DEPARTMENT OF DEFENSE
Developmental Test and Evaluation and Systems Engineering

FY 2009 Annual Report

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Response to 10 U.S.C. 139d

Directorate of Developmental Test and Evaluation ∗ Directorate of Systems Engineering

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The Department of Defense Directorates of Developmental Test and Evaluation (DDT&E) and Systems Engineering (DSE) are pleased to submit this report in response to 10 U.S.C. 139d.

This report includes descriptions of DDT&E and DSE activities and oversight functions, assessments of the Military Department and Defense Agency organizations and capabilities, and assessments of Major Defense Acquisition Programs that reached significant milestones or conducted significant developmental test and evaluation or systems engineering activity in FY 2009.

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1 EXECUTIVE SUMMARY

This report responds to 10 U.S.C. 139d, which established the positions of Director of Developmental Test and Evaluation (DDT&E) and Director of Systems Engineering (DSE), reporting to the Under Secretary of Defense for Acquisition, Technology, and Logistics (USD(AT&L)). Section 139d(c) requires a joint annual report by the two directors, stating as follows:

> *(c) JOINT ANNUAL REPORT.—Not later than March 31 each year, beginning in 2010, the Director of Developmental Test and Evaluation and the Director of Systems Engineering shall jointly submit to the congressional defense committees a report on the activities undertaken pursuant to subsections (a) and (b) during the preceding year. Each report shall include a section on activities relating to the major defense acquisition programs which shall set forth, at a minimum, the following:*
> *(1) A discussion of the extent to which the major defense acquisition programs are fulfilling the objectives of their systems engineering master plans and developmental test and evaluation plans.*
> *(2) A discussion of the waivers of and deviations from requirements in test and evaluation master plans, systems engineering master plans, 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.*
> *(3) An assessment of the organization and capabilities of the Department of Defense for systems engineering, development planning, and developmental test and evaluation with respect to such programs.*
> *(4) Any comments on such report that the Secretary of Defense considers appropriate.*

Following this executive summary, Sections 2 and 3 of this report provide an overview of the principal activities and oversight functions of DDT&E and DSE, addressing subparagraphs (c)(1) and (c)(3). These sections outline the duties for DDT&E and DSE as spelled out in DoD policy and include summaries of DDT&E and DSE accomplishments in FY 2009 and plans for future activities.

Sections 4 and 5 of this report provide DDT&E and DSE assessments of the Military Departments and Defense Agencies' DT&E and systems engineering organizations and capabilities, addressing subparagraph (c)(3).

The report concludes in Section 6 with DDT&E and DSE assessments of Major Defense Acquisition Programs (MDAPs) that reached milestones or accomplished significant DT&E or systems engineering activity during FY 2009, addressing subparagraphs (c)(1) and (c)(2).

Appendix E presents a matrix showing traceability from this report to 10 U.S.C. 139d.

Throughout this report, the acronyms DDT&E and DSE may refer to the Director or to the Directorate.

1.1 Director of Developmental Test and Evaluation

The DDT&E is the principal adviser to the Secretary of Defense and the USD(AT&L) on DT&E in the Department. DDT&E reviews and approves the developmental test and evaluation content and issues in the Test and Evaluation Strategy (TES) and the Test and Evaluation Master Plan (TEMP) for each MDAP; monitors and evaluates the developmental test activities of each MDAP and special interest program on the Office of the Secretary of Defense Test and Evaluation (T&E) Oversight List; provides advocacy, oversight, and guidance to the acquisition DT&E workforce; and assesses the DT&E organizations and capabilities of the Military Departments.

In the area of T&E policy and guidance, DDT&E shares responsibility throughout the Department of Defense Instruction (DoDI) 5000.02, "Operation of the Defense Acquisition System," specifically Enclosure 6, Test and Evaluation, and the Defense Acquisition Guidebook Chapter 9, Integrated Test and Evaluation, with the Director, Operational Test and Evaluation (DOT&E).

In FY 2009, DDT&E increased policy and oversight focus on the Technology Development phase and Pre-Milestone B activities, with a goal of strengthening test and evaluation foundation of programs such that there is earlier identification and correction of technical and operational deficiencies. In the recent Defense Acquisition Guidebook update, the TES content now incorporates the statutory test planning for the Technology Development phase, developmental test and evaluation support to technology maturation, and reliability growth test and evaluation. The TES and TEMP content was updated to require planning for integrated test and reliability growth. These documents emphasize an evaluation framework guidance and testing operationally relevant environment with evaluation in a mission context.

In addition to policy updates, DDT&E worked to emphasize the role of test and evaluation in early technology development through several initiatives. These initiatives focused on the need for early involvement by experienced Government DT&E personnel in the requirements process, in the preparation of requests for proposals and contracts, in technology readiness determination, and throughout system development and integration. DDT&E involvement from the onset of a program's development and planning provides opportunities to gain insight into problems and issues as they arise.

In addition, in FY 2009 DDT&E led studies and working groups on Integrated Test Implementation, Information Assurance, Design of Experiments, Software T&E, and Testing in the Joint Mission Environment. The purpose of these studies and groups was to identify gaps and shortfalls in the T&E practice and to identify need to advance the state of T&E.

In the oversight role, DDT&E provides critical technical expertise and advice to support acquisition decisions through program reviews such as Assessments of Operational Test Readiness (AOTRs), directed technical reviews, and participation in Program Support Review (PSRs) and Nunn-McCurdy certifications. DDT&E conducts an independent AOTR for all MDAPs and special interest programs prior to the Component Acquisition Executive's determination of readiness for Initial Operational Test and Evaluation. The impartial evaluation of DT&E progress in a program is important in assisting the USD(AT&L) to make informed decisions during acquisition program reviews. DDT&E is a collaborative partner with DOT&E to ensure that acquisition decisions are supported with the right T&E information. In FY 2010, DDT&E will continue to focus on early and continuous

oversight and involvement by DDT&E personnel. DDT&E also serves as the Functional Leader (FL) for the T&E acquisition workforce. The FL is the subject matter expert in qualifications and education requirements. The Functional Integrated Product Team is a forum that assists the FL in carrying out FL responsibilities. The FL continuously assesses education, training, and certification requirements to strengthen T&E acquisition workforce qualifications.

1.2 Director of Systems Engineering

The DSE is the principal adviser to the Secretary of Defense and USD(AT&L) on systems engineering in the Department. DSE provides systems engineering and development planning guidance to DoD acquisition programs through program support and oversight, as well as through policy and guidance and workforce development advocacy.

DSE interacts with major programs through reviews of their Systems Engineering Plans (SEPs) and subsequent hands-on verification of the viability of that planning through Program Support Reviews prior to milestone events, in support of Nunn-McCurdy certifications, and at the request of USD(AT&L). These reviews, which are conducted on site at Program Offices and contractor facilities, use a detailed program support methodology, the by-product of which is a database of Systemic Root Cause Analysis findings for analysis and root cause determination. This database will be evaluated for use in support of the DDT&E, DSE, and Director, Performance Assessment and Root Cause Analysis (PARCA) initiative to develop joint guidance on performance metrics.

During FY 2009, DSE, in conjunction with DDT&E, conducted formal reviews of 35 programs. Based on the results of these reviews, DSE provided information and recommendations to the USD(AT&L) to inform decision making.

In the area of systems engineering policy, DSE is responsible for systems engineering through DoDI 5000.02 and Enclosure 12, Systems Engineering. The instruction provides systems engineering policy addressing SEP development, systems engineering leadership, and technical reviews. It also provides policies on related systems engineering activities such as configuration management, system safety, data management, and technical data rights. These policies are implemented by comprehensive guidance in the Defense Acquisition Guidebook and associated specialty guides. The policies and related materials support DSE's role as the Functional Leader for training and education of the Systems Planning, Research, Development and Engineering–Systems Engineering/Program Systems Engineer and Production, Quality and Manufacturing acquisition workforces. In FY 2009, DSE published new systems engineering policy and guidance expanding Department efforts in reliability, availability, and maintainability and has begun developing strategies for policy, guidance, and oversight for development planning.

1.3 Assessments of Military Department and Defense Agency Reports

DDT&E and DSE requested that the Military Departments and selected Defense Agencies submit self-assessments to support this report. Sections 4 and 5 present DDT&E and DSE evaluations of these Component self-assessments.

Overall, the DT&E self-assessment reports provided by the Army, Navy, Air Force, and the Missile Defense Agency stated their satisfaction with the current T&E resources. However, these Components are often using people who are either not fully qualified or certified in other acquisition categories to support T&E functions, especially during early acquisition activities. The Components indicated that there are no requests for additional authorities or resources.

The Components are adequately tracking certifications of T&E professionals and report that current training and rewards help to sustain their workforce. DDT&E noted that in the coming year there are significant opportunities for improvements in policy, guidance, and hands-on engagement in the workforce arena. Based on DDT&E's assessment of the Services and Agencies, the focus areas are qualification of resources assigned to early T&E, program engagement opportunities and structure, concerns of in-sourcing T&E personnel, and ensuring the inherently governmental T&E functions are performed by fully qualified Government personnel.

From the perspective of the defense acquisition workforce, the Services all stated to DSE that they are using the available mechanisms and funding vehicles to attract, develop, retain, and reward new developmental test and evaluation and systems engineering personnel. There were no requests for additional authorities or resources.

Initial investigations and discussion by DSE with the Services revealed a range of methods for executing development planning activities by various communities within each Service. Although each Service has development planning practices, the organizational ownership, resourcing, and transfer of pre-Materiel Development Decision and Milestone A knowledge and artifacts are not consistent. Effective development planning will require an institutionalized awareness and exchange among communities involved in systems engineering, planning, analysis, acquisition, science and technology, cost, intelligence, and requirements, throughout all phases of capability development. Development planning capabilities will be a major focus area in DSE's annual assessments of Service and Component capabilities beginning in the FY 2010 report. In FY 2009, DSE established a Director of System Analysis, chartered with development planning, modeling and simulation, and strategic initiatives including system-of-systems systems engineering and system security and assurance.

1.4 MDAP Assessments

The 42 MDAPs reviewed in this document represent those programs in FY 2009 identified for oversight prior to major milestone events or other specific assessment requests. This report discusses how MDAPs are fulfilling their documented objectives; any waivers and deviations from the program documents; and assessments of the DoD organization and capabilities for systems engineering, development planning, and developmental test and evaluation. As a rule, the program assessments are dated as of the end of FY 2009 (September 30, 2009); however, some assessments may include information through the 1st quarter FY 2010 (December 31, 2009).

DDT&E and DSE now are responsible for oversight and select document approval for all MDAPs (including ACAT IC). The Department has a plan to increase the Government and contractor staffs of DDT&E and DSE over the next 3 years to manage this additional oversight workload. The expected result will be an increase in the number of MDAPs addressed in future reports.

ACTIVITIES AND OVERSIGHT FUNCTIONS

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2 DEVELOPMENTAL TEST AND EVALUATION ACTIVITIES AND OVERSIGHT FUNCTIONS

In May 2009, the Department of Defense (DoD) established the new Office of the Director, Developmental Test and Evaluation (DDT&E) under the Director, Defense Research and Engineering (DDR&E) within the Office of the Under Secretary of Defense for Acquisition, Technology, and Logistics (OUSD(AT&L)). DDT&E is the principal adviser to the Secretary of Defense and the USD(AT&L) on developmental test and evaluation for defense acquisition programs and developmental test and evaluation matters across the Department. The Director, DT&E developed an initial staffing plan for DDT&E approved by DDR&E; however, DDT&E will evolve the plan through FY 2010. In addition, DDT&E plans to use in-sourcing initiatives to complete personnel staffing from FY 2010 through FY 2012.

The fundamental purpose of T&E is to provide knowledge to assist in managing the risks involved in developing, producing, operating, and sustaining systems and capabilities. T&E provides knowledge of system capabilities and limitations to the acquisition community for use in improving the system performance, and the user community for optimizing system use and sustainment in operations. T&E enables the acquisition community to learn about limitations (technical or operational) of the system under development, so that they can be resolved prior to production and deployment.

2.1 Policy and Guidance

DDT&E is responsible for policy and guidance for the conduct of developmental test and evaluation in DoD. The DDT&E works closely with the Office of the Director, Defense Procurement and Acquisition Policy and the Office of the Director, Operational Test and Evaluation (DOT&E) to develop formal documentation. The policy and guidance are published in the Defense Acquisition Guidebook and in DoD directives and instructions including the Department of Defense Instruction (DoDI) 5000.02, "Operation of the Defense Acquisition System."

During FY 2009, DDT&E engaged on the above-mentioned policy and guidance development in addition to publishing the guide "Incorporating Test and Evaluation into DoD Acquisition Contracts." In addition, existing documentation includes policy and guidance on test and evaluation (T&E) for joint Military Departments and Agencies to support systems that provide capabilities for missions that must be tested in a joint operational environment. Moreover, DDT&E serves as a Vice Chair to DoD's Testing in a Joint Environment Senior Steering Group, a formal governance body to oversee the implementation of the DoD Testing in a Joint Environment Roadmap.

During FY 2010, DDT&E plans to develop policy and guidance to establish the Office of DDT&E.

