperability, information security, and cyber T&E for Inc 2. The JMS program is on track for the scheduled Inc 1 MS C in March 2013 and the planned Inc 2 MS B in April 2013.

### Summary of FY 2012 DT&E Activities

- February 2012, JMS SP3 delivered the space user-defined operational picture (UDOP) functionality, infrastructure, integrated Web applications, and system performance to ensure no degradations from the existing system.



- February 27–March 2, 2012, the 46th Test Squadron (46 TS) conducted JMS SP4 DT&E. The primary focus of JMS SP4 was to resolve 224 IA vulnerabilities. JMS SP4 also provided Layer 7 automatic failover, load balancing, and system backup and recovery capabilities.
- June 4–15, 2012, the 46 TS began DT&E of JMS SP5, which was delayed for 2 weeks to allow additional time to complete connectivity to the legacy Command, Analysis, and Verification of Ephemeris Network (CAVENet) system. This allowed JMS access to the legacy space catalog in near real time. JMS SP5 primarily focuses on delivering two KPPs – Net-Ready and UDOP – and takes strides toward delivering a third KPP for a space catalog.
- July 16–27, 2012, JMS SP5 was not recommended for OT following integrated test and evaluation (IT&E). IT&E start was delayed 2 weeks to fix problems discovered during DT&E. When IT&E concluded, the 46 TS had opened 327 deficiency reports and closed 267. Two additional tests were performed to work off deficiencies after which the program exited IT&E and passed PEO certification for an OUE.

### **Summary of FY 2012 DT&E Program Engagement and Assessments**

- JMS Inc 1 delivers an initial SOA infrastructure and initial user tools – foundational capabilities for replacing the legacy systems. The driving need to replace these systems created a sense of urgency that drove an unrealistic schedule for development and T&E, causing repeated critical findings throughout the early Inc 1 test events. Looking forward, DASD(DT&E) engagement helps ensure sufficient T&E for early identification and correction of critical errors.
- Prior to August 2012, JMS pursued a combined Inc 1/Inc 2 MS C/MS B decision. DASD(DT&E) recommended that the two decisions be decoupled and that the Inc 1 schedule be realistic and resourced and include time for a true test/fix/test approach before MS C. The DASD(DT&E) position on Inc 2 is that MS B should not proceed until a feasible, executable, and resource-loaded schedule is developed; thorough evaluation and test planning linked to stable system requirements is complete; and the system architecture is properly designed for interoperability, scalability, and security. The program office resolved these issues for Inc 1 MS C.
- In August 2012, the Commander, Air Force Space Command (AFSPC/CC) relaxed the stringent requirement to complete Inc 2 by October 2014. This decision provided the program office with sufficient time to deliberately plan Inc 2, including developing an interoperable, secure, and scalable system; building a realistic, resource-loaded schedule; and articulating program plans in an OSD-approved TEMP and other required MS C documentation. The program office resolved these issues for Inc 2 MS B.
- During the initial rounds of DT&E and IT&E, JMS identified critical deficiencies in the 1,000-user UDOP KPP. Following these tests, DASD(DT&E) recommended that the program office fix all Category I and II urgent deficiencies and perform two additional tests. JMS completed these tests with significant and operationally acceptable progress toward the 1,000-user and catalog administration requirements.
- The successful completion of SP5 and the time for deliberate Inc 2 planning bode well for JMS future development, T&E, and operational fielding. DASD(DT&E) is also encouraged by the users' favorable response to the nascent JMS capabilities and performance as observed during the real-world, high-interest event (Phobus-Grunt) in January 2012.
- DASD(DT&E) provided additional recommendations, which the program has integrated into the TEMP for early evaluations of system performance, reliability, interoperability, and information security. Additional consideration is being given to cyber testing to assess vulnerabilities to the advanced persistent threat.

**Assessment of Operational Test Readiness**

- On November 7, 2012, the DASD(DT&E) recommended entry into OUE based upon demonstrated system performance and DASD(DT&E) assessment of the impact on a successful OUE and subsequent operations. OUE completed in December 2012.



## KC-46A Tanker Modernization

**Executive Summary:** As the initial phase of a comprehensive aerial refueling recapitalization strategy, the KC-46 program will replace approximately one-third of the capability provided by the current aerial refueling fleet with 179 aircraft. The KC-46 also supports other mission areas to include airlift, aeromedical evacuation, as well as treaty compliance. The program is currently in the early phases of DT&E planning; no test aircraft having been delivered and no testing conducted to date.



### Summary of FY 2012 DT&E Activities

- The program successfully completed the KC-46A Preliminary Design Review (PDR) in April 2012.
- Boeing delivered its initial detailed test plans at the end of June 2012, with the next level of test plan detail scheduled for delivery in December 2012.
  - Flight testing should begin in mid-2014.
- DASD(DT&E) continues to work with the ITT to develop a more efficient flight test schedule.
- The Air Force and Boeing worked together to reduce the discrepancy in estimated time to conduct air refueling certifications from about 200 hours to 40 hours.
- The DASD(DT&E) FY 2011 annual report recommended that the Air Force reconsider deactivating the Reserve unit that will support KC-46A air refueling receiver testing. The Air Force has since cancelled that deactivation.

### Summary of FY 2012 DT&E Program Engagement and Assessments

- DASD(DT&E) leveraged the ITT to make progress toward reducing the test program risk, but more remains to be done. Resolving the discrepancy concerning flight hours required to certify receiver aircraft provided the greatest contribution toward schedule risk reduction. The military flight test schedule remains aggressive, with widely varying workloads between the test aircraft. Risk mitigations must be implemented and aggressively monitored in order to complete the test program on schedule.
- DASD(DT&E) remains concerned about the insufficient calendar time planned for the correction of significant discrepancies and/or deficiencies discovered during DT prior to the planned start of OT.
- DASD(DT&E) remains concerned about the concurrence of activities such as aircrew and maintenance training during DT&E, which would increase the competition for limited aircraft resources.

## MQ-9 Unmanned Aircraft System (UAS) Reaper

**Executive Summary:** The MQ-9 UAS Reaper is a multi-mission hunter-killer and ISR weapon system with a timely and persistent capability to find, fix, track, target, engage, and assess time-sensitive targets.



The program is in production for Increment 1, Block 1 aircraft and obtained an LRIP decision for Increment 1, Block 5 aircraft in 2012. The program continues development of Increment 1, Block 5 capabilities along with incorporation of new, unplanned capabilities to support overseas contingency operations. The MQ-9 system meets the killer KPP and partially meets the hunter and net-ready KPPs.

### Summary of FY 2012 DT&E Activities

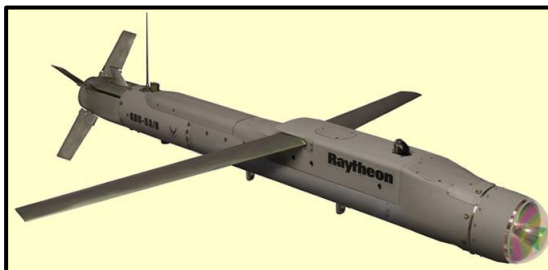
- MQ-9 Block 5 hardware and software development and testing continued throughout 2012. Discovery and correction of deficiencies in Block 1 software delayed the completion of testing of Block 1 capabilities and the start of Block 5 software testing by 6 months.
- The MQ-9 Block 5 prototype conducted DT flights in 2012 to demonstrate basic system integration and some functionality. These DT&E-advocated demonstration flights satisfied some milestone decision entrance criteria, leading to a favorable LRIP decision in September 2012. Developmental evaluations of the Block 5 functionality will begin in 2013.