2.2 T&E Program Development

DDT&E and DOT&E work together to develop the OSD T&E Oversight List, published each calendar year. This list contains all of the MDAPs and special interest programs that are subject to T&E oversight. DDT&E and DOT&E identify additional programs for the OSD T&E Oversight List

based on a system's interface or criticality with other systems. According to statute and policy, DDT&E reviews and jointly, with DOT&E, approves the Test and Evaluation Master Plan (TEMP) and Test and Evaluation Strategy (TES) for the programs on the OSD T&E Oversight List. DDT&E also coordinates with DSE to ensure developmental test and evaluation activities are integrated and consistent with systems engineering and development planning. In regard to integrated test, DDT&E will require the TES and TEMP to use integrated test as its foundation. In FY 2010, DDT&E will update policy and guidance as required.

In addition, DDT&E communicates and advises with respective Program Offices regarding the quality of test and evaluation, assessments of the weapon systems maturation, capabilities, and limitations, and evaluation of the validity of the TEMP. During FY 2009, DDT&E, through the T&E Working Integrated Product Team (WIPT), provided expertise and support for 76 TEMPs through draft, review, and final approval status.

DDT&E sponsored an Information Assurance study, a Software T&E workshop, and design of experiments initiative in FY 2009. DDT&E also maintained outreach efforts to academia, industry, and technical communities including publishing articles in T&E journals, attending T&E conferences, providing tutorials, and facilitating town hall meetings.

2.3 Major Defense Acquisition Program DT&E Oversight

DDT&E, as a principal adviser, provides T&E expertise to the USD(AT&L) throughout the entire program acquisition life cycle. DDT&E is a collaborative partner with DOT&E and is strengthening that relationship to ensure acquisition decisions are supported with the right T&E information. DDT&E reviews and approves the developmental test content and issues in the program TES and TEMP. The DDT&E provides an impartial judgment for acquisition decisions and technical reviews such as an Assessment of Operational Test Readiness (AOTR). An AOTR assesses the risk associated with the system's ability to meet operational suitability and effectiveness goals, identifies system and subsystem maturity levels, assesses programmatic and technical risk, and provides risk mitigation recommendations.

DDT&E fulfills the monitor, review, and oversight functions and provides advice to the USD(AT&L) through senior OSD meetings. The most critical meeting is the Defense Acquisition Board (DAB) in which DoD's senior leaders meet to advise the USD(AT&L) on decisions concerning MDAPs and special interest programs. At DAB meetings, DDT&E provides independent assessments to the Milestone Decision Authority based on developmental test and evaluation planning, resourcing, execution, and results. The DDT&E is also a principal member of the Overarching Integrated Product Team (OIPT). DDT&E provides T&E oversight and review, through the OIPT, on individual programs as they proceed through the acquisition life cycle.

DDT&E engages with each program through T&E Working Integrated Product Teams (WIPTs). The T&E WIPT is chartered by the Program Manager as early as possible during the Materiel Solution Analysis phase. The purpose of a T&E WIPT is to develop the program's T&E strategy and guide the execution of the T&E program. Membership consists of all stakeholder organizations requiring test data for developmental evaluation, operational evaluation, other required certifications, and the user assessment. The T&E WIPT uses draft and final capability documents, budget

documentation, threat documentation, Technology Development Strategy, Acquisition Strategy, T&E strategies, and detailed evaluation plans.

2.3.1 Program Reviews

DDT&E provides an independent evaluation of a program through T&E expertise to systems engineering and technical reviews, Program Support Reviews, and Nunn-McCurdy certification teams. DDT&E is working together with DSE and supports these reviews to address key issues and risks that need design resolution prior to production.

DDT&E evaluates technical progress against measures of effectiveness, measures of performance, measures of suitability, technical performance measures, concept of operations, critical technical parameters, key performance parameters, early operational assessments, and modeling and simulation (M&S). This T&E-based knowledge can result from component, subsystem, or system-level evaluations. Concentrating on developing maturity-related knowledge earlier in the system life cycle helps identify issues so better informed decisions can be made on technology or design trade-offs.

The primary T&E product at technical reviews is credible knowledge of a system, component, or technology maturity capabilities and limitations. To be credible, this knowledge must be obtained through an objective, disciplined and repeatable process. Decision makers must be able to accept the observed results as factual and representative of actual system capability.

DDT&E conducts an independent AOTR for all MDAPs and special interest programs prior to the Component Acquisition Executive's (CAE) determination of readiness for Initial Operational Test and Evaluation. Our results of the AOTR are provided to the USD(AT&L), DOT&E, and CAE.

2.4 T&E Workforce

The USD(AT&L) designated DDT&E as the functional leader (FL) for the T&E acquisition career field. DDT&E provides the leadership and oversight for T&E acquisition positions, covering workforce career development requirements for approximately 7,800 T&E military and civilian personnel. As the principal adviser and proponent for the T&E community under DoD Instruction (DoDI) 5000.66 ("Operation of the Defense AT&L Workforce Education, Training, and Career Development Program"), the DDT&E is responsible for establishing and maintaining the T&E acquisition workforce education, training, and practical experience requirements. This involves keeping T&E functional and core acquisition competencies current, establishing certification standards, and developing the T&E position category description. In accordance with the DoD Directive (DoDD) 5000.52 ("Defense AT&L Workforce Education, Training, and Career Development Program") the T&E Functional Integrated Process Team (FIPT) supports DDT&E with this oversight, as the Director is the Functional Leader. Members of the FIPT include DoD T&E personnel from Services and agencies, acquisition career managers, and Defense Acquisition University (DAU) T&E curriculum leaders.

2.4.1 Advocacy and Training

During FY 2009, DDT&E updated DAU education and training requirements. In addition, DDT&E validated the AT&L T&E certification requirements for each of the three certification levels for the T&E acquisition workforce personnel: Level I–Entry; Level II–Journeyman; Level III–Advanced.

Also during FY 2009, the DDT&E sponsored the development and incorporation of a new Continuous Learning Engineering and Technology Module (CLE 029) on testing in a joint environment. Furthermore, the DDT&E continued improving the M&S education tools with the potential of incorporating two Naval Post Graduate School M&S Continuous Learning Modules.

As a member of the Defense Acquisition Workforce Senior Steering Board, DDT&E advocates the use of the 2008 National Defense Authorization Act Section 852 funding to sharpen the Department's strategic focus and provide a forum for the acquisition leadership team to thoughtfully deliberate and advance the workforce initiatives. This will allow for more practical hands-on training and mentoring. Although there has been an increase in the T&E workforce, DDT&E's efforts continue to increase the skill level. DDT&E understands the need for more practical T&E developmental courses within the Services to increase the expertise and intellectual capital for the T&E community.

2.4.2 Oversight and Guidance

DDT&E is required to annually certify the accuracy and completeness of the T&E curriculum and certification criteria. DDT&E ensures DAU's T&E curriculum adequately trains and maintains a sustainable T&E workforce. During FY 2009, DDT&E supervised changes to the curriculum and certifications as a result of updates to DoDI 5000.02.

In addition, DDT&E leads the T&E competency assessment effort for the T&E career field as directed by the USD(AT&L). This effort provides direction, guidance, and oversight for a personnel survey of the T&E acquisition-coded positions. The survey includes a framework of required competencies deemed necessary to effectively accomplish the DT&E and OT&E mission in support of the DoD acquisition life cycle process. This effort will continue into FY 2010.

3 SYSTEMS ENGINEERING ACTIVITIES AND OVERSIGHT FUNCTIONS

The Directorate of Developmental Test and Evaluation (DDT&E) and Directorate of Systems Engineering (DSE) were established by restructuring and reorganizing the former Systems and Software Engineering directorate, which previously included developmental test activities and oversight. In the new structure, the Department of Defense (DoD) has located DDT&E and DSE within the Office of the Director of Defense Research and Engineering (DDR&E). The two directorates continue to work closely together and report through DDR&E to the Under Secretary of Defense for Acquisition, Technology, and Logistics (USD(AT&L)) for program oversight matters. DDR&E supports the staffing plan that DSE has in place to be fully staffed over the next 3 years.

Systems engineering is the interdisciplinary application of engineering tools, analysis, and techniques in a systems context. It focuses on defining customer needs and required functionality early in the development cycle, documenting those requirements, and then proceeding with a structured process of design synthesis and system validation while considering the complete problem.[1] Systems engineering discipline provides a focus on continuous improvement through identification and reduction of programmatic and technical risk.

Systems engineering is critical to defense programs because it supports rigorous analysis and coordination of complex system design, development, and production. Systems engineering facilitates the smooth integration of the numerous individual components and subsystems that make up major defense programs. Systems engineering focus areas include operations, performance, test, manufacturing, cost and schedule, training and support, and disposal. Although DDT&E is a separate organization within DoD, testing is part of the systems engineering continuum and plays an essential part in assessing and validating technical risk.

DSE provides objective assessments of program risk for Major Defense Acquisition Programs (MDAPs) and Major Automated Information Systems (MAISs) to support knowledge-based decision making by DoD leadership. MDAPs and MAISs are Acquisition Category (ACAT) I programs,[2] so designated because of their cost or at the discretion of DoD leadership. Under previous policy, DSE

[1] Modified from International Council on Systems Engineering definition, www.incose.org.

[2] ACAT I programs are either MDAPs or designated by the Milestone Decision Authority (MDA) as special interest. MDAPs are either designated by the MDA as MDAPs or have a dollar value estimated by the USD(AT&L) to require an eventual total expenditure for research, development, test and evaluation (RDT&E) of more than $365 million in FY 2000 constant dollars or, for procurement, of more than $2.190 billion in FY 2000 constant dollars. ACAT IA programs are either MAISs or designated by the MDA as special interest. MAIS programs are either designated by the MDA as a MAIS or estimated to exceed: (1) $32 million in FY 2000 constant dollars for all expenditures, for all increments, regardless of the appropriation or fund source, directly related to the AIS definition, design, development, and deployment, and incurred in any single fiscal year; or (2) $126 million in FY 2000 constant dollars for all expenditures, for all increments, regardless of the appropriation or fund source, directly related to the AIS definition, design, development, and deployment, and incurred from the beginning of the Materiel Solution Analysis phase through deployment at all sites; or (3) $378 million in FY 2000 constant dollars for all expenditures, for all increments, regardless of the appropriation or fund source, directly related to the AIS definition, design, development, deployment, operations and maintenance, and incurred from the beginning of the Materiel Solution Analysis phase through sustainment for the estimated useful life of the system. Source: DoDI 5000.02.

supported only those programs designated ACAT ID or ACAT IAM, the subset of MDAPs for which decision authority rests with the USD(AT&L). DSE is now expanding its role to address all MDAPs.

DSE provides systems engineering expertise and leadership in three major areas: program support and oversight, policy and guidance, and human capital. DSE works closely with acquisition Program Offices to support Program Managers, their engineering staff, and their affiliated engineering centers in the technical management of programs and in documenting their management approaches in approved Systems Engineering Plans (SEPs). In all its activities, DSE employs processes intended to reduce the cost, acquisition time, and risk of acquisition programs and to support the ultimate goal of delivering superior capability to the warfighter to prevail in current and future conflicts.

DSE conducts detailed program reviews using a consistent, repeatable methodology (the Defense Acquisition Program Support Methodology) to advise Program Managers on program risk and to provide recommendations to mitigate risk, to inform DoD leadership of risks, and to make recommendations to address risks and issues. Using this consistent review process enables systemic analysis of common issues and the root causes that may be best addressed with new or modified policy and guidance.

Using the insight gained from program support and oversight, DSE works with other DoD organizations, the Components, industry, and academia to improve the Department's systems engineering and development planning policy and guidance. To ensure broad-based application, the DSE works closely with national and international standards organizations to establish or update industry standards that meet the needs of the DoD acquisition managers. Since systems engineering research is often required to support policy and guidance development, DSE established the Systems Engineering Research Center, a University-Affiliated Research Center jointly supported by DSE and the National Security Agency.

In-depth program support and development of policy and guidance require a substantial investment in human capital. DSE works with other Office of the Secretary of Defense offices and Component personnel organizations to identify and attain adequate resources to execute programs and to ensure that curricula for defense training programs and associated public academic institutions reflect the Department's current policy, guidance, and standards.

DSE also provides expertise in specialty engineering and focus areas including software engineering, system assurance, RAM (reliability, availability, and maintainability), and many other areas. The following paragraphs provide further information on DSE activities in the major areas of program support and oversight, policy and guidance, and human capital, as well as a description of selected specialty engineering and focus areas.

3.1 Program Support and Oversight

DSE works with Program Managers responsible for the execution of MDAPs and their supporting teams to promote strong systems engineering in program execution. DSE program support is reflected in five major areas of activity: continuous engagement with programs, SEP review and approval, Program Support Reviews (PSRs), systemic root cause analysis, and tracking of program health metrics.

3.1.1 Continuous Engagement

DSE's ongoing engagement with programs includes participating in program technical reviews, conducting independent PSRs, assisting programs to develop effective SEPs, and participating in Systems Engineering Working Integrated Product Teams (WIPTs) to monitor and provide objective guidance on the program's development. DSE continually seeks ways to improve the communication and effective collaboration between the Department and programs in order to promote a seamless team organization that leverages the expertise available throughout the Department, not only in specialized programs or offices.

3.1.1.1 Technical Reviews

DSE helps shape a program's technical planning and management by participating in the program's technical reviews. The technical reviews to be conducted by a program are tailored and defined in the program's SEP. Standard reviews include but are not limited to the following:

- The System Requirements Review (SRR) confirms whether the user's operational requirements are sufficiently well understood to establish an initial system-level functional baseline.
- The System Functional Review (SFR) (alternatively called System Design Review (SDR)) determines whether the system's functional definition is fully decomposed to its lowest level and that Integrated Product Teams are prepared to start preliminary design.
- The Preliminary Design Review (PDR) assesses the chosen design for each configuration item (hardware and software) and ensures that each function has been allocated to one or more system configuration items.
  - DoDI 5000.02 requires that PDRs be conducted in advance of Milestone B.
  - DSE's participation in the PDR informs the Milestone Decision Authority's assessment of the review, required for Milestone B certification.
- The Critical Design Review (CDR) assesses the final design as captured in product specifications for each configuration item and ensures that each product specification has been captured in detailed design documentation. The CDR is mandatory and informs the Milestone Decision Authority's post-CDR assessment.
- The Test Readiness Review (TRR) determines whether the system is ready to begin Government testing and whether the testing organizations are ready to conduct the tests.
- The Production Readiness Review (PRR) determines whether the design is ready for production and if the prime contractor and major subcontractors have accomplished adequate production planning without incurring unacceptable risks.

In 2009, DSE personnel participated in technical reviews for 20 programs.

Development planning implies a focus on applying systems engineering principles early in the acquisition life cycle. As part of the effort to increase development planning oversight and help shape the program's early technical planning and management prior to Milestone A, DSE will also participate in the Initial Technical Review and the Alternative Systems Review in the future. These

reviews will assess whether the program has performed sufficient technical analysis and robust system trades in preparation for Milestone A.

3.1.1.2 Systems Engineering Plan Development

A program documents its systems engineering and other technical management planning in the SEP. The document should include activities conducted by the Program Manager, the program staff, and supporting functional organizations and is designed to ensure the program properly applies systems engineering policy and guidance. DSE assists Program Managers of MDAPs and MAISs in developing SEPs. The SEP provides an effective means of tracking progress against goals.

In 2009, DSE worked with 21 programs to review initial draft SEPs. DSE also teams with systems engineering centers of excellence to help streamline SEP development by establishing common technical planning and SEP development practices that apply to multiple programs within a Service product line or commodity area. DSE supported the following centers in developing Command-wide systems engineering practice:

- U.S. Army Aviation and Missile Research Development and Engineering Center, Redstone Arsenal, Alabama
- U.S. Army Armaments Research Development and Engineering Center, Picatinny Arsenal, New Jersey
- USAF Space and Missile Center, Los Angeles Air Force Base, Los Angeles, California
- USAF Electronics Systems Command, Hanscom Air Force Base, Massachusetts

3.1.1.3 Systems Engineering Working Integrated Product Teams

DSE participates in program working teams known as Systems Engineering WIPTs, as well as Service functional organizations that support programs with systems engineering processes and resources. The teams strive to aid the technical authority to establish the program's technical strategy and management approach, recording it in appropriate program documentation such as the Acquisition Strategy, the Statement of Work, and the SEP, and monitoring the execution of systems engineering activities. DoDI 5000.02 encourages Program Managers to use the Integrated Product Team approach. DSE works with the Program Offices to help establish Integrated Product Teams and support technical management activities. The SEP identifies the Systems Engineering WIPT as well as the relationships among program teams. In 2009, DSE supported WIPTs for 29 programs.

3.1.2 Systems Engineering Plan Review and Approval

DSE is now the approval authority for all MDAP Systems Engineering Plans. Prior DoD policy required that Program Managers for MDAP ACAT ID and MAIS IAM submit SEPs to USD(AT&L) for review and approval. The DSE has assumed responsibility for approving SEPs for MDAPs and IAM programs. The expansion to all MDAPs is a significant workload increase and is being phased in as staff and resources are increased. In 2009, DSE reviewed 22 and approved 16 SEPs.

3.1.3 Program Support Reviews

3.1.3.1 Overview

Program Support Reviews are a means to inform the Milestone Decision Authority, the Overarching Integrated Product Team, and the Program Office of the status of program technical planning and management processes. The reviews identify cost, schedule, and performance risk and recommendations to mitigate those risks. DSE leads the PSRs and builds teams of experts appropriate to the program and situation. Teams include persons from DSE, other Department offices, and independent subject matter experts, as needed.

DSE plans PSRs for ACAT IDs and IAMs to support pending Defense Acquisition Boards or at other times as directed by the USD(AT&L), and in response to requests from Program Managers. Full assessments are conducted 9 to 12 months before each acquisition milestone. Detailed findings, risk areas, and recommendations are provided solely to the Program Management Office. These assessments are conducted in collaboration with the Program Management Office rather than entirely from an oversight perspective.

DoDI 5000.02 requires DSE to conduct PSRs on all ACAT ID and ACAT IAM programs and as directed by USD(AT&L) or requested by Program Managers. DSE also conducts PSRs on MAIS ACAT IAMs as required by DoDI 5000.02. In 2009 DSE conducted 11 PSRs.

Quick-Look Reviews

Quick-look reviews are conducted 2 to 3 months before the acquisition milestone, using the same methodology as a full assessment but tailored to focus on a specific issue or to accommodate a time constraint. They are conducted as a "for record" review to support the Defense Acquisition Board. Quick-look reviews provide an efficient way to assess a program's status and identify potential problems, without the investment of a full review.

Development Planning Reviews

The development planning oversight process will foster engagement in activities preceding and following milestone decisions. Activities will include systems engineering engagement before the Materiel Development Decision and in the Analysis of Alternatives (AoA) and post-AoA engineering analysis activities. These activities offer an opportunity to review and guide development planning as a part of the independent oversight preceding key decisions. Activities may include a development planning PSR conducted by a team of individuals with appropriate scientific, technical, and programmatic knowledge.

3.1.3.2 Defense Acquisition Program Support Methodology

DSE established certain imperatives for the conduct of program reviews. All programs must be treated equally; all assessments must be objective; reviews must use multi-disciplinary, cross-functional teams; and reviews cannot rely solely on the experiences and expectations of acquisition

experts. To comply with these principles, DSE established the Defense Acquisition Program Support (DAPS) Methodology.

The methodology supports PSRs as well as Non-Advocate Reviews and other independent reviews such as those to inform Nunn-McCurdy breach certifications. The methodology consists of a robust list of questions concerning programmatic and technical areas, sub-areas, and factors. The list is broad in scope but includes enough detailed questions to enable application to programs regardless of product line, commodity, program size, or lead Service.

The methodology is intended for use at all phases of design, development, production, and deployment. Specific criteria and focus questions pertain to programs approaching their respective milestone A, B, or C. The methodology is tailorable to enable quick-look assessments as well as more comprehensive milestone decision assessments. The current DAPS Methodology is available to all DoD activities and the public at www.acq.osd.mil/sse/docs/DAPS_V2.0_Methodology.pdf.

DAPS Methodology Updates

In the current version of the DAPS Methodology and in other systems engineering assessment methodologies, the subject of integration risk is embedded within review elements of programmatics, technical specialties, engineering management, and systems engineering processes. The updated DAPS structure specifically addresses life cycle management, sustainment, RAM, and overall suitability as part of the program review. DSE has initiated an analysis to establish conceptual integration readiness definitions and standards. The effort builds from earlier work by the U.S. Air Force and will be tested in pilot programs in 2010.

As this effort continues, DSE will update the DAPS Methodology to provide knowledge-based standards to address integration risk to meet the requirements of this statute. Similarly, as development planning policy, guidance, standards, and best practices are developed, DSE will incorporate additional development planning evaluation areas in the DAPS Methodology.

3.1.4 Systemic Root Cause Analysis

The consistent review process using the DAPS Methodology allows the DSE to conduct systemic analysis of common issues and their root causes, which are often best addressed through new or modified policy and guidance. Using the insight gained from continuous program engagement and root cause analysis, DSE works with other DoD organizations, the Components, industry, and academia to improve the Department's systems engineering policy and guidance.

Soon after initiating the PSR process, DSE recognized patterns of common findings emerging from multiple reviews. This led to the development of DSE's Systemic Root Cause Analysis (SRCA) process. DSE analysts created a database to capture positive, neutral, and negative findings from all reviews conducted to date. Analysis has demonstrated that many PSR findings could have multiple root causes and a single root cause could drive issues that appear in multiple findings. SRCA allows researchers and analysts to identify root causes of recurring program issues and in turn develop effective recommendations that go beyond just treating symptoms.

3.1.4.1 Root Cause Study

Using the DSE SRCA data, in 2008 the Systems Engineering Division of the National Defense Industrial Association (NDIA) conducted a major root cause study, which led to recommendations for changes in policy, guidance, and workforce development. The full report, "Report on Systemic Root Cause Analysis of Program Failures," was released December 2008 by the NDIA Systems Engineering Division in conjunction with the OUSD(AT&L) Systems and Software Engineering/ Assessments and Support (now Systems Engineering/Major Program Support). The report is available at http://www.ndia.org/Divisions/Divisions/Systems Engineering/Documents/Studies. DSE will be involved in evaluating the SRCA database for potential support to the Director, Program Assessment and Root Cause Analysis.

3.1.5 Program Health Metrics

DSE measures program health through the fact-based PSRs and continuous program engagement discussed above. The program assessments contained in this report (Section 6) reflect the findings of PSRs. To fully monitor program health, the Department needs additional predictive measures that can be applied across programs and reported through the Services to the Office of the Secretary of Defense without placing additional burdens on the Program Managers.

DSE is conducting a pilot project to develop these metrics. The study is based largely on work by Quality Software Measurements, the Software Engineering Institute, NDIA's Survey of Systems Engineering Effectiveness, and the International Council on Systems Engineering and MIT's Systems Engineering Leading Indicators Study.

3.2 Policy and Guidance

3.2.1 Policy

3.2.1.1 DoD Instruction 5000.02

DSE is responsible for the systems engineering content of DoDI 5000.02, which includes Enclosure 12, Systems Engineering. This enclosure provides programs with systems engineering policy addressing the SEP; systems engineering leadership; technical reviews; configuration management; environment, safety, and occupational health requirements; corrosion prevention and control; modular open systems approach; data management and technical data rights; Item Unique Identification; and spectrum supportability. These integrating technical processes are intended to define and balance system performance, cost, schedule, and risk within a program and within a family-of-systems and systems-of-systems context. Department policy requires that systems engineering be embedded in program planning and support the entire acquisition life cycle.

Significant changes in the December 2008 DoDI 5000.02 update include applying systems engineering disciplines earlier in the acquisition cycle, using prototypes in the Technology Development phase, and mandatory Preliminary Design Reviews and Critical Design Reviews with associated reports and independent assessments. The December 2009 Directive Type Memorandum adjusted and strengthened these new policies.

3.2.1.2 Development Planning

Acquisition requires a balance. Programs must accept some risk in order to proceed with prototypes that have a likelihood of meeting the stated requirements. On the other hand, there is always a chance that a project includes problems that do not surface until the Department has made a considerable investment in a technology or system. Development planning implies a focus on establishing facts earlier in the acquisition life cycle to avoid allowing programs to progress too far through development before identifying critical problems. Development planning is intended to provide the greatest ability to manage risk and maintain the balance of investment to realistic expectations. DSE supports the Department's rebuilding the practice of development planning within the Services, enabling more robust systems analysis to inform and support more disciplined, predictable, and effective acquisition processes. According to the National Research Council's 2008 Report on Pre-Milestone A Systems Engineering, up-front analysis and systems engineering should improve the understanding of trade space, technical feasibility, and risks of proposed solutions; inform the development of requirements; support development of cost and schedule estimates; and result in better informed decisions. Development planning encompasses early systems engineering.

Initiatives

DSE is engaged with the development planning communities to discuss the exchange and use of each community's products and the leveraging of their activities and competencies to implement development planning across the Department. In addition, DSE has collaborated with other offices in the Department to publish the Weapon Systems Acquisition Reform Product Support Assessment (WSAR-PSA) Report, which addresses key life cycle management and sustainment enablers. WSAR-PSA implementation activities complement existing DoD initiatives in acquisition reform, including the initiatives described in this report. The USD(AT&L) has directed greater specificity in policy and guidance documents such as the Defense Acquisition Guidebook on coverage of life cycle management and sustainment. Under consideration is guidance amplification primarily for the Life Cycle Sustainment Plan and secondarily, the SEP.

DSE has established a Director, System Analysis, chartered with development planning, systems engineering research, modeling and simulation, and strategic initiatives such as systems engineering for systems of systems and system security against malicious actors, to include cyber threat. This directorate has developed a plan for approaching development planning and has initiated research and outreach activities. Among the activities currently in progress, DSE has contracted a study team to visit product centers across the Military Services where development planning activities occur to ascertain how the process currently takes place.