### Summary of 2012 DT&E Program Engagement and Assessments

- DASD(DT&E) actively engaged with the MQ-9 program in 2012 to mitigate risk for the Block 5 LRIP decision by advocating for demonstrations of Block 5 system maturity through an update to the T&E strategy.
- The Block 1 system has demonstrated operational capability in the killer role and is currently in sustainment.
- The MQ-9 TEMP was updated to address Block 5 T&E and follow-on testing and was approved in February 2012. A TEMP update to address reliability growth changes was approved in September 2012.
- The program continues development of Increment 1, Block 5 capabilities along with incorporation of new, unplanned capabilities to support overseas contingency operations. Developmental issues are causing unplanned software changes and extending the schedule.
- The Block 5 configuration was established along with an understanding of the subset of capabilities able to be evaluated prior to the milestone decision.
- The system meets the killer KPP and partially meets the hunter and net-ready KPPs due to sensor limitations with medium-vehicle-sized moving targets and some imagery transmission issues.
- The aircraft reliability requirement – mean time between critical failures – was changed to a threshold of 19 hours. The demonstrated reliability of the Block 1 aircraft is 21 hours, and there is insufficient operating time to establish an achieved level for Block 5 reliability.
- The program has deferred 12 Capability Production Document (CPD) requirements that the system will not meet or will only partially meet.

## Small Diameter Bomb Increment II (SDB II)

**Executive Summary:** The Guided Bomb Unit-53/B SDB II is the second increment of the Miniature Munitions weapons system capability program and will provide the capability to attack moving targets through weather with standoff (outside of point defenses), using a tri-mode seeker and data link. SDB II is a 250-pound class air-to-ground glide weapon designed with the F-15E, F-35B, and F-35C.



SDB II is a joint interest Air Force and Navy program that is 29 months into Engineering and Manufacturing Development. Testing involves captive carry of the seeker flown from a modified UH-1 helicopter for sensor characterization, and release of Controlled Test Vehicles (CTVs) for flight dynamics with data link connectivity and Guided Test Vehicles (GTVs) for fly-out of an inert weapon. Early flight testing at White Sands Missile Range, New Mexico, has since moved to the Eglin AFB, Florida, range. The test team plans to conduct live-fire testing at the Utah Test and Training Range.

Due to delays at the start, the test program is on a critical path to support an initial production decision in January 2014.

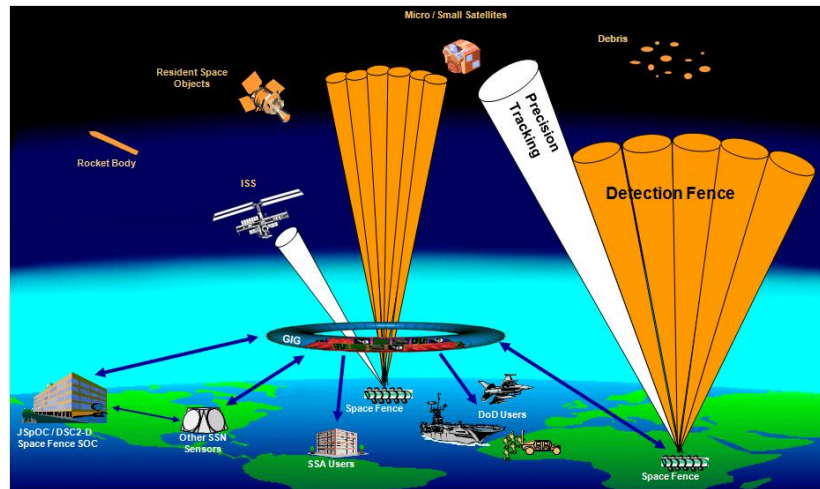
### Summary of FY 2012 DT&E Activities

- Development of a computer-in-the loop laboratory delayed the flight test schedule by 6 months, driving the System Verification Review to November 2013 and a MS C decision to January 2014.
- Captive flight test began in January 2012 and approximately 480 captive data runs for the seeker have been completed against moving and stationary targets in varied environmental conditions and geographic locations.
- DT has entered the free flight test phase with two successful CTV events executed in March and September 2012 and a successful GTV-1 event executed in July. A root cause of a subsequent GTV-2 test failure has been identified with corrections being implemented.
- Risk reduction activities included weapons bay fit checks for the SDB II loaded on an F-35A and F-35B aircraft in July and August 2012.

### Summary of FY 2012 DT&E Program Engagement and Assessments

- DASD(DT&E) engaged the program to minimize risk for the 2013 initial production decision by pressing for an 11-shot test series (9 GTV flights and 2 All-Up-Round (live fires) against stationary and moving ground targets). This test series is now part of the MS C exit criteria.
- Delays in executing GTV-2 and the Failure Review Board have further delayed the test schedule. The net delay of 8 months is of concern in completing testing in time to meet MS C.
- F-35 Joint Strike Fighter development has pushed SDB II integration into Block 4. This will not impact the SDB II development and the F-15E Required Asset Availability.

# Space Fence



**Executive Summary:** Space Fence is an S-band ground-based, phased array radar system composed of up to two ground radar sites and an operational control center designed to detect and track small objects in low Earth orbit. Space Fence supports the space control mission area by enhancing SSA, providing metric and characterization data to support target discrimination, identification, and positional tracking during prevention/negation operations and lethal/nonlethal applications of force, including support to battle damage assessment.

Space Fence has employed a multi-contractor competitive prototyping acquisition strategy to reduce technical risks and costs through the program's PDR. Phase A served as risk reduction and TD and provided an opportunity for 100+ trade studies and analyses to inform design reviews, requirements development, and final source selection documentation. Phase A, through full and open competitions, first awarded three contracts culminating in system design review, and then awarded two contracts culminating in dual PDRs concluded in February 2012. The RFP for the final EMD/P&D effort to include a single contract with options was posted on October 4, 2012. The MS B decision is planned for April 2013 and final EMD/P&D contract award is anticipated in May 2013.

## Summary of FY 2012 DT&E Activities

- February 2012, final PDR: The PDR events detailed the contractors' engineering and test plans and demonstrated key performance characteristics through the contractors' developed prototypes.
- March 1, 2012: The Air Force PEO for Space designated the 46th Test Squadron as the Space Fence RTO.
- March 22, 2012: TEMP writing and revision throughout the fiscal year culminated in a high-performance team meeting that adjudicated all critical comments on the TEMP and provided a way forward for MS B TEMP approval.

## Summary of FY 2012 DT&E Program Engagement and Assessments

- Throughout the Independent Program Assessment (IPA) (March 12–30, 2012) and the decision forums leading to the DAB (e.g., IIPT, April 4, 2012; OIPT, April 11, 2012; pre-EMD review,

April 23, 2012), DASD(DT&E) recommended and assisted the program office in developing the following:

- A comprehensive technical evaluation framework that will serve as the TEMP's basis to align Government and contractor T&E strategies as CDR entrance criteria.
- Cross-program awareness and discussions to synchronize Space Fence and JMS activities to ensure information discovered by the Space Fence sensor would be available for SSA mission needs through the space surveillance network (SSN), with the JMS serving as its information hub.
- An inclusive and realistic integrated master schedule.