Initial investigations and discussion with the Military Services have revealed a range of methods for executing development planning activities by communities within each Service. Although each Service has development planning practices, the organizational ownership, resourcing, and transfer of pre-Materiel Development Decision and Milestone A knowledge and artifacts are not clear. Effective development planning will require an institutionalized awareness and exchange among communities involved in systems engineering, planning, analysis, acquisition, science and technology, cost, intelligence, and requirements, throughout all phases of capability development.

Development planning capabilities will be a major focus area in DSE's annual assessments of the Components.

3.2.2 Guidance

3.2.2.1 Defense Acquisition Guidebook

The Defense Acquisition Guidebook is the Department's handbook providing guidance to Program Managers and their supporting staffs and organizations to comply with defense acquisition policy. The DSE is responsible for the guidebook's Chapter 4, Systems Engineering. This chapter facilitates compliance with mandatory systems engineering direction outlined in DoDI 5000.02. The chapter provides the definition of systems engineering accepted by the Department, outlines DoD guidance on systems engineering, and explains expectations for completing the SEP. The chapter describes standard systems engineering processes and how they apply to the DoD acquisition system. It also addresses the systems engineering principles that a Program Manager should apply to achieve a balanced system solution. The next update will include interim guidance on development planning. The current Defense Acquisition Guidebook is available through the Defense Acquisition University (DAU) Web site, http://www.dau.mil.

3.2.2.2 Systems Engineering Plan Preparation Guide

DSE is responsible for the SEP Preparation Guide. This guide is applicable to all acquisition category programs and to each component of a system: hardware, software, support, operations, training, life cycle management, and sustainability. It is available to all DoD personnel and the general public and can be found at http://www.acq.osd.mil/sse/docs/SEP-Prep-Guide.pdf.

The SEP Preparation Guide is derived from published Government and industry policy, guidance, standards, and best practices and clarifies SEP content expectations. The guide presents a sample SEP format and suggests details to include, and sources to consult, for specific SEP material.

The SEP describes the program's overall technical approach, including key technical risks, processes, resources, roles and responsibilities, metrics, and applicable performance incentives. As applicable, a program's SEP is expected to describe all design considerations that may affect a system's design, such as: corrosion control and prevention, safety, interoperability, quality, producibility, RAM, supportability, life cycle sustainment, and ownership cost. The SEP should also detail the timing, conduct, and entry/exit/success criteria of each planned technical review as well as how systems engineering will integrate with program management efforts. SEP Preparation Guide Version 3.0 is planned for release in 2010.

3.2.3 Standards

DSE is responsible for Defense Standardization and the encompassing DoD Instruction 4120.24, which implements the Defense Standardization Program (DSP). The goals of the DSP are to improve operational readiness, reduce cycle time, and reduce total ownership costs. To this end, DSE provides centralized management of the DSP through the issuance of DoD-wide policies,

procedure, guidance, and oversight. The execution of the program is assigned to the DoD Components, which are collectively referred to as Standardization Management Activities. The DSE chairs the Standardization Council, which includes representatives from the Standardization Management Activities of all Services and Components.

DSE has recently participated in updating or adopting the following commercial, industrial, and military standards:

- ISO/IEC 15288:2008, Systems and software engineering–System life cycle processes
- ISO/IEC 12207:2008, Systems and software engineering–Software life cycle processes
- ISO/IEC 26702:2007, Systems engineering–Application and management of the systems engineering process [IEEE 1220:2005]
- ISO/IEC 16085:2006, Systems and software engineering–Life cycle process–Risk Management
- ISO/IEC 15939:2007, Systems and software engineering–Measurement process
- GEIA-Std-0009, Reliability Program Standard for System Design and Manufacturing
- GEIA-Std-0007, Logistics Product Data
- GEIA-649, Configuration Management (update in progress)
- GEIA-859, Data Management
- MIL-STD-189A, Reliability Growth Management (in review)
- MIL-STD-882D, Standard Practice for Safety (update in progress)
- MIL-STD-881, Work Breakdown Structure (update in progress and converted from a handbook to a standard)
- MIL-STD-31000D, Technical Data Package (update in progress and converted from a detailed specification to a standard)
- MIL-HDBK-217, Reliability Prediction of Electronic Equipment
- DI-SESS-81785, SEMP Data Item Description (DID) (approved)

All DoD MIL-STDs are available via the ASSIST database located at https://assist.daps.dla.mil/online/start/.

3.2.4 Other Policy and Guidance

Other policy and guidance exists to provide further detail on many areas within or related to systems engineering, including modeling and simulation, system assurance, program protection, RAM, and specialty engineering processes such as configuration management, data management, risk management, safety, and security. DSE is responsible for, or provides significant contributions to, the policy and guidance listed in Table 3-1.

Table 3-1. Systems Engineering and Security Policy and Guidance

Systems Engineering and Security Policy and Guidance	
• Systems Engineering Plan (SEP) Preparation Guide • DoD Modeling and Simulation Management and Modeling and Simulation Guidance • DoDD 5000.59, DoD Modeling and Simulation Management • DoDI 5000.61, DoD Modeling and Simulation Verification, Validation, and Accreditation • Reliability, Availability, and Maintainability Guide • Reliability, Availability, Maintainability, and Cost Rationale Report Manual • Configuration Management Handbook 61A • Work Breakdown Structure Handbook 881 • Risk Management Guide • Safety/Environmental, Safety and Occupational Health Guides • MIL-STD-882D, Standard Practice for System Safety • Guide for Integrating Systems Engineering into DoD Acquisition Contracts • Systems Engineering Guide for Systems of Systems	• Integrated Master Plan/Integrated Master Schedule Guide • DoDI 5200.39, Program Protection Plan • Engineering for System Assurance • DTM 08-048, Supply Chain Risk Management • Program Protection Plan Preparation Guide (in development) • CPI Security Classification Guide • CPI Identification Tool • Program Protection Contract Language Compendium • DoDD 3222.3, EW and C2W Countermeasures • DoDD 8500.01E, Information Assurance • Interoperability and Supportability of IT and NSS DoDD 4630.05 • Acquisition Security-Related Policies and Issuances Tool • Technical Review Guide • Data Management Guide • Modular Open Systems Architecture Guide

3.2.5 Joint Requirements Oversight Council

DSE is working to further the inclusion of systems engineering in the process the Joint Requirements Oversight Council (JROC) uses to establish joint military requirements. DSE will facilitate the engineering analysis of potential system solutions during the Materiel Solution Analysis phase in conjunction with and following the Analysis of Alternatives. During the Technology Development phase, DSE will identify and reduce the technical risk of the proposed solution through a series of key activities, assisting with the maturation of system requirements and the identification of cost and schedule delays caused by technical barriers.

In validating the system requirements through the Capability Development Document, the JROC needs to understand if the technology and design of the proposed solution supports the achievement of the proposed user needs, given cost and schedule projections and current technical capabilities. The acquisition community, through the systems engineers, must identify the cost, schedule, and technical risks of pursuing that option.

DSE is working toward policy and guidance updates that will require systems engineering involvement following the Materiel Development Decision, to enable programs to understand and validate the engineering considerations of the Analysis of Alternatives. Systems engineering involves identifying the critical technology elements and key design risks. Knowing these, the program can more precisely target, identify, and mitigate risks during the Technology Development phase and can more effectively inform the JROC of the technical feasibility of the proposed solution. With this increased insight, the JROC will be able to perform more informed trades in considering system performance against cost and schedule.

As a result, this process should reduce the risk of investing in technically immature solutions driven by requirements that turn out to be unachievable at Milestone B. DSE will provide the JROC with the necessary technical foundation to support JROC review and approval of the Capability Development Document to produce a set of system requirements that are realistically achievable within the current technical capabilities of the acquisition system.

3.3 Human Capital

Strong policy, guidance, and standards require a substantial investment in human capital to ensure their implementation. DSE works with OSD and Component personnel organizations to identify and attain adequate resources to execute programs and to ensure that curricula for both defense training programs and public academic institutions reflect the Department's current policy, guidance, and standards. DSE will establish procedures for overseeing Military Department organizational capability to conduct development planning and systems engineering. Areas of review will include Service policies, processes, and governance procedures; resource allocation; workforce education and training; and overall organizational performance metrics. DSE will perform assessment activities annually across Service commands and centers to review and assess systems engineering and development planning capability, to review baseline and implementation plans to achieve those requirements where there may be deficiencies, and to assess the progress of the plan in working to achieve full compliance.

3.3.1 Resources

Through Systemic Root Cause Analysis, evidence shows that staffing shortfalls (numbers, skill, and experience) lead to adverse acquisition consequences specifically in the areas of requirements, planning, execution, and expectations. Recent analysis of more than 60 MDAPs shows that the highest-ranking leading systemic issue in today's programs relates to staffing. Two other leading systemic issues also relate to staffing and expertise. Frequently occurring negative findings related to human capital include the following:

- Marginal Program Office staffing (#1 Systemic Issue)
- Program Offices lack experts in acquisition or related specialties
- Program Offices find it difficult to bring in and retain highly qualified staff

Approximately 25 percent of the recommendations developed by a joint Government-Industry Task Group in 2008 related to human resource/capital and specifically focus on ensuring an adequate

number of personnel, the appropriate skill mix, and the required amount of experience to properly staff, manage, and execute an acquisition program.

3.3.2 Workforce Advocacy, Oversight, and Guidance

Ensuring that quality systems engineering, development planning, and life cycle management and sustainability are practiced within the DoD requires a highly skilled and competent workforce. In accordance with DoDI 5000.66, "Operation of the Defense Acquisition, Technology, and Logistics Workforce Education, Training, and Career Development Program," USD(AT&L) is charged to designate a Functional Leader for each acquisition career field. Functional Leaders play a critical role in advising and supporting the USD(AT&L) in implementing career development policies and procedures, including education, training, and experience requirements and certification standards for civilian and military personnel in the acquisition, technology, and logistics workforce.

The Functional Leaders serve as the subject matter experts relating to qualifications and career development requirements for their assigned career fields and serve as the proponents and advocates for the interests of their respective functional community. The Functional Leaders annually verify the accuracy and currency of Position Category Descriptions and the career field/path certification requirements. In addition, they verify currency and the technical accuracy of the DAU certification courses. The Director of Systems Engineering serves as the Functional Leader and principal advocate for the acquisition workforces assigned to the Systems Planning, Research, Development, and Engineering–Systems Engineering and Program Systems Engineer (SPRDE-SE/PSE) career paths and the Production, Quality, and Manufacturing (PQM) career field. There are currently 36,704 military and civilian personnel in the SPRDE-SE/PSE career paths and 9,023 in the PQM career field.

3.3.2.1 Functional Integrated Product Teams

In accordance with the Functional Leader Charter, the Functional Leader is charged to establish a Functional Integrated Product Team (FIPT) and to designate a FIPT Chair. The FIPT assists the Functional Leader in carrying out responsibilities as stated in the charter. Membership of the FIPT is also designated in the charter and consists of functional and career management representatives from each Service and relevant DoD Agency, functional experts from DoD components as determined by the Functional Leader, including members of the Product Support Manager community, and the DAU Program Director for the functional area. In particular, members of the SPRDE-SE/PSE FIPT and Life Cycle Logistics FIPT work together on several initiatives and participate in each other's FIPT meetings. For example, these two communities are currently collaborating with other career fields on the development of executive-level competencies for key leader professional development under the auspices of the Acquisition Management Functional Group.

The FIPTs' mission is to support and provide recommendations to the Functional Leaders regarding their assigned career fields within the acquisition workforce. As appropriate, a Functional Leader may task the FIPT to perform support activities and may direct the work of the FIPT. Advisers to the FIPT may be invited by the FIPT Chair on an ad hoc basis depending on the needs of the Functional Leader and FIPT. The FIPTs are also responsible for annually verifying the accuracy and currency of Position Category Descriptions and the career field/path certification requirements for the

Functional Leader. In addition, they verify currency and the technical accuracy of the DAU certification courses.

3.3.2.2 Systems Engineering Competencies and Education

An effort is under way to assess the competencies of the current SPRDE-SE/PSE-coded workforce. The purpose of this assessment is to define the observable, measurable pattern of skills, knowledge, abilities, behaviors, and other characteristics needed to successfully perform on the job. Broad participation of the systems engineering workforce will help us improve workforce development by identifying the expertise needed to provide quality capabilities to the warfighter.

To ensure systems engineering workforce members understand the importance of life cycle management and sustainability functions, the SPRDE-SE/PSE certification standards require DAU courses in these areas. For example, the required continuous learning module Designing for Supportability in DoD Systems provides a comprehensive overview and introduction to incorporating the principles of systems engineering throughout the system life cycle to design, develop, produce, and sustain operationally reliable, supportable, and effective systems. This module also emphasizes the essential link between overall weapon system operational effectiveness and product support performance. The SPRDE-SE/PSE FIPT members and the Product Support Manager community plan to update the DAU systems engineering curriculum to include additional course content on Ownership Cost (life cycle affordability) and sustainment.