## Space-Based Infrared System High Component (SBIRS High)

**Executive Summary:** The SBIRS primary mission is to provide initial warning of a ballistic missile attack on the United States, its deployed forces, and its allies. SBIRS also supports missile defense, battlespace awareness, and technical intelligence missions by providing reliable, accurate, and timely data to unified combatant commanders and other users. The system consists of geosynchronous Earth orbit (GEO) satellites, highly elliptical orbit payloads, and a fixed and mobile ground segment. GEO-1 launched in May 2011 and has been undergoing on-orbit testing throughout 2012 and is expected to enter into operations in December 2012. This first operational certification of a SBIRS GEO satellite is called “Effectivity 5.” GEO-2 has completed production and is undergoing final testing prior to shipping to Cape Canaveral for launch in March 2013.



### Summary of FY 2012 DT&E Activities

- Lockheed Martin executed certification and accreditation testing supporting continued authority to operate for existing networks and satellite control stations throughout FY 2012.
- November 11, 2011, Lockheed Martin completed GEO-2 Space Vehicle Thermal Vacuum Test (TVAC). TVAC verifies space vehicle workmanship and performance when the space vehicle is exposed to all environmental extremes and functional operations that simulate launch, ascent, and on-orbit conditions.
- April 2, 2012, GEO-2 completed the Final Integrated System Test, validating the space vehicle’s operation following environmental testing.
- April 22, 2012, SBIRS Baseline Release 11-1 mission control station software was tested by Lockheed Martin, verifying that deficiencies previously uncovered were fixed and the software had functionality required for accepting missile track data.
- August 27, 2012, SBIRS IT&E was completed by HQ AFOTEC, Lockheed Martin, and the SBIRS Program Office, providing a comprehensive test of mission performance, telemetry tracking and control, information assurance, technical intelligence, and reliability and maintainability. Test results confirmed that the system was ready for operational testing and operations.
- August 29, 2012, GEO-2 was taken out of storage and Lockheed Martin executed Reactivation and Regression Test demonstrating that the satellite is still fully functional.
- September 15, 2012, Lockheed verified GEO-2 ground system capability with GEO-2.
- Space and Missile Systems Center (SMC)/Aerospace Study, based on 20 years of spacecraft testing (commercial and Government spacecraft), shows that acoustic testing consistently identified a Mission Degrading Anomaly (50 to 60 percent per test) across time and contractors; the study was consistent with the European Space Agency study (cited in the SMC/Aerospace Study).



- DASD(DT&E) believes acoustic testing is vital to mitigating risk by verifying design and/or quality of workmanship; DASD(DT&E) recommended SMC not eliminate acoustic testing of SBIRS space vehicles.
- DASD(DT&E) recommended that the single line flow of satellite integration and testing not deviate from approved SMC existing compliance documentation.
- DASD(DT&E) has requested through the ITT that the SBIRS program office identify a Lead DT&E Organization outside of the program office. The program office serves as Lead DT&E Organization.

#### **Summary of FY 2012 DT&E Program Engagement and Assessments**

- The SMC/IS System Engineering and Integration contractor, independent of the developmental contractor, executed DT&E assessments of SBIRS mission performance based on developmental and operational test M&S scenarios. This assessment provided performance and system non-degradation information on SBIRS Missile Warning North America, Missile Warning Theater, and Missile Defense Capability. This assessment was monitored and reviewed by DASD(DT&E) from June to August 2012.
- The SBIRS program planned to eliminate acoustic testing on GEO-5 and GEO-6. DASD(DT&E) recommended that the single line flow and acoustic testing be performed per SMC compliance documents referenced in the approved SBIRS TEMP.

#### **Assessment of Operational Test Readiness**

- DASD(DT&E) determined that DT&E and IT results indicate that the SBIRS Effectivity 5 system meets the system performance and non-degradation requirements listed in the Air Force Space Command SBIRS Test to Letter.
- DASD(DT&E) recommended in its AOTR memorandum, dated August 20, 2012, entering the OUE at the end of IT&E.

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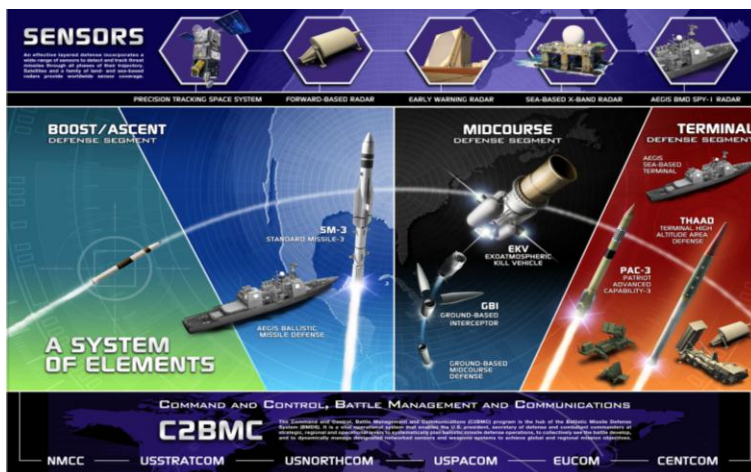
## 6.4 DoD Programs

This section includes summaries of the following 7 programs:

- Ballistic Missile Defense System (BMDS)
- EProcurement
- F-35 Joint Strike Fighter (JSF)
- Joint Lightweight Tactical Vehicle (JLTV)
- Key Management Infrastructure (KMI) Capability Increment 2 (CI-2)
- Public Key Infrastructure (PKI) Increment 2 (Inc 2)
- Theater Medical Information Program–Joint (TMIP-J) Increment 2 (Inc 2)

## Ballistic Missile Defense System (BMDS)

**Executive Summary:** The BMDS is designed to counter ballistic missiles of all ranges – short, medium, intermediate, and intercontinental. The BMDS is an integrated, layered architecture that provides multiple opportunities to destroy missiles and their warheads before they can reach their targets. The system’s architecture includes networked overhead persistent infrared sensors and ground- and sea-based radars for target detection and tracking; ground- and sea-based interceptor missiles for destroying a ballistic missile; and a command and control, battle management, and communications (C2BMC) system that networks, integrates, and synchronizes missile defense systems operations, providing the Warfighter with the needed links between the sensors and weapon systems.



### Summary of FY 2012 DT&E Activities

- October 17–28, 2011, MDA completed a hardware-in-the loop (HWIL) ground test event incorporating a new Army Navy/Transportable Radar Surveillance and Control Model 2 (AN/TPY-2) location, operational mission profile, trajectories, and raid sizes supporting an engineering assessment.
- November 15–20, 2011, MDA completed integrated ground testing assessing combined United States–Israel capability.
- December 2–4 and 13–15, 2011, MDA completed a theater/regional BMDS distributed ground test event involving sea-based Aegis Weapon System, AN/TPY-2 forward-based mode (FBM), and C2BMC to demonstrate capability against theater/regional ballistic missile threats for Phase I of the European Phased Adaptive Approach (PAA).
- February 25, 2012, the sensors program accomplished Sea-Based X-Band Radar (SBX) risk reduction for a future ground-based interceptor (GBI) flight test by validating software performance during a target-of-opportunity missile launch.
- April 4–27, 2012, MDA completed an HWIL ground test event focusing on Critical Engagement Condition (CEC) and Empirical Measurement Event (EME) data collection and inclusion of developmental Ground-Based Midcourse Defense (GMD) Fire Control, SBX, and Aegis Ballistic Missile Defense (BMD) software.
- June 25–29 and August 3–11, 2012, MDA initiated HWIL and distributed ground test events to evaluate the AN/TPY-2 FBM and C2BMC ability to enhance existing combatant command capability.
- May 9, 2012, the Aegis BMD conducted a lethal engagement of a unitary short-range ballistic missile target with Aegis BMD 4.0.1 and a Standard Missile-3 (SM-3) Block IB missile.
- June 26, 2012, the Aegis BMD conducted a lethal engagement of a separating short-range ballistic missile target in a complex debris environment with Aegis BMD 4.0.1 and an SM-3

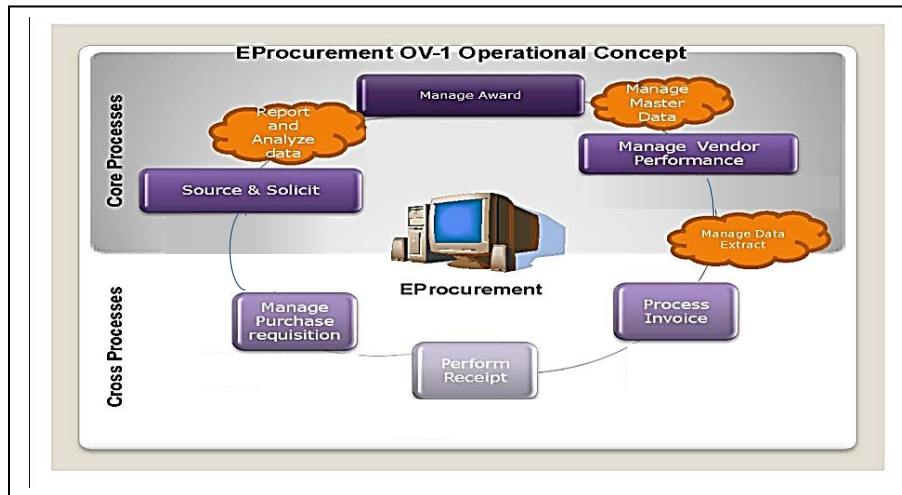
Block IB missile and demonstrated the ability to cue Aegis Radar System AN/SPY-1 using space assets.

- October 24, 2012, MDA conducted a missile defense flight test of five ballistic missile and cruise missile targets involving multiple sensors and missile defense systems to simultaneously engage multiple targets.

### **Summary of FY 2012 DT&E Program Engagement and Assessments**

- In the FY 2011 DT&E/SE Annual Report to Congress, DASD(DT&E) identified issues concerning the GBI flight tests. During 2012, no GBI flight tests occurred due to continuing GBI design issues. DASD(DT&E) supports delaying T&E events until system readiness occurs, but Failure Review Board (FRB) findings for the GBI may not be exhaustive. DASD(DT&E) recommends that MDA reassess GMD Exoatmospheric Kill Vehicle redesign to verify root-cause analysis findings, assess previous T&E, and if necessary, perform additional T&E to determine system and element design margins and perform GBI electromagnetic interference/electromagnetic compatibility, vibration, and environmental T&E in ground and flight tests.
- To demonstrate integrated regional/theater defense, MDA launched five targets and successfully demonstrated the ability of the Terminal High-Altitude Area Defense (THAAD) system to intercept a medium-range ballistic target, the ability of the PAC-3 to near simultaneously destroy short-range ballistic missile and low-flying cruise missile targets, and Aegis BMD engagement of a low-flying cruise missile. The Aegis BMD system tracked and launched an SM-3 Block 1A interceptor but failed to intercept a short-range ballistic missile target. FRB activities are ongoing to determine the root cause.
- In support of the European PAA, MDA demonstrated the ability of the Aegis BMD, AN/TPY-2, and C2BMC to defend Europe and our deployed personnel.
- In support of combined United States and Israeli operations, MDA demonstrated the ability of the BMDS Aegis BMD, PATRIOT, THAAD, AN/TPY-2 FBM, SBIRS, and C2BMC to support engagements with United States and Israeli interceptors.
- The Aegis BMD system completed the necessary ground and flight test and evaluation to support an initial production decision for a limited quantity of SM-3 Block IBs. This includes successful intercept tests conducted on May 9 and June 26, 2012.
- DASD(DT&E) analysis identified potential gaps between BMDS capability delivery and flight and ground T&E results. DASD(DT&E) recommends that the gaps be assessed to identify whether ground test and M&S can adequately assess the capabilities or whether more robust flight test and evaluation is required.
- CECs and EMEs were examined to ensure that they are consistently applied across the BMDS and that CEC/EME changes, with rationale, are documented. A CEC/EME baseline is established and DASD(DT&E) supports continued activity to link CECs/EMEs to acquisition decisions, prioritize CEC/EME data collection, and shift the DT&E focus from CEC/EME data collection to M&S verification, validation, and accreditation.
- Ground test facilities and personnel are at maximum capacity. As ground test activities are added to support flight test risk reduction efforts and combatant commanders' requests, planned T&E activities are delayed or cancelled.
- Nearly all BMDS FY 2012 DT&E test events missed their planned date of execution or have not occurred. However, decision dates associated with T&E events do not change as T&E events are delayed or cancelled, resulting in increased risk. DASD(DT&E) recommends that as T&E events are delayed or cancelled, the effect on programmatic decisions, capability delivery, and risks be identified.

# EProcurement



**Executive Summary:** The Defense Logistics Agency (DLA) EProcurement is designed to provide enterprise-level procurement capabilities for DLA to replace legacy procurement systems (Pre-Award Contracting System, Electronic Contract Folder, Procurement Automated Contract Evaluation, and Base Operations Support System). The intended functions of EProcurement include purchase requisition management, sourcing and solicitation, award management, and vendor performance management. DLA users will use EProcurement to procure and provide the full spectrum of consumables, services, and depot-level repairables to the Army, Navy, Air Force, Marine Corps, other Federal agencies, and combined and allied forces. The major contractor for the system is Accenture, based in Reston, Virginia. The production environment for EProcurement is hosted at the Defense Enterprise Computing Center (DECC) in Ogden, Utah, which is operated and maintained by DISA. EProcurement is one of the programs in the overall DLA Enterprise Business System Infrastructure hosted by the Ogden DECC. The backup site is located at the DECC in Mechanicsburg, Pennsylvania.

The program office delivered EProcurement in three releases: Release 1.0 was deployed to approximately 50 users in November 2010; Release 1.1 was deployed to approximately 320 users in May 2011; and Release 1.2, which has all of the required functionality of EProcurement, is currently being delivered in multiple rollouts across the DLA supply chains.

Based on effectiveness and suitability issues raised by DASD(DT&E) at the October 2011 EProcurement DAB, the Milestone Decision Authority decided not to approve MS C and to reconsider the decision after DLA conducted additional stabilization and testing to mature the system and improve the probability of successful fielding and IOT&E. The Milestone Decision Authority did authorize a limited fielding of EProcurement Release 1.2 not to exceed 700 users. After conducting an extended stabilization and maturity period, as well as successfully completing an OA, the Milestone Decision Authority authorized additional limited fielding in March 2012 and entry into IOT&E. The DOT&E reported successful IOT&E results to the Milestone Decision Authority at the FDD DAB Readiness Meeting on July 19, 2012. The Milestone Decision Authority signed the ADM on August 23, 2012, authorizing full deployment of EProcurement Release 1.2.