Civilian university offerings in systems engineering have expanded steadily over the past decade. The International Council on Systems Engineering (INCOSE) directory of systems engineering academic programs lists 112 programs in 15 countries offering a mix of bachelor's, master's, doctoral, and certificate programs in systems engineering and systems engineering management. Seventy-two of those programs are in the United States with more than 30 offering a bachelor's degree. Therefore, in collaboration with the U.S. Air Force Academy, DSE is sponsoring the first of its kind workshop on U.S. undergraduate programs in systems engineering in spring 2010. The purpose of this workshop is to (1) analyze the current state of bachelor's degree programs in systems engineering across the United States, (2) explore where those programs are headed, and (3) propose actions that could be taken by academia, industry, and Government to strengthen the value those programs offer to students, universities, employers, and the Nation.

The three supporting goals of this workshop are to (1) explore the characteristics, successes, and challenges of U.S. bachelor's degree programs in systems engineering; (2) develop high-level proposals for how to reinforce the strengths of those programs and address their challenges, increasing their value to students and prospective employers in a way that is practical in today's challenging educational environment; and (3) build a sense of community among U.S. faculty who operate undergraduate systems engineering programs in order to facilitate future exchanges of information and willingness to work together to refine and implement the high-level proposals developed by the workshop attendees.

DSE is also working with professional organizations such as INCOSE and NDIA. For example, DSE representatives worked with a team of INCOSE members to provide an Acquisition extension to the INCOSE Certified Systems Engineering Professional (CSEP) certification. In addition to the

requirements for the CSEP certification, achieving this Acquisition extension requires that the candidate demonstrate understanding of the DoD systems engineering competencies as described in Chapter 4 of the Defense Acquisition Guidebook and taught in the DAU Systems courses SYS 101 Fundamentals of SPRDE and SYS 202 Intermediate SPRDE. DAU has granted equivalency status to the INCOSE CSEP-Acquisition certification for these courses. This means that anyone who achieves this certification also receives credit for these two courses.

Within the Systems Engineering Division of NDIA there is an Education and Training Committee. This committee is co-chaired by a representative each from DSE, DAU, and industry. The purpose of this committee is to strengthen systems engineering capabilities through education, training, and experience opportunities across the Government, industry, and academia sectors. DSE recently tasked this committee to identify industrial base workforce challenges and to determine how to best attract, foster, and develop future DoD engineering leaders.

In summary, raising the bar for the systems engineering workforce through education, training, and experience applies not only to individuals working for the DoD but to workforce members from the industrial and academic communities as well. The DSE strategy is to include these partners as we execute our strategic plan for the workforce.

3.3.3 University-Affiliated Research Center

In 2008, DoD awarded a 5-year contract following full and open competition to establish the university-affiliated Systems Engineering Research Center (SERC). Stevens Institute of Technology leads the center and draws on senior researchers from 18 academic institutions across the United States. The center focuses on systems engineering methods, processes, and tools to better develop and acquire weapons platforms, major defense systems, systems of systems, and network-centric and enterprise systems. Table 3-2 lists several research tasks currently under way.

Table 3-2. Systems Engineering Research Center Tasks

Title of SERC Research Task	Description
Systems Engineering Body of Knowledge (BoK) and Graduate Reference Curriculum	Establish an authoritative BoK in systems engineering (SE) and establish a broad, consensus-based reference curriculum for an SE master's degree based, in part, on the BoK.
Modular Reconfigurable Architecture for Tailored Rapid Systems Engineering Knowledge Dissemination	Investigate architectures and establish a capability to rapidly generate and distribute tailored systems engineering artifacts.
Graphical CONOPS Development Environment for Agile Systems Engineering	Perform research in how to quickly and graphically articulate a concept of operations (CONOPS) for new missions, business processes, and feature sets to realize a shared mental model and understanding of the mission, and potential solutions across a set of diverse stakeholders.
Developing Systems Engineering Technical Leadership	Research, synthesize, and validate curriculum content and structure for future DoD SE senior leaders and executives.
Systems Engineering Implications of Evolutionary Acquisition	Identify next-generation DoD life cycle SE process needs and associated infrastructure support that will enable future DoD systems to be more cost-effectively developed and more rapidly adapted to changing mission needs.
Software Intensive Systems Data Quality and Estimation Research in Support of Future Defense Cost Analysis	Establish measures and methods for assessing software-intensive systems to enhance systems engineering insight and assessment.
Security Engineering	Develop a 3-year roadmap for research that will significantly improve security engineering, as an integral part of the systems engineering process, focusing on security definitions, metrics, framework, human capital, and methods/tools.
Systems Engineering Methods, Processes, and Tools for Agile Development of Network-Centric Systems	Determine which methods, processes, and tools can most improve agile development of network-centric systems, and what research remains.
Systems Engineering Transformation	Develop a 3-year roadmap to transform the SE discipline.

The research center consortium proposed and selected in open competition includes the following institutions:

Lead Organizations:

- Stevens Institute of Technology
- University of Southern California

Members:

- Auburn University
- Air Force Institute of Technology
- Carnegie Mellon University
- Fraunhofer Center at University of Maryland

- Georgia Institute of Technology
- Massachusetts Institute of Technology
- Missouri University of Science and Technology
- Naval Postgraduate School
- Pennsylvania State University
- Southern Methodist University
- Texas A&M University
- Texas Tech University
- University of Alabama in Huntsville
- University of California at San Diego
- University of Maryland
- University of Massachusetts
- University of Virginia
- Wayne State University

3.4 Specialty Engineering and Focus Areas

Though not directly responsible for policy, guidance, and human capital for specialty engineering activities, DSE must advocate for these areas because systems engineers are responsible for incorporating specialty engineering functions on defense programs. DSE works closely with other OSD organizations and the Services in areas such as software engineering, system assurance and program protection, open systems, safety, reliability, data management, configuration management, and value engineering. Reliability improvement has been a major focus area in the past 2 years.

3.4.1 Reliability, Availability, and Maintainability

In response to reports from the Government Accountability Office, the Defense Science Board, and the Reliability Improvement Working Group, DSE has taken a four-part approach to improve RAM in acquisition programs:

- Policy and Guidance
- Practice and Programs
- Tools and Education
- Communication

Policy and Guidance: Updates to policy (DoDI 5000.02, CJCS I/M 3170.01, and the RAM Policy Memo of July 21, 2008) and issuance of the RAM-C (Cost) Rationale Report Manual and guidance have been completed. Reliability "Way-Forward" meetings with all DoD stakeholders and evaluation and implementation of best practices from all available sources began in 2009 and are continuing to focus the Department's approach to RAM. DSE and other AT&L stakeholders are staffing ongoing updates to the Defense Acquisition Guidebook based on the aforementioned policy changes and continued implementation of best practices.

Practice and Programs: DSE has increased the focus on RAM and Supportability in PSRs. DSE provides direct support to programs through RAM technical interchange meetings and events. RAM content is included in Systems Engineering Forums, and coordination of RAM policy implementation with DoD stakeholders (e.g., DDT&E, DOT&E, Logistics and Materiel Readiness, the Services) is ongoing. Other activities include evaluations required by the annual report to Congress, the DOT&E-sponsored study on the effects of policy change, and implementing the Reliability Improvement Working Group recommendation to rebuild the inherent DoD capability in RAM.

Tools and Education: Implementation of the Army Reliability Scorecard, updating the Defense Acquisition Program Support Methodology to include Sustainment-specific (RAM and Supportability) assessment criteria, participation in the development of the new ANSI/GEIA-STD-0009 Reliability standard, creation of the reliability best practices matrix, and updates for RAM to the DAU curriculum and special interest area Web site are complete. A comprehensive RAM course is under development by the Systems Engineering and Life Cycle Logistics FIPTs.

Communication: To promote communication, DSE uses proactive outreach efforts to ensure the entire stakeholder community has the opportunity to understand what the DoD RAM policies are and what the stakeholder needs to do to satisfy the requirements. DSE participates in industry conferences, PSRs, and technical interchange meetings. DSE personnel with RAM expertise have written numerous articles for RAM-themed publications and deliver presentations at conferences for which RAM is of special significance.

3.4.2 Including Systems Engineering and Reliability Provisions in Requests for Proposal

All requests for proposal (RFPs) should address the program's plans for systems engineering and reliability growth. The Department is considering new policy to make certain reliability requirements mandatory in future RFPs. DSE participates in AT&L peer reviews for RFPs for major programs.

The Director, Defense Procurement and Acquisition Policy, organizes review teams and facilitates pre-award and post-award Peer Reviews for all service contracts with an estimated value of $1 billion or more (including options). Teams include senior contracting leaders from across DoD, as well as members of the Office of General Counsel who are civilian employees or military personnel from outside of the Military Department or other Defense Agency whose procurement is the subject of the Peer Review. Systems engineering personnel participated in six peer reviews in 2009. Pre-Award Peer Reviews are conducted in three phases for competitive procurements: (1) prior to issuance of the solicitation; (2) prior to the request for final proposal revisions; and (3) prior to contract award.

DSE is developing policy, guidance, and procedures to review all requests for proposals for the development of MDAPs. When the process is developed, the existing DSE-published Guide for Integrating Systems Engineering into DoD Acquisition Contracts will be updated, DSE personnel will be trained to support RFP evaluations, and DSE will review all MDAP RFPs to ensure inclusion of provisions relating to systems engineering and reliability growth. The current guide is available at http://www.acq.osd.mil/sse/docs/Integrating-SE-Acquisition-Contracts_guide_ 121106.pdf.

ASSESSMENTS OF MILITARY DEPARTMENT AND DEFENSE AGENCY REPORTS

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4 ASSESSMENT OF MILITARY DEPARTMENT AND DEFENSE AGENCY DEVELOPMENTAL TEST AND EVALUATION REPORTS

4.1 Overview

Congress has directed the Military Department and Defense Agency acquisition executives with responsibility for Major Defense Acquisition Programs (MDAPs) to deliver a report to the Director of Developmental Test and Evaluation (DDT&E) regarding their test and evaluation (T&E) organization and capabilities.

4.2 Scope of Assessment

DDT&E provided format and content guidance that requested the Services and Agencies' reports include an overview of the T&E organization and structure, and details of how T&E personnel accomplish the following:

- Ensure developmental test and evaluation (DT&E) requirements are translated from operational capabilities into contract specifications, support to source selection, and preparation for requests for proposals (RFP)
- Participate in planning of DT&E activities including the preparation of the Test and Evaluation Strategy (TES) and Test and Evaluation Master Plan (TEMP)
- Participate in and oversee the conduct of DT&E, analysis of data, and preparation of evaluation reports

The DDT&E report format included sections for details regarding T&E personnel training and qualifications and tracking methods to support each area noted above. DDT&E requested that the Services and Agencies identify any shortfalls in their T&E personnel resources and specific mitigation or improvement plans. In addition, DDT&E requested details on the ability to attract, develop, retain, and reward T&E personnel.

DDT&E assessed the reports to determine whether the Services and Agencies have adequate resources to support DT&E activities across the Department. These activities include the responsibilities for DDT&E, such as monitoring and reviewing the DT&E activities of the MDAPs and providing advocacy, oversight, and guidance to elements of the acquisition workforce responsible for DT&E.

Service and Agencies acquisition executives with responsibility for MDAPs submitted reports to DDT&E. The following organizations formally reported that they do not have responsibility for MDAPs and therefore do not have a requirement to report to DDT&E:

- Business Transformation Agency (BTA)
- Defense Advanced Research Projects Agency (DARPA)

- Defense Intelligence Agency (DIA)
- Defense Information Systems Agency (DISA)
- Defense Threat Reduction Agency (DTRA)
- National Geospatial-Intelligence Agency (NGA)
- National Reconnaissance Office (NRO)
- National Security Agency (NSA)

DDT&E received self-assessment reports from the Army, Department of the Navy (DON) (includes the Navy and Marine Corps), Air Force, Missile Defense Agency (MDA), and U.S. Special Operations Command (U.S. SOCOM). Although the U.S. SOCOM has oversight of MDAPs, it reported that it has no assigned T&E acquisition personnel and therefore defers to the Services for this report.

This section provides an overview of the reports received from Army, DON, Air Force, and MDA. When appropriate, information was extracted directly from the self-assessment reports to support the DDT&E assessment.

4.3 Overall Summary

Across the DoD, there is an adequate number of qualified T&E personnel to support T&E on MDAPs from Milestone B to Full-Rate Production. The focus on T&E is expanding to include activities in advance of Milestone B such as program formulation, input to Analysis of Alternatives (AoA), supporting requirements definition, RFP preparation, and source selection. However, during these early engagement activities, DDT&E has found that the Services and MDA have a shortfall in adequate numbers of T&E workforce. In addition, the Components are also lacking qualified T&E personnel in positions that require T&E certification.

With the establishment of DDT&E, the recognition of developmental test and evaluation is elevated within the acquisition community. The DoD is now focusing on reclaiming inherently governmental T&E responsibilities, including the conduct of developmental test and evaluation and independent assessment of program performance. One major challenge for DDT&E is that there is no Responsible Test Organization (RTO) used consistently across the Services and Agencies; an RTO has the inherently governmental responsibility to provide an impartial evaluation of system maturity, capabilities, and limitations. Without an established RTO, DDT&E cannot gather all the appropriate T&E data and information required for decision making and risk management. During FY 2009, DDT&E began analyzing the structures of the Components' T&E organizations. DDT&E will continue to examine the existing structures to advocate for an arrangement that will support the Department's developmental test and evaluation mission.