### **Summary of FY 2012 DT&E Activities**

- October 2011–January 2012, the PMO conducted developmental and performance testing for Release 1.2.
- October 2011–January 2012, JITC conducted validation tests to verify fixes to deficiencies identified during operational use and DT.
- January 2012, JITC conducted an OA to verify fixes to performance, usability, and security issues.

### **Summary of FY 2012 DT&E Program Engagement and Assessments**

- October 2011, DASD(DT&E) provided the Milestone Decision Authority with an assessment of EProcurement DT and maturity in support of the MS C decision. DASD(DT&E) identified issues related to throughput, scalability, response time, and security. FY 2011 DT data indicated the following: the system did not meet several KPP and KSA throughput requirements, testing was insufficient to assess scalability, OA results indicated response time issues, and penetration testing discovered major IA vulnerabilities. DASD(DT&E) recommended that the Milestone Decision Authority defer the MS C decision until additional system stabilization and testing confirmed readiness for operational test.
- March 2012, DASD(DT&E) recommended MS C approval and entry into IOT&E based on significant improvement in performance and security as demonstrated in FY 2012 DT, deficiency fix validation activities, and the OA.
- July 2012, DASD(DT&E) recommended full deployment based on successful IOT&E results as reported by JITC and DOT&E. DASD(DT&E) approved a TEMP Addendum focused on monitoring three areas during full deployment: software maturity, user satisfaction, and resolution of minor IA vulnerabilities.

## F-35 Joint Strike Fighter (JSF)

**Executive Summary:** The JSF is the nation's next fifth-generation Air Force, Navy, and Marine Corps fighter providing stealth capability with unprecedented sensor fusion. The F-35 is in the third year of a 7-year DT program, extended about 2 years as a result of the June 2010 program restructure with an increase in test scope. To date, 17 test aircraft have been delivered to the test sites: six F-35A conventional takeoff and landing (CTOL) variants and two F-35B short takeoff and vertical landing (STOVL) variants to Edwards Air Force Flight Test Center, and five F-35B STOVL variants and four F-35C carrier variants (CVs) delivered to Naval Air Warfare Center, Patuxent River, Maryland. DASD(DT&E) has been engaged with the program in developing the revised DT program and addressing issues discovered during DT.



The program is early in test execution with roughly 30 percent of the nearly 73,000 planned flight test points flown mainly in the conservative regions of the test envelope. Full approval of test point closure is a significantly lower percentage. With key functionality expected for delivery in 2013, there remains significant opportunity for discovery. The program has conducted engine air start testing on F-35A and F-35B as a prerequisite for high-angle-of-attack testing and completed initial daytime F-35B ship compatibility testing aboard USS WASP (LHD-1). Wing loads, flutter, and buffet testing are limited to 80 percent allowable design loads until the 2014–2015 timeframe. Full-scale ground durability testing is in various stages of completion with F-35A at 8,000 hours (50 percent complete); F-35B at 7,000 hours (44 percent complete); and F-35C at 4,000 hours (25 percent complete).

### Summary of FY 2012 DT&E Activities

- Although test execution at the two primary test sites is meeting or exceeding planned fly rates, test point closure and capability verification are behind the planned schedule. This delay is mainly due to discovery and late software delivery to flight test. For example, Block 2A software was delivered to flight test about 4 months late.
- During FY 2012, the test program accomplished the following:
  - Completed LRIP flight envelope and mission systems test requirements for release to the Integrated Training Center.
  - Completed initial daytime F-35B ship compatibility, envelope, and maintenance evaluations.
  - Conducted initial F-35C carrier suitability, catapult compatibility, and launch and arrestment loads tests to support an Arresting Hook System (AHS) redesign.
  - Conducted engine air restart testing as a prerequisite for high-angle-of-attack testing.
  - Executed first airborne weapon separation on F-35 A and B variants.
  - Conducted initial sea trials with 72 vertical landings and takeoffs onboard USS WASP.
  - Conducted initial mission systems software Block 2A testing.

### **Summary of FY 2012 DT&E Program Engagement and Assessments**

- DASD(DT&E) has been thoroughly engaged with the F-35 Program Office, the Services, and OSD staff in increasing insight into system maturity, test progress, and ensuring adequate test resources are planned to test F-35 JSF against current and planned threats. Specifically, in FY 2012:
  - The DASD(DT&E) completed an Installed Systems Test Facility (ISTF) study to identify how the Services' land-based test facilities can better support reducing F-35 design and verification risk before executing more expensive flight testing. This report was instrumental in supporting additional Department investment for these Service sites.
  - The DASD(DT&E) was the DT&E lead in the USD(AT&L) Quick Look Report on F-35 concurrency risks, which identified key deficiencies in the Department's test facilities to verify the F-35 unique sensor and fusion capabilities.
  - The DASD(DT&E) was the key DT&E lead in a separate F-35 Threat Tiger Team study to determine the threat resources required to adequately test the F-35 to meet new threats.
- These three efforts culminated in Department-level agreement to fund urgently needed investments to the ISTFs and open-air ranges to support adequate JSF testing as well as all future fifth-generation tactical fighters and electronic warfare (EW) systems.
- The program is meeting projected fly rates at this stage of test execution with roughly 30 percent of the nearly 73,000 planned flight test points flown mainly in the conservative regions of the test envelope.
- Revisions to the test program and flight test schedule have been made and incorporated into the revised TEMP that is currently in OSD staffing.
- Testing has revealed several issues, many of which are consistent with this level of maturity; the following key issues are being addressed by the program:
  - Helmet Mounted Display System (HMDS) – The Generation II (Gen II) HMDS has deficiencies in five areas that impact flight tests and may delay fielding.
  - Fatigue Life – Testing and analysis identified additional life-limited parts that must now be changed out and redesigned, which places test limits on delivered aircraft.
  - Buffet – The aircraft are experiencing higher-than-predicted buffet during flight test, which impacts resolving the HMDS issues. Flight test has not yet reached the areas where the highest predicted buffet loads may exist.
  - Arresting Hook System (AHS) – Initial arresting system testing has shown the current F-35C design to be inadequate. Risk reduction hook point testing was completed. The redesigned AHS Critical Design Review (CDR) was conducted in February 2013. Additional certification testing will be required above that which is currently planned.
  - Fuel Dump Subsystem – The current fuel dump design has been shown to be ineffective in dumping fuel clear of the aircraft surfaces, resulting in pooling and wetting aircraft surfaces with the potential risk of fire. Minor redesigns to seals are currently in test.
  - Wingtip Vortices – Based on prior operational assessment, the program has conducted additional modeling to assess wingtip modifications, which must still be verified in flight test.



## Joint Lightweight Tactical Vehicle (JLTV)

**Executive Summary:** The JLTV Family of Vehicles is expected to modernize the light tactical vehicle fleet and provide the joint Warfighter with a mobile, lightweight tactical vehicle capable of being transported on rotary-wing aircraft and other lift assets.



The JLTV should provide increased force protection over the current up-armored high mobility multipurpose wheeled vehicle. It will consist of two mission role variants: the combat tactical vehicle (CTV) and the combat support vehicle (CSV), which are expected to possess maximum commonality and a set of mission-specific components to meet the requirements of all mission packages. Mission packages will include the general purpose vehicle, heavy guns carrier, close combat weapons carrier, and utility/prime mover/shelter carrier.

The JLTV is intended to support rapid deployment and offensive operations across the full spectrum of Army and Marine Corps military operations. The JLTV should interoperate in units with other tactical vehicles and weapon systems to provide maneuver, combat power, support, and sustainment at key decision points, and disperse to conduct subsequent operations. It is expected to provide increased force protection, reliability, maintainability, availability, and fuel efficiency over current light tactical wheeled vehicles, while providing similar mobility, net-centricity, transportability, and reduced logistical footprint.

The JLTV program entered the TD phase in December 2007 and underwent DT&E from May 2010 through June 2011. The program entered the EMD phase in August 2012. In August 2012, the Army awarded EMD contracts to three vendors: AM General, Lockheed Martin, and Oshkosh. Each contractor will deliver 22 vehicles (16 CTVs and 6 CSVs) to undergo DT&E beginning in July 2013 and continuing through August 2014. The JLTV program has eight KPPs (mobility, transportability, net-ready, force protection, vehicle survivability, payload, sustainment, and training) and five KSAs (reliability, fuel efficiency, energy efficiency, unit cost, and ownership cost).

### Summary of FY 2012 DT&E Activities

- OSD approved the EMD TEMP in June 2012.
- Contractor shakedown testing of the vehicles will be conducted prior to entering DT.
- Vehicle performance, reliability growth, C4ISR, transportability, and live-fire testing, in addition to a LUT, will be conducted in support of a MS C decision in May 2015.

### Summary of FY 2012 DT&E Program Engagement and Assessments

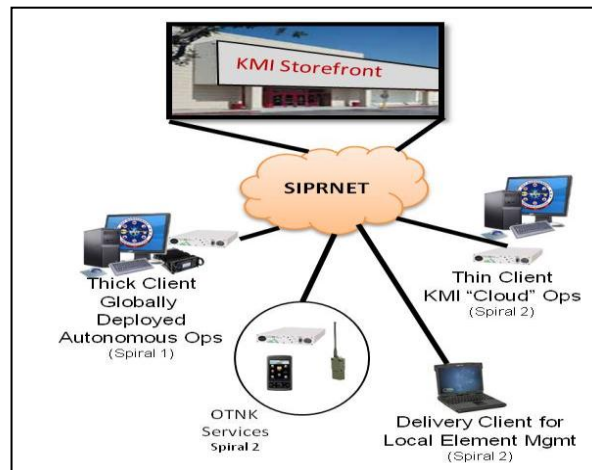
- The TEMP adequately addresses the performance requirements and appropriate T&E planning details for the EMD phase of the program; however, the TEMP assumes that there will be a large amount of design commonality between the CTVs and CSVs.
  - The program is planning to defer interoperability, C4I/EW data architecture, software, data bus, and possibly mobility sand slope testing for the CSV until after MS C with the expectation that CTV testing will provide insight to CSV performance because of vehicle commonality.



- The Army will conduct a design understanding review in the 1st quarter FY 2013. If this review shows significant design differences between the variants, then the test plan may have to be modified before the start of testing and the program may have to provide a TEMP addendum that identifies the required changes to the T&E strategy, test schedule, scope, or resources.
- The JLTV is expected to demonstrate reliability on or above the RGC before MS C. Reliability growth, live-fire, and C4ISR testing are assessed as low risk. For each of the three vendors, CTVs and CSVs will undergo 80,000 miles of reliability growth testing over three phases with two corrective action periods, in addition to a 12,000-mile LUT.
- Vehicle performance and transportability testing are assessed as medium risk. Test results will be heavily dependent on the weight and design characteristics of the vehicles. A curb weight of more than 14,000 pounds or a gross vehicle weight of more than 20,000 pounds will begin to challenge the ability to balance force protection, mobility, and transportability within the required cost constraints.
- Given the performance achieved during the TD phase, DASD(DT&E) recommended that for EMD, the Army develop a lower risk test and reliability growth program by adding reliability test miles and reviewing the reliability requirement.
  - The program responded to this recommendation by eliminating the most complex mission packages (command and control on the move (C2OTM) and special purpose (SP)) and adding two CSV test vehicles and 40,000 test miles during reliability growth testing to lower the risk of the EMD test program.
  - The program also further reduced the reliability requirement to 2,400 mean miles between operation mission failure, which is more in line with the predicted growth potential based on the TD results.

## Key Management Infrastructure (KMI) Capability Increment 2 (CI-2)

**Executive Summary:** The KMI program is a vital element of the DoD defense-in-depth strategy, adopted to ensure the security posture for the Global Information Grid (GIG) by providing transparent cryptographic capabilities consistent with operational imperatives and mission environments. As a critical enabler to the GIG IA strategy, KMI is characterized by the steady rollout of capability increments toward end-state IA objectives consistent with the overarching GIG and cryptographic modernization capability requirements.



The program office submitted a Critical Change Report (CCR) in March 2012 due to the cost and schedule criteria cited in Title 10, U.S.C., Chapter 144. Specifically, the program failed to achieve an FDD within 5 years of first funds being obligated. The program also missed the FDD threshold by more than a year, and program cost has increased by 75 percent. Four review teams were formed and conducted a complete review of the program. As a result of the recommendations from the four teams, the Milestone Decision Authority recertified the program in May 2012. DASD(DT&E) representatives participated on team four, assessing and making recommendations that were included in the final report.

The program completed several rounds of DT and follow-on operational assessments over the course of FY 2012 in preparation for IOT&E. The ADM approving MS C included direction that the program office demonstrate improved software maturity and eliminate high-priority discrepancies prior to beginning IOT&E. The DASD(DT&E) and DOT&E co-signed a memorandum confirming the program had met those criteria in June 2012. The program completed IOT&E in August 2012 and was determined by DOT&E to be not operationally suitable due to deficiencies in system transition, token reliability, software configuration management, Configuration Control Board processes, and help desk preparedness to support operational users. The program office fixed five Category 2 discrepancies noted during IOT&E and conducted validation testing on those fixes in September 2012.

In July 2012, the PMO awarded the next spiral of capability development – Spiral 2. In Spiral 2, the program is transitioning to an agile software development methodology. In doing so, the program is aligning developmental testing with quarterly software releases, which should identify defects much earlier and reduce discovery in the operational test environment.

### Summary of FY 2012 DT&E Activities

- October 7, 2011, DASD(DT&E) signed the KMI CI-2 MS C TEMP.
- March 26–April 6, 2012, JITC conducted regression testing to validate all high-priority discrepancy reports (DRs) (one Priority 1 and 36 Priority 2) identified during OA 2, which was held in August 2011.

- April 17–19, 2012, JITC conducted a token functionality regression test to ensure that the new hardware baseline for the token (to address electrostatic discharge issues) did not affect KMI system functionality.
- September 17–26, 2012, JITC conducted a structured test and verified that all high-priority discrepancies (five Priority 2 DRs) noted during the IOT&E had been corrected.