As DDT&E increases involvement in acquisition decisions, it is critical that DDT&E have access to all T&E data and reports, so that the Director can carry out the prescribed duties. DDT&E is working to ensure compliance with the USD(AT&L) December 4, 2009, Directive-Type Memorandum (DTM 09-027), "The DDT&E shall have access to all DoD Component records and data including classified, unclassified, competition sensitive, and proprietary information that the Director considers necessary to carry out these duties."

The self-assessment reports contained detailed data on the number of T&E acquisition-coded positions within the Services and MDA. The Services and MDA are regularly tracking and monitoring the T&E acquisition positions within their respective organizations. The DoD is currently emphasizing development planning and evaluations leading to higher-confidence information to support acquisition decisions and resource allocations. To do so, the T&E career field will need personnel adjustments and increased staffing levels to adequately accommodate this expanded workload.

Based on the DDT&E assessment of the Services and MDA self-assessment reports, the following foci will be assessed during FY 2010.

4.3.1 DDT&E Recommended Focus Areas

In review of the Services and the MDA self-assessment reports, four key themes were evident to the DDT&E: qualified T&E resources assigned to early T&E, program engagement, in-sourcing of T&E personnel, and ensuring qualified personnel are performing T&E inherently governmental functions.

4.3.1.1 Qualified T&E Resources Assigned to Early T&E

It is critical that developmental test and evaluation be addressed earlier within the acquisition life cycle, specifically beginning in the Technology Development phase. Based on the reports submitted for this assessment, the Services and MDA do not have qualified T&E resources assigned to early T&E efforts. Often, the Services use non-T&E-coded acquisition personnel to support early acquisition efforts. For the most part, the Services reported using Program Manager (PM) and Systems Planning, Research, Development, and Engineering (SPRDE)-coded acquisition personnel.

Specifically in contracting, the T&E responsibility needs to be accomplished by qualified T&E personnel. The challenge with this approach is that the personnel are responsible for both T&E and SPRDE or PM and they may not understand the T&E concerns of the program. This approach does not support the goals of T&E in the acquisition life cycle, fulfill the DDT&E objectives, or support the intent of the Defense Acquisition Workforce Improvement Act (DAWIA) of 1990. DDT&E is currently examining implementation methods such as policy and guidance to ensure that fully qualified and experienced T&E personnel are assigned to contracting tasks like source selection, requirements generation, and requests for proposals.

4.3.1.2 Program Engagement

The Services use various methods for program engagement to provide continuous communication throughout the program life cycle. The Army and the DON use T&E Working Integrated Product Teams (WIPTs), and the Air Force uses Integrated Test Teams (ITTs). The focus of these meetings is to bring stakeholders who have or require T&E information together to develop and execute the T&E program in fulfillment of their roles and mission. The T&E WIPT and ITT provide a forum for the T&E community to share information on T&E planning, execution, and issues in all phases of the acquisition life cycle. DDT&E is a required member for T&E WIPTs and ITTs and will participate in them as a part of continuous program engagement. As a member, DDT&E will perform program

oversight to ensure programs are executing their TES and TEMP and evaluating the test results to determine if the T&E program requires any modifications.

In addition to DDT&E and the Services' participation in T&E WIPTs and ITTs, DDT&E will participate in Systems Engineering WIPTs and technical reviews. Involvement in these reviews allows DDT&E to share and gather information in an effort to identify technical risks early in the program life cycle.

4.3.1.3 In-Sourcing of T&E Personnel

The Army, Air Force, and MDA self-assessment reports contained plans for in-sourcing of Government acquisition positions over the next 2 years. The Army reported that almost 800 Government positions will be funded through in-sourcing and identified 500 of those positions to be coded for T&E. The Air Force estimates 300 positions to be targeted for T&E-coded acquisition positions. MDA also has plans to increase by 200 acquisition positions, 14 of which are T&E. The DON does not have plans for additional positions through in-sourcing.

In-sourcing of personnel presents several challenges across the DoD as the Services attempt to fill positions and hire subject matter experts (SMEs). Based on the uncertainty and length of time in the Government hiring process, SMEs are leaving for outside opportunities. In addition, SMEs may be discouraged by the strict hiring regulations and salary. Overall, the Department will lose historical knowledge and intellectual capital.

In terms of training in-sourced personnel, each Service and Agency has the capability to provide organizational and local training. However, all are concerned that the new personnel may not be able to complete all required Defense Acquisition University (DAU) training for formal T&E certifications within the 24-month time period currently allotted by DAWIA. With the high number of T&E personnel requiring training, DDT&E will work with DAU to ensure that courses are available and to mitigate future training issues.

4.3.1.4 T&E Inherently Governmental Functions

The Services and MDA were asked to present their approach for performing inherently governmental T&E functions. These functions include impartial evaluating and reporting upon system performance. Since all of the Services and MDA use the developer and the prime contractor in the acquisition process, however, it is not apparent how the T&E governmental functions are being accomplished.

Across the Department, the capability to perform these Government functions has atrophied. The Air Force self-assessment report stated that prime contractors are often responsible for the evaluations and reports on developmental test and evaluation events. If evaluations are conducted by the prime contractor, there is the chance that test results are not qualified, could be inaccurate or misleading, or could result in premature fielding decisions. This conclusion is consistent with findings from the May 2008 Report of the Defense Science Board (DSB) Task Force on the Developmental Test and Evaluation. DDT&E thinks that the solution is to use Government T&E personnel and facilities to

evaluate developmental test and evaluation events to ensure the impartiality of the testing, evaluation, and reporting.

During FY 2010, DDT&E will further investigate how evaluations are conducted and will adjust policy and guidance as necessary. DDT&E has formally recommended to USD(AT&L) to add the position of Program T&E Leader to the list of Key Leadership Positions outlined in the draft Department of Defense Instruction (DoDI) 5000.66, "Operation of the Defense Acquisition Workforce Education, Training, and Career Development Program." The Program T&E Leader would be a Government position for all MDAPs and Major Acquisition Information Systems. The implementation of this position will be a step toward ensuring that key T&E functions are performed by fully qualified Government personnel. The recommendation was accepted and will be a part of DoDI 5000.66 when it is published before the end of FY 2010.

4.4 DDT&E Assessment of the Army Report

Within the Army, DT&E is located within Headquarters, Department of the Army and U.S. Army Test and Evaluation Command (ATEC). Within ATEC, the U.S. Army Developmental Test Command (DTC) has the primary responsibility for conducting developmental tests. The U.S. Army Evaluation Center (AEC) is a subordinate element within ATEC with responsibility for conducting independent Army system evaluations and system assessments in support of the systems acquisition process. Decision makers use AEC's independent report addressing an Army system's operational effectiveness, operational suitability, and survivability. The U.S. Army Space and Missile Defense Command/Army Force Strategic Command also support the systems acquisition, force development, and experimentation processes through management of certain Army, DoD, and other Government agency testing programs.

The self-assessment report to DDT&E indicated that the Army has adequate DT&E personnel resources for the Army acquisition community to support its 36 MDAPs. The Army reported the use of personnel who are not T&E-coded to perform T&E functions. The Army also recognized other resources for T&E, such as ranges and test support personnel.

The Army has indicated plans for in-sourcing more than 500 jobs in the next 2 years. This in-sourcing will enhance the existing 2,131 civilian and 11 military T&E positions performing DT&E functions. The Army has comprehensive local T&E basic training in place and noted that it could be difficult to attain full DAWIA T&E certification through DAU because this increase in personnel is almost double the number that typically require training annually.

The following section addresses the Army's self-assessment report on the requested areas of T&E support.

4.4.1 Army T&E Resources for Contracting

The Army has T&E personnel in place to ensure that DT&E matters are addressed early in the acquisition process. The Army indicated the key areas in which DT&E personnel are engaged at the Program Executive Office (PEO) and PM level. The Army uses T&E Leads, Liaison Officers, and T&E WIPTs to ensure developmental testing (DT) requirements are appropriately addressed in the

translation of operational requirements into contract specifications, in the source selection process, and in the preparation of RFPs on MDAPs.

The Army uses the ATEC T&E Liaison Officer, located within the PEO, to advise on all T&E matters and to assist the staff on T&E functions. In addition, T&E engineers and systems engineers assigned to Program Offices provide overall management of T&E matters at the program level. Together the PEO/PM T&E personnel support all T&E functions, of which DT&E is a part.

The Army T&E WIPT is composed of representatives from all involved organizations including the Combat Developer, test personnel (i.e., developmental and operational test agency and system evaluators), and other organizations that have critical roles for the success of the program. The T&E WIPT's goal is to develop a mutually agreeable T&E program that provides the necessary data for evaluations and subsequent program decision making.

The Army PEO/PM organizations do not have dedicated DT&E personnel but have personnel that manage T&E, to include operational test and evaluation functions. Many of the PEO/PM personnel performing T&E are support contractors who are SPRDE or PM coded. Relying on contractors is a challenge because the contractors may have limited ability to represent the Government when working with other Government agencies. Some of the T&E support contractors have military experience but may lack formal DAWIA training that T&E acquisition personnel require.

DDT&E will continue to monitor the Army's resources for contracting. DDT&E recognizes the Army's efforts toward early involvement through the Liaison Officers. These officers ensure the T&E community is informed early in the process; however, this involvement does not always ensure the use of qualified T&E acquisition personnel. DDT&E plans to improve the consistent level of T&E qualified personnel through DoDI 5000.66, which will implement a Government Program T&E Leader for all MDAPs.

4.4.2 Army T&E Resources for Planning

The Army uses many organizations and tools to manage test planning efforts. The majority of DT&E efforts are accomplished through ATEC and its DTC. Within the Army, ATEC's mission is to perform the T&E of acquisition and rapid acquisition initiative systems. The ATEC System Team (AST) performs most DT&E in a coordinated effort between the DTC Headquarters (HQ) test manager and the AEC system evaluator. Likewise, the detailed test/simulation event execution planning is a coordinated effort between the DTC HQ test manager, the DTC HQ functional support staff (e.g., safety, environmental, and human factors), and the test officer at the responsible test center who is in charge at the test site. The Army tracks the certification of DTC HQ test managers to make sure they are qualified to satisfy their mission of developmental test planning, oversight, and safety verification. The AST ensures that testing addresses the requirements of the TEMP, ATEC's System Engineering Plan, the Operational Test Agency Test Plan, and the DT Detailed Test Plan, as required.

The Army has processes, resources, and personnel in place to participate in the planning of DT&E activities. As the developmental tester prepares the Detailed Test Plan and executes the tests, the Program Management Office, supported by the T&E WIPT, monitors progress to identify any

technical issues raised through developmental testing, to determine whether any design or other changes are needed and whether milestone schedules are achievable.

To ensure the availability of skills, instrumentation, facilities, and range time, all capabilities are closely managed. As a test becomes imminent, considerations for the prioritization of tests include Army priority of programs, program schedule, test sequence, availability of special resources, weather, and other timing considerations.

ATEC uses metrics to track the activities and documents associated with T&E planning. The ATEC Stoplight Report is a management tool to track the timeliness of all ATEC T&E briefings, plans, and reports. The Stoplight Report graphically depicts the status of briefings and documents by program type, document type, and the individual document level. Compiled semi-weekly, the Stoplight Report derives from data contained in the ATEC Decision Support System database, which stores up-to-date details on T&E for Army acquisition programs. The Stoplight Report is reviewed by senior leadership at ATEC's headquarters and Subordinate Command/Activities. Command-wide distribution of the report provides full visibility to all ATEC T&E briefings, plans, and reports. On a weekly basis, the Stoplight Report tracks more than 500 briefings and documents. From January through August 2009, ATEC reduced the frequency of late Rapid Initiative documents by 31 percent.

DDT&E recognizes the Army's resources and structure for T&E planning activities. The use of the Stoplight Report is paramount to the Army's awareness of current and upcoming acquisition requirements. The Army uses T&E WIPTs to develop planning documentation. DDT&E will continue to monitor and provide an update in the FY 2010 annual report.

4.4.3 Army T&E Resources for Execution and Reporting

The Army reported on resource capability to participate in and oversee the conduct of DT&E, data analysis, and preparation of evaluations and reports on developmental testing. Since the majority of test execution is within ATEC's DTC, it is critical that DTC measure and certify the adequacy of its civilian test center test officers. Certification standards are tracked and reported on a quarterly basis to senior ATEC leaders. In addition, test centers have mission-specific requirements for test officers within their primary mission areas. The requirements include formal training, self-study, or on-the-job training to ensure the test officers have sufficient knowledge, skills, and abilities to safely and properly execute developmental tests. Mission-specific plans for test officers include: range safety orientation briefings, local safety requirements, accident and incident reporting, local environmental procedures to include emergency and hazardous waste spills procedures, safety testing and preparation of safety release and safety confirmation recommendations, and environmental testing facilities orientation.

To meet the demands of developmental test execution, the Army has focused on the areas of combined DT and operational test (OT), experimental design, and reliability growth models. These test methodologies allow the Army to use its resources wisely to support DT&E execution.

The Army contends that methods of combining DT and OT are increasingly essential in order to address the greatest number of evaluation questions while minimizing use of already limited T&E personnel resources. The Army stated that combined DT and OT has the potential to answer both test objectives more efficiently in terms of the time and resources normally required by separate tests

(e.g., increase the validity of the developmental test results as they are used in answering operational effectiveness, operational suitability, and survivability questions).

ATEC has developed a methodology for integrating experimental design across all testing (e.g., contractor testing, DT, OT, and modeling and simulation). In addition, AEC leadership is working with DTC and Operational Test Command leadership to ensure test plans are based on the experimental designs developed by the AST. ATEC is continuing to develop and refine standard repeatable experimental design procedures and methodologies for designing tests and analyzing data as well as developing policy addressing experimental design.

As part of the ATEC methodology, AEC is also developing a Design of Experiment (DOE) course required for all AEC analysts. The increased number of factors and conditions represented across multiple DT and OT collection phases increases the breadth of the evaluation and the number of questions the evaluator can answer. Metrics, collected in different event phases (e.g., through DT and OT) and complementary to each other, might be analyzed together, thus increasing sample sizes and the confidence in test results. Operational test experimental designs might be designed so they return developmental test-relevant information and provide useful feedback to the system developers.

Recent Army Reliability Growth (RG) policy requires the inclusion of an RG program in all MDAPs. In order to implement these policies, ATEC-AEC analyzes failure-mode data from each vendor in order to track RG throughout DT and project expected RG for the next test phase. The Army RG policy mandates ATEC to conduct an assessment of each vendor's design-for-reliability practices before RG testing begins, and a mid-Engineering Manufacturing Development (EMD) phase assessment of whether the system is seriously off track with respect to its RG plan. In the event that a system is seriously off track, ATEC-AEC refines the 20-year maintenance and repair part costs overlaid on the growth curve or at AEC's request, and the Army Materiel Systems Analysis Activity (AMSAA) determines a life cycle cost impact so that leadership makes the most informed decision for any programmatic options. AMSAA also performs many of the reliability scorecard assessments and continues to provide the tool to multiple DoD organizations.

DDT&E's assessment is that the Army has sufficient resources and tools for T&E execution. The Army leverages DOE, combined testing, and RG to develop an effective T&E program. The Army has successfully implemented RG policy, and DDT&E will look for ways to apply that policy across all the Services.

4.4.4 Army Ability to Attract, Develop, Retain, and Reward Personnel

The Army reported that some of its focus areas for personnel are Recruitment, Succession Planning, and Recognition.

The Army reported that recruiting T&E personnel has current challenges. Government jobs cannot compete with industry salaries in the current demand for SMEs and qualified T&E personnel. In addition to the job market, the Army is currently in the middle of several Base Realignment and Closure (BRAC) actions that have a direct impact on the T&E workforce. One major impact is the move of ATEC and AEC HQ from Alexandria, Virginia, to Aberdeen Proving Ground, Maryland, by November 2011. With this change, there are expected to be many vacancies at APG, including many in the T&E workforce. In addition, there are other organizations within the Army making moves to

Aberdeen. These external challenges with attraction and retention have to be taken into consideration when assessing the T&E workforce of the Army.

Senior Army leadership is optimistic that some of these recruitment issues will be eliminated by using the new Expedited Hiring Authority (EHA) for acquisition positions. For this year, it is too early to assess the actual impact on the Army T&E workforce.

The Army states the key to developing its T&E workforce is the Individual Development Plan. Directors and Commanders within the Army ensure supervisors prepare and maintain Individual Development Plans for all civilian employees. Employees who work in the area of DT&E are provided with information to take advantage of Army resources in T&E. Training is granted based on mission requirements, cost-effectiveness, best value to the organization, and career field requirements.

ATEC develops leadership succession plans for its technical experts and uses internal and external recruitment practices to attract highly qualified candidates from a variety of sources who are interested in Federal careers. ATEC uses financial incentives to attract and retain individuals who are best qualified by partnering with academia to establish technical and advanced leadership training programs to hone skills needed in their mission areas. ATEC provides opportunities for individuals to exercise leadership and to build and refine coaching and mentoring skills.

The Army places great emphasis on training as it believes that training is imperative in growing the new employees as well as in advancing current employees within the organization. Within the Army, the Test and Evaluation Basic Course was specifically developed to meet the unique needs of the Army T&E workforce. The computer-based training component and follow-on seminar provide an intensive overview of T&E activities throughout the system acquisition process.

In addition, the Army T&E leadership places value on recognition. The Army takes advantage of Special Act Awards and prestigious, non-monetary awards to recognize significant achievements. The Army nominates individuals for local, regional, and national Federal and private sector high-level honorary awards. Recognition starts at the local level with the use of commanders or director's awards and coins, and continues through the ranks of Army honorary awards that recognize superior accomplishments. In FY 2009, approximately 5 percent of the DTC workforce received prestigious, honorary awards, and most of the workforce received at least one monetary award and some monetary awards were customer-funded, which recognized the efforts of DTC's workforce.

DDT&E acknowledges the Army's challenges in its recruitment activities to include the effects of BRAC; however, EHA, other hiring incentives, and training and retention efforts should allow the Army to maintain the workforce. DDT&E will use this information to form a baseline and will assess the Army T&E workforce in future reporting years.

4.5 DDT&E Assessment of the Navy Report

The DON is structured to respond to T&E workload demand and to provide needed workforce expertise and infrastructure via its Naval Systems Commands (SYSCOMs) and their affiliated PEOs. Each SYSCOM hosts its affiliated PEOs and portfolios of PMs that in turn report directly to the

Assistant Secretary of the Navy for Research, Development and Acquisition (ASN(RD&A)) for systems acquisition oversight and governance. The major Naval SYSCOMS are Naval Air Systems Command (NAVAIR), Space and Naval Warfare Systems Command (SPAWAR), Naval Sea Systems Command (NAVSEA), and Marine Corps Systems Command (MCSC).

The DON has responsibility for approximately 54 MDAPs. Currently, the DON has 2,831 civilian and 450 military T&E acquisition positions. The DON did not indicate any plans for significant increases in its T&E personnel through hiring or in-sourcing.

Based on the DON self-assessment report to DDT&E, there are distinctions between the processes employed at each of the SYSCOMs. Each SYSCOM is responsible for managing its structure and workforce. Based on a January 2009 DON memorandum, ASN(RD&A) directed the SYSCOMs, PEOs, and Naval Warfare Centers to align within a Competency Aligned Organization/Integrated Product Team/Naval Warfare Center business model similar to NAVAIR. During the briefing, DON presented that SPAWAR is doing a 3-year phased Competency Aligned Organization implementation scheduled for completion in September 2010. NAVSEA and MSCS have the competency in place and plan for their sub-competencies to be complete in 2010.

NAVAIR, with its use of Test Squadrons and collocation with facilities for T&E, has more structured organizations and processes in place than the other SYSCOMs. NAVAIR also accounts for the largest portion of T&E resources within the DON. The Navy reported details of its workforce training and certifications. It tracks and maintains metrics of the workforce; overall certification numbers for T&E are at 89 percent, which exceeds their goal of 80 percent. SPAWAR and NAVSEA have processes in place and are managing their own T&E resources. In addition, the DON indicated that they utilize SPRDE and PM resources as needed for T&E functions. These resources may or may not have the T&E training and experience necessary for the job. Currently, there is not a formal method to track qualifications of these personnel since they are not coded for T&E acquisition. The MCSC is currently implementing its processes.

DDT&E recognizes that the DON has defined processes for T&E being used by NAVAIR; however, the processes are not being applied consistently across all the SYSCOMS. The DON reported that the intent is to implement a NAVAIR-like business model across the Service. DDT&E will monitor and request updates. This will be assessed in the FY 2010 annual report.

The following paragraphs address the report from the DON on the requested areas of T&E support.

4.5.1 Navy T&E Resources for Contracting

The DON identified processes and personnel to ensure that T&E matters are addressed early in the acquisition process. The DON noted that there is no established organization that selectively focuses on contracting for T&E activity or translation of operational capabilities into contract specifications. The DON uses program IPTs to ensure that developmental T&E requirements are appropriately addressed in the translation of operational requirements into contract specifications, in the source selection process, and in the preparation of RFPs on MDAPs. All PMs use program IPTs to assist in developing RFPs and contract specifications. Depending on acquisition category (ACAT) level and pre-program funding available, the SYSCOMs support preparation of RFPs with T&E expertise. Senior members of the T&E workforce enter early engagement, often as the lead T&E agent/assistant

Program Manager, familiar with and skilled in Systems Engineering and Technical Review (SETR) processes.

The DON reported on its Gate Reviews process for individual acquisition programs and PEO acquisition program portfolios. The Gate Reviews are used to assess the health of major programs and to determine performance and readiness for boards and major milestones. As part of this effort, the health of T&E for individual programs is reviewed and formally reported. The DON Gate Review process is used in planning and execution as well; however, it provides the objective assessment of T&E in early life cycle activities. This process is a well-used tool to ensure T&E is represented in the early life cycle activities.

MDAPs complete five Gate Reviews prior to RFP release. T&E is involved in Gates Two through Five. Beginning at Gate Two, T&E staffing and probability for success criteria are assessed, providing the PEO, SYSCOM, and the DON T&E Executive with an opportunity to review the adequacy of T&E participation and the overall health of the program before moving forward. The Gate Review process uses objective criteria to evaluate all areas of the program, including T&E.

DDT&E's assessment of DON is based on the Gate Reviews. During its formal brief to DDT&E, the DON presented examples of material used during Gate Reviews that included the T&E-specific items with Entrance Criteria, Goals/Exit Criteria, and Briefing Content. The explanation to DDT&E demonstrated that the DON has ample processes in place in this area. The Gate Review process provides an objective means of assessing the T&E strategy and program and policy compliance early in the life cycle. DDT&E will assess to ensure these processes continue to be applied.

4.5.2 Navy T&E Resources for Planning

The DON has processes and resources in place to participate in planning DT&E activities. The DON uses local instructions and procedures, programs, and projects (to include pre-ACAT) to solicit and assign the appropriate T&E expertise. The T&E competency lead, in collaboration with the PEO and SYSCOM leadership, is responsible for identifying qualified personnel to support the PEOs and PMs. At a minimum, a program will start with a T&E lead that has the knowledge, skills, and ability through education, multiple program experiences, and years in the T&E field. This assignment supports the development of test strategies and plans. Within SYSCOMs and PEOs, programs use local workforce processes and tools to accommodate the workload.

In addition, early T&E WIPT membership must contain engineering expertise for technologies under consideration and include a requirements representative, an OT representative, and contractor test lead. The T&E WIPT has access to all documentation relevant to the program, including the Analysis of Alternatives, Technology Readiness Assessments, Initial Capabilities Documents, draft Capability Development Document, Systems Engineering Plan, and Acquisition Strategy. The program's T&E lead also has access to the system's design and engineering data and related Integrated Product Team sessions information, and as required, provides this information and available documentation to T&E WIPT members. The DON report noted that it tracks the use of T&E WIPTs for planning and preparation of all testing. The PMs are directly accountable for assigning a T&E lead who chairs the T&E WIPT and is a member of the Program Office.

Based on the report and presentation, the DON is not always using T&E personnel to support the planning mission. Overall, T&E personnel in support of planning are not consistently T&E acquisition coded and therefore are not qualified. DDT&E will continue to monitor and report an update in the FY 2010 annual report.

4.5.3 Navy T&E Resources for Execution and Reporting

The DON reported on the resource capability to participate in and oversee the conduct of DT, the analysis of the data, and the preparation of the evaluations and reports on such testing.

In the DON, the PM is accountable for execution and analysis of DT&E. Depending on the technology, system complexity, and facility requirements for the execution of testing, test events and data analysis are augmented by technical expertise from the SYSCOMs headquarters, Naval Warfare Centers, and labs. NAVSEA, SPAWAR, and MCSC PMs are responsible for completing test reports for technical reviews and milestones. Dependent on staff levels maintained by a PM, reports will be written by the PM's T&E lead and staff or may be contracted to a Warfare Center or Civilian Support Service. Content and format for these reports are controlled by PEO and SYSCOM technical warrant holder direction. NAVAIR is unique in having test squadrons that conduct DT&E and provide test reports in accordance with NAVAIR instruction.

Overall, the DON relies on local SYSCOM management of the DT&E workforce, matching workload to resources and providing best value for taxpayers. Management at the local level is essential to matching critical technical skills and knowledge with an appropriate level of T&E expertise. Each SYSCOM must flex to meet design, production, and fielding needs and schedules. In addition, the DON utilizes its Enterprise T&E Board of Directors and Deputy DON T&E Executive to provide for integration and identification of best practices and development of improvements.

The DON stated that it manages T&E execution at the SYSCOM level. The three DON SYSCOMs (NAVSEA, NAVAIR, and SPAWAR) currently have adequate management practices in place to meet T&E equity sustainment needs and access to those processes and capabilities will be provided to MCSC as they build their T&E competency and base. However, DDT&E found that the use of fully qualified T&E acquisition personnel is not consistent across all PM offices in the DON to carry out test execution and reporting. DDT&E will continue to monitor and provide an update in the FY 2010 annual report.