#### **Summary of FY 2012 DT&E Program Engagement and Assessments**

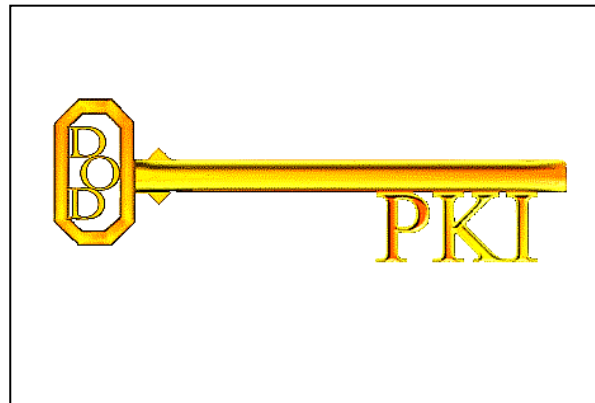
- March 2012, DASD(DT&E) contributed to the CCR assessment that the KMI program office management structure could support agile processes for the next spiral of development and testing.
- June 2012, the DASD(DT&E) and DOT&E certified to the Milestone Decision Authority via joint memorandum that KMI was sufficiently stable and mature to enter IOT&E.
- DASD(DT&E) recommends that:
  - The KMI PMO continue the reliability growth program by tracking/reporting failure modes and then implementing corrective actions to eliminate the identified issues, and complete the recommended power cycling and mechanical insertion testing to determine whether other failure modes are identified.
  - The National Security Agency work with the Services to mature the help desk, Configuration Control Board, and Electronic Key Management System to facilitate KMI transition processes.
  - The KMI PMO, in conjunction with OSD test oversight entities, establish processes to incorporate OSD oversight into agile acquisition processes and deployment decisions.

#### **Assessment of Operational Test Readiness**

- The KMI MS C ADM requested an assessment from DOT&E and the Assistant Secretary of Defense for Research and Engineering regarding the stability and maturity of the KMI program and its readiness to enter IOT&E.
- Developmental and operational regression testing demonstrated fixes to all known Priority 1 and Priority 2 discrepancies with acceptable work-arounds for remaining Priority 3 discrepancies.
- The PM implemented a token reliability growth program and conducted accelerated life testing that showed improved reliability of the redesigned token.
- DASD(DT&E) and DOT&E jointly recommended that the program office add square wave (power cycling) and mechanical insertion tests to maximize user confidence in token reliability.
- June 2012, the DASD(DT&E) and DOT&E certified to the Milestone Decision Authority via joint memorandum that KMI was sufficiently stable and mature to enter IOT&E.

## Public Key Infrastructure (PKI), Increment 2 (Inc 2)

**Executive Summary:** The goal of the DoD-wide infrastructure is to provide PKI capabilities to a broad range of human and non-person entities (NPEs) (devices, applications, processes, etc.) at levels of assurance consistent with operational imperatives. PKI will gradually unfold through the rollout of enhancements based on an evolutionary acquisition strategy in the form of capability increments to meet end-state GIG IA objectives consistent with the overarching DoD identity management and protection requirements.



Spirals 1 and 2 completed IOT&E in September 2011 and were rated effective but not suitable by DOT&E due to lack of end-to-end logistics management. The Milestone Decision Authority authorized full fielding and the acquisition of associated materiel in January 2012 and directed the National Security Agency (NSA) to resolve and retest IOT&E issues. The PMO added inventory logistics support capabilities to aid the Service users in their completion of mandated issuance of Secret Internet Protocol Router Network (SIPRNET) tokens by the end of 2012, but early fielding of that capability without sufficient developmental or operational testing created errors between the Inventory Logistics System (ILS) and Token Management System (TMS) databases that further delayed FOT&E to resolve the continuing suitability problems. Spiral 3 is intended to provide infrastructure improvements and deliver certificate management capabilities for NPEs (e.g., domain controllers, Web servers, and workstations).

### Summary of FY 2012 DT&E Activities

- January 2012, PKI demonstrated the bulk loader formatting capability for SIPRNET tokens and made a limited buy to assist the Services as they ramped up issuance of tokens.
- May–September 2012, DASD(DT&E) supported monthly in-process reviews with the NSA SAE to evaluate PKI progress toward correcting the suitability issues identified in the IOT&E.
- June 2012, DASD(DT&E) and DOT&E provided guidance to the NSA SAE via a joint memorandum requesting a TEMP Addendum to document the T&E strategy to support Spiral 3.
- July 2012, PKI showed basic functionality of the ILS and TMS through a focused demonstration.
- August 2012, the PKI PMO and selected Service participants conducted a limited DT of ILS and TMS interfaces.

### Summary of FY 2012 DT&E Program Engagement and Assessments

- Bulk formatters have been useful in enabling the Services' effort to issue tokens to their operational users. The formatters have shown some minor reliability issues, but they have generally performed as expected.
- The ILS encountered early problems with database synchronization and access to the system for some users. Although no formal Government testing has been completed in FY 2012, the system is in operational use, and the program office has instituted additional procedures to correct database errors generated before the system became operational. Formal OT&E of the ILS slipped to January 2013.

- DASD(DT&E) rated the PKI Inc 2 program as a high risk for an August 2012 DAES review because of the following issues:
  - The post-IOT&E DT program is poorly planned and insufficiently scoped; DT is mostly scripted demonstrations vice functional evaluations; and the program has only informal documentation.
  - The Spiral 3 TEMP Addendum is late and slipping.
  - Initial Spiral 3 DT was delayed and de-scoped due to inadequate planning and lack of Service support and resources; the current Spiral 3 DT will be inadequate to inform FOT&E or FDD.
  - PMO test staff experience and manpower are insufficient to support a MAIS program.
- DASD(DT&E) recommends that:
  - OSD obtain high-level buy-in from Service CIOs to support PKI testing with sufficient resources.
  - NSA clarify the NPE strategy and finalize the Spiral 3 TEMP Addendum and submit it to OSD for approval.
  - The PMO increase the fidelity and stability of the T&E schedule and clearly link T&E activities to program and Service development and fielding activities.
  - The PMO use the T&E WIPT to deliberately plan for and report on DT.
  - NSA assign a Level III T&E certified Chief Developmental Tester to the PKI PMO and increase PMO test manning.
- DASD(DT&E) will continue to work with the PMO to improve the DT program planning, execution, and reporting based on lessons learned from other programs and best practices.

## Theater Medical Information Program–Joint (TMIP-J) Increment 2 (Inc 2)

**Executive Summary:** TMIP-J integrates components of the Military Health System sustaining base systems and the Services' medical information systems to ensure timely interoperable medical support for mobilization, deployment, and sustainment of all theater and deployed forces in support of any mission. TMIP-J enhances the clinical care and information capture at all levels of care in theater, transmits critical information to the theater commander, tracks the evacuation chain for combat and noncombat casualties, and forges the theater links of the longitudinal health record to the sustaining base and the Department of Veterans Affairs. TMIP-J provides information at the point of care and to the theater tactical and strategic decision makers through efficient, reliable data capture and data transmission to a centralized theater database. TMIP-J delivers information support through the electronic health record, integrated medical logistics, patient movement and tracking, and medical command and control through data aggregation, reporting, and analysis tools for trend analysis and situational awareness. TMIP-J uses an open system architecture approach to integrate COTS, Government off-the-shelf, commercial, and non-developmental items.



The TMIP-J Acquisition Strategy encompasses evolutionary acquisition with incremental integration of functionality and time-phased delivery of capabilities in defined increments with scheduled full releases to the Services for TMIP-J deployment in accordance with Service-approved COE. All five KPPs will be verified and validated during the MOT&E scheduled in 3rd quarter FY 2013. The current deployment schedule calls for an FDD in 1st quarter FY 2014, in accordance with the APB approved in January 2012, and full deployment accomplished in 2nd quarter FY 2015.