4.5.4 Navy Ability to Attract, Develop, Retain, and Reward Personnel

There are no standard personnel practices across the DON because management of T&E resources is handled at the individual SYSCOMs. The DON indicated in its self-assessment and subsequent brief that it has and continues to be successful in the recruitment and retention of T&E employees. The DON's attrition rate of 5 to 6 percent is considerably lower than the national average, and the DON attributed this success to training and the U.S. Naval Test Pilot School.

The DON also stated that the SYSCOMs plan to take advantage of the EHA. The EHA has proven effective for the DON in meeting acquisition position hiring goals within the past fiscal year. The

EHA has allowed the organization to bring highly qualified mid-level and expert level candidates with critical skill sets onboard in a greatly reduced time frame. The DON reported that previously many candidates were lost due to the complicated and drawn-out hiring process. However, EHA cannot be used to fill non-acquisition positions, which is approximately half of the T&E total vacancies.

Below are highlights of DON's efforts for personnel focused on the positive efforts in NAVAIR, NAVSEA, and SPAWAR. The MCSC business structure and method for attracting, developing, and retaining T&E personnel are under development. MCSC's initial focus has been on establishing a current baseline for T&E personnel to ensure that all T&E individuals are identified in T&E acquisition-coded positions. This approach will allow the T&E competency to be centrally managed against USMC requirements and will support achievement of DAWIA certification needs.

NAVAIR has a focused T&E recruitment process for all entry-level scientific and engineering positions. Candidates are solicited from colleges with technical/engineering programs, job fairs, and recruiting Web sites. Entry-level hires are assigned to a formal career development program, the Engineering and Scientist Development Program (ESDP). The ESDP provides a structured approach to career development and is designed to prepare participants to assume positions of significant technical responsibility. It provides formal classroom training, rotational assignments, and increasingly responsible work assignments. The internal labor market also serves to support recruitment efforts, particularly at the journey (mid) level, as employees from other technical organizations move into the T&E organization.

Where appropriate, the T&E organization offers recruitment bonuses at the entry, journey, and masters (expert) level. Workforce revitalization funds, as well as Section 852 funds, have been instrumental in providing bonuses and enabling the organization to meet recruitment targets for FY 2010. The DON uses the National Defense Authorization Act (NDAA) of 2008, Section 852 Defense Acquisition Workforce Development Fund to provide funds for the recruitment, training, and retention of acquisition personnel.

The T&E organization within NAVAIR uses an awards framework of monetary and non-monetary awards tools to recognize individual employees for the contribution to T&E. The program relies on collaboration between T&E Competency Managers and PEO/ PM personnel to identify contributions and ensure recognition. These award tools are used for recognizing actions beyond normal expectations and for clearly identifying and distinguishing sustained top performers.

NAVSEA's establishment of the T&E sub-competency enables sustainment of its workforce in the future. While the basic approach of day-to-day monitoring and control of the workforce remains distributed throughout the organization, the sub-competency promotes a degree of networking of the T&E personnel and of sharing T&E management and execution experience between programs, in real time.

The T&E organization currently uses the services of outside resources to provide the needed training such as the NAVAIR ESDP, DAU, the U.S. Naval Test Pilot School, and T&E organizations such as the International Test and Evaluation Association, Society of Flight Test Pilots, Institute of Electronic and Electrical Engineers. Funding for such training is often limited, which inhibits the career development of T&E professionals.

The NAVAIR T&E group hopes to improve its professional development opportunities by establishing the Naval Aviation T&E University. The university will provide comprehensive and standardized training, career development, and professional guidance to all members of the NAVAIR T&E workforce, as well as related NAVAIR competencies and partners in Commander, Operational Test and Evaluation Force (COMOPTEVFOR) and industry. Its goal is to provide consistent technical expertise to NAVAIR; to facilitate career satisfaction, advancement, and retention for all members of the workforce; and to strengthen T&E partnerships.

SPAWAR personnel qualifications and training are defined, tracked, and maintained in accordance with the Team SPAWAR Engineering and Test Evaluation and Certification (TE&C) Competency Development Models (CDMs). Regardless of how the individuals enter competency, they are able to advance to the next CDM stage through extensive training. The CDM addresses and encourages the use of available DAU training requirements. It also addresses non-DAU training courses available to individuals. SPAWAR and DAU cosponsor a one-week PMs/Assistant PMs training course. This course primarily focuses on issues related to DON-specific acquisition (i.e., SECNAVINST 5000 series) and includes a module on T&E Planning. SPAWAR TE&C Competency also has an initiative entitled the TE&C Academy with a variety of training courses planned to complement the DAU training package.

All SYSCOMs have a variety of methods by which all personnel including T&E personnel can achieve recognition for their efforts. The civilian National Security Personnel System (NSPS), or other evaluation systems, allow for the identification of outstanding performers who can be compensated for exceeding expectations using pay-for-performance. There are also team awards to recognize outstanding accomplishments. In addition, "On the Spot Awards" (e.g., cash awards or time-off awards) allow individuals to be recognized and compensated for outstanding performance at any time during the employee evaluation cycle. Also, as applicable, SYSCOMs encourage and support nominations for recognition by T&E professional organizations.

DDT&E's assessment of the DON is that it has sufficient practices to attract, develop, retain, and reward T&E personnel in NAVAIR, NAVSEA, and SPAWAR. MCSC is under development and will provide updates by DDT&E in future years. Through sources of funding, using internal and external training, and establishment of the Naval Aviation T&E University, the DON has many positive sources for the sustainment of personnel.

4.6 DDT&E Assessment of the Air Force Report

The Air Force has a robust organizational structure for T&E. Air Force Materiel Command (AFMC) is the primary manager for DT&E of non-space systems and performs all levels of research, develops weapons systems, and conducts Government-based DT&E. Air Force Space Command (AFSPC) is the primary DT&E manager for space and missile systems and uses mostly contractor-based DT&E capabilities in lieu of Government DT&E capabilities. These decentralized structures provide stronger interfaces between the developer, tester, and operational user communities.

The Air Force supports 44 MDAPs and currently has 1,354 civilian and 1,276 military T&E acquisition positions. In the next 2 years, the Air Force will have additional positions as a result of in-sourcing. The Air Force expects to obtain more than 300 positions in T&E.

The Air Force reported details of its workforce training and certifications. It tracks and maintains metrics of the workforce; overall certification numbers for T&E are above 91 percent.

During the presentation for the self-assessment to DDT&E, the Air Force explained that its reporting structure for DT&E events is through the PM. In addition, T&E is often conducted by the prime contractor. This approach is a primary concern for DDT&E because these evaluations and reports may be accomplished by the prime contractor and would not represent an impartial evaluation of results. DDT&E initiatives, such as the implementation of the Program T&E Leader as stated in DoDI 5000.66 and the DDT&E focus area to provide an RTO, should address this concern. DDT&E will monitor and report in the FY 2010 annual report.

The following paragraphs address the report from the Air Force on the requested areas of T&E support.

4.6.1 Air Force T&E Resources for Contracting

The Air Force indicated the ITTs and High Performance Teams (HPTs) are where T&E personnel engage during early T&E efforts. At the earliest point in the acquisition process (at or before Milestone A), an ITT is formed to assist new-start programs with designing the most efficient and effective T&E Strategy. The ITT consists of SMEs drawn from the test centers, product centers, test organizations, the developing and operating Major Commands (MAJCOMs), and other disciplines to advise the PM on all T&E matters and create complete integrated T&E strategies.

ITT membership includes representatives from the RTO, operational test organizations, system contractors, test range, test facility managers, Service headquarters staff, OSD/Director, Operational Test and Evaluation (DOT&E), and USD(AT&L) staff. Additional members include the requirements, intelligence, operations, and support communities, and experts in contracting are brought in as required. AFMC and AFSPC ensure that Center Test Authority and test representative personnel from the appropriate logistics and product centers are ITT members. These individuals serve as test advisers to product development teams throughout the program's life cycle.

The ITT supports the program throughout the system life cycle. The ITT specifically monitors contracting activities by reviewing and providing inputs to contractual documents to ensure the contractor addresses the Government's testing needs. The ITT reviews draft RFPs and Statements of Work to ensure user-defined capabilities are accurately translated into system specifications and to ensure contractor support to Government T&E is included and accurately described. In addition, the ITT reviews the Contract Data Requirements List (CDRL) to ensure it describes the content, format, delivery instructions, and approval and acceptance criteria for all deliverable T&E data. CDRLs must provide for the following items: Government review and approval of contractor test plans and procedures before tests commence; Government insight into contractor testing to ensure systems are maturing as planned; the contractor's deficiency reporting system interfaces properly with the Government's deficiency reporting system; portability of data into Government information management systems; contractor T&E support such as failure analyses, T&E data collection and management, operation of unique test equipment, provision of logistics support and test reports; and contractor participation in Government test planning forums such as the ITT.

The Air Force continues to strengthen the early involvement of T&E experts in HPTs, where they help operators develop more testable and accurate operational Joint Capabilities Integration and Development System (JCIDS) requirements. DT&E personnel participate early in HPTs, where early acquisition and T&E strategies are formulated and early program documentation is written. Generally, more experienced test personnel are chosen for these tasks. The influence of test personnel helps the HPT state JCIDS requirements that are "testable," resulting in higher quality information for decision makers.

AFMC and AFSPC personnel support DT&E requirements in contracting through the ITT. Prior to Milestone A, the PM is responsible for establishing and co-chairing a program ITT with the operational test organization to ensure all DT&E, operational effectiveness, and suitability issues are addressed. The ITT may consist of a number of other test agencies or organizations based on the program's test requirements. The team is structured to encompass all aspects of the T&E process and to meet the T&E needs of the program. Acquisition and sustainment programs continue to rely on the ITT throughout the life cycle.

Tracking of T&E acquisition personnel who support requirements definition, RFP development, and source selection starts with the Acquisition Professional Development PMs (APDP) and T&E functional managers. They provide certification support and data to test centers and wing organizations, which assist in tracking workforce attainment of training and certification requirements. APDP managers further help manage the workforce by assisting employees and supervisors with Individual Development Plans. APDP managers track completion of the identified training and ensure mandatory continuous learning and certification training/education requirements are available and met.

DDT&E's assessment is that the Air Force has efforts in place to support the early life cycle activities of T&E. The Air Force is making good use of ITTs and HPTs to support these efforts. DDT&E participation in both forums has shown positive results in the form of better JCIDS requirements and clearer acquisition and T&E strategies for new acquisition programs. The information in the report and the Air Force's brief indicate that resources are in place to support current early life cycle activities. As initiatives are implemented to include earlier activities, DDT&E will monitor, assess, and report the Air Force T&E organization and capabilities in future annual reports.

4.6.2 Air Force T&E Resources for Planning

Air Force DT&E personnel are key participants in the planning of DT&E activities in support of acquisition programs. As members of the ITT, they are the lead and prepare DT&E contents of the Acquisition Strategy, the TES, the TEMP, and detailed DT&E plans. Contractor DT&E personnel prepare DT&E plans and conduct testing according to the Statement of Work. The Air Force Government DT&E personnel review the soundness of the contractor's plans, and after contractor prototypes are delivered, conduct Government-led DT&E. DT&E planning continues throughout the program's life cycle to support system modifications and upgrades.

Air Force instructions direct that an ITT be formed early in the Concept Refinement Phase to assist the PM in creating and managing the strategy for T&E for the life of each program. Formal direction

for establishing the ITT comes from the program's first Acquisition Decision Memorandum. A formal ITT charter describes ITT membership, responsibilities, resources, and required T&E documentation output.

Air Force DT&E personnel support the ITT and the PM in preparation for all decision reviews and milestone decisions. The TEMP lists the system's top-level JCIDS requirements, Critical Operational Issues, and Critical Technical Parameters so all T&E can be integrated to the maximum practical extent. The latest Defense Acquisition Guidebook revision contains substantial new information about integrated testing. The ITT facilitates the integration of DT&E with all other types of testing to form an efficient continuum of integrated testing. Finally, DT and OT personnel provide early and continuous information, analysis, and feedback to the PM about system progress in meeting JCIDS requirements and other technical goals.

T&E personnel supporting planning activities for a specific program are tracked by the individual program. Other than the training required by the DoD certification standards and what training the PM identifies for the team, there is no fixed training or experience criteria established. Each product and logistics center's Acquisition Center of Excellence provides general source selection training and covers T&E requirements issues.

The DDT&E assessment of the Air Force Planning efforts is positive due to the use of ITTs. These teams draw effectively on T&E expertise throughout the Air Force community to ensure strategies and plans are in place.

4.6.3 Air Force T&E Resources for Execution and Reporting

The Air Force reported on its resource capability to participate in and oversee the conduct of DT, the analysis of the data, and the preparation of the evaluations and reports on such testing. The focus for Air Force T&E is to coordinate, manage, and report on DT&E activities.

Air Force DT&E personnel are required to plan, coordinate, manage, and report on DT&E for assigned programs. They must design and execute specific test events, schedule the appropriate test facilities and instrumentation, manage the test event, collect and reduce data, conduct analysis, and report test results to the PM and other decision makers. Specific responsibilities are negotiated between the PM's staff and the Program Engineer