### Summary of FY 2012 DT&E Activities

- October 26–November 3, 2011, Component System Integration Test (SIT) 5 focused on testing new and existing functionality of individual components.
- March 2–August 24, 2012, Integration SIT 1–5, two phases:
  - Migration testing – verified migration from Inc 2 Release 1 to Release 2 with automated scripts and visual inspection.
  - Regression/new functionality testing – focused on data flow and ensuring end-to-end functionality.
- August 15–24, 2012, Integration System Qualification Test (SQT) – verified key technical and functional system characteristics based upon the essential mission requirements.

### Summary of FY 2012 DT&E Program Engagement and Assessments

- The program successfully completed planned developmental testing; the program is on track and making favorable progress toward MOT&E planned for 3rd quarter FY 2013.
- Release 2 system development was completed; defects found during SQT and SITs were resolved, leaving no unresolved Priority 1 or 2 or cluster 3-level defects.

- The program is proceeding to the next planned GDT event, System Acceptance Test, scheduled during 2nd quarter FY 2013.
- The multi-Service system test team updated the TEMP to reflect changes in program schedule and scope for TMIP-J Inc 2 Release 2; the TEMP is being formally staffed for signatures with an expected completion in 2nd quarter FY 2013.

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## Abbreviations and Acronyms

ABT	air-breathing target
ACAT	Acquisition Category
ACETEF	Air Combat Environment Test and Evaluation Facility
ADM	Acquisition Decision Memorandum
AEDC	Arnold Engineering Development Center
AFB	Air Force base
AFIT	Air Force Institute of Technology
AFOTEC	Air Force Operational Test and Evaluation Center
AIAMD	Army Integrated Air and Missile Defense
AOTR	Assessment of Operational Test Readiness
APB	Acquisition Program Baseline
AS	Acquisition Strategy
ASW	antisubmarine warfare
ATEC	Army Test and Evaluation Command
BLRIP	beyond low-rate initial production
BMDS	Ballistic Missile Defense System
C2	command and control
C4I	command, control, communications, computers, and intelligence
C4ISR	command, control, communications, computers, intelligence, surveillance, and reconnaissance
CAE	Component Acquisition Executive
CDD	Capability Development Document
CDR	Critical Design Review
C-IED	counter-improvised explosive device
CIO	chief information officer
CLM	continuous learning module
CNDSP	Computer Network Defense Service Provider

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## Abbreviations and Acronyms

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COE	Center of Excellence
COMOPTEVFOR	Commander, Operational Test and Evaluation Force
COTS	commercial off-the-shelf
CPD	Capability Production Document
CTEIP	Central Test and Evaluation Investment Program
CTP	critical technical parameter
DAB	Defense Acquisition Board
DACM	director of acquisition career management
DAE	Defense Acquisition Executive
DAES	Defense Acquisition Executive Summary
DAG	Defense Acquisition Guidebook
DASD(DT&E)	Deputy Assistant Secretary of Defense for Developmental Test and Evaluation
DASD(SE)	Deputy Assistant Secretary of Defense for Systems Engineering
DAU	Defense Acquisition University
DAWDF	Defense Acquisition Workforce Development Fund
DAWIA	Defense Acquisition Workforce Improvement Act
DBR	Dual-Band Radar
DISA	Defense Information Systems Agency
DoD	Department of Defense
DoDD	DoD Directive
DoDI	DoD Instruction
DOE	Design of Experiments
DON	Department of the Navy
DOT&E	Director of Operational Test and Evaluation
DT	developmental test/testing
DT&E	developmental test and evaluation
DTM	Directive-Type Memorandum
EHF	extremely high frequency
EMD	Engineering and Manufacturing Development

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## Abbreviations and Acronyms

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EUT	early user test
EW	electronic warfare
FDD	Full Deployment Decision
FFRDC	Federally Funded Research and Development Center
FIPT	Functional Integrated Product Team
FOT&E	follow-on operational test and evaluation
FRP	full-rate production
FY	fiscal year
GDT	Government developmental test
GIG	Global Information Grid
GPS	Global Positioning System
GWEF	Guided Weapons Evaluation Facility
IA	information assurance
IAMD	integrated air and missile defense
ICE	InterTec Cyber Event
IOC	initial operational capability
IOT	initial operational test
IOT&E	initial operational test and evaluation
IPR	In-Progress Review
IPT	Integrated Product Team
IR	infrared
IRCM	infrared countermeasures
ISR	intelligence, surveillance, and reconnaissance
IT	information technology
IT&E	integrated test and evaluation
ITT	Integrated Test Team
IWS	Integrated Warfare Systems
JDIGS	Joint Distributed Infrared Countermeasures (IRCM) Ground System
JIOR	Joint Information Operations Range

## Abbreviations and Acronyms

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JITC	Joint Interoperability Test Command
JMETC	Joint Mission Environment Test Capability
KLP	Key Leadership Position
KPP	key performance parameter
KSA	key system attribute
LRIP	low-rate initial production
LUT	limited user test
LVC	live, virtual, and constructive
M&S	modeling and simulation
MAIS	Major Automated Information System
MDA	Missile Defense Agency
MDAP	Major Defense Acquisition Program
MOT&E	multi-Service operational test and evaluation
MRTFB	Major Range and Test Facility Base
MS	milestone
MSWG	Modeling and Simulation Working Group
MWS	missile warning system
NAS	Naval Air Station
NASA	National Aeronautics and Space Administration
NAVAIR	Naval Air Systems Command
NAWCWD	Naval Air Warfare Center Weapons Division
NDAA	National Defense Authorization Act
NIE	Network Integration Evaluation
OA	operational assessment
OFS	Operational Flight Software
OIPT	Overarching Integrated Product Team
OMS/MP	Operational Mode Summary/Mission Profile
OSD	Office of the Secretary of Defense
OT	operational test

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## Abbreviations and Acronyms

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OT&E	operational test and evaluation
OTA	Operational Test Agency
OTRR	Operational Test Readiness Review
OUE	operational utility evaluation
P&D	Production and Deployment
PAC	Patriot Advanced Capability
PCD	position category description
PDB	post-deployment build
PDR	Preliminary Design Review
PEO	program executive office
PM	program manager
PMO	program management office
RAM	reliability, availability, and maintainability
RDT&E	research, development, test, and evaluation
RF	radio frequency
RFP	request for proposal
RGC	reliability growth curve
RTO	Responsible Test Organization
S&T	science and technology
SAE	Service Acquisition Executive
SATCOM	satellite communications
SE	systems engineering
SES	senior executive service
SoS	system of systems
SSA	space situational awareness
SST	serial streaming telemetry
STAT	Scientific Test and Analysis Techniques
STEM	science, technology, engineering, and mathematics
SUT	system under test

## Abbreviations and Acronyms

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SUW	surface warfare
SYSCOM	systems command
T&E	test and evaluation
TAMD	theater air and missile defense
TD	Technology Development
TEMP	Test and Evaluation Master Plan
TENA	Test and Training Enabling Architecture
TES	Test and Evaluation Strategy
TEWG	T&E Working Group
TFA	Test Functional Area
TRMC	Test Resource Management Center
TSMO	Threat Systems Management Office
TSPI	time, space, position information
UARC	University Affiliated Research Center
UAS	unmanned aircraft system
U.S.C.	United States Code
USD(AT&L)	Under Secretary of Defense for Acquisition, Technology, and Logistics
WIPT	Working Integrated Product Team
WMG	Workforce Management Group
WSMR	White Sands Missile Range



**Department of Defense Developmental Test and Evaluation FY 2012 Annual Report**

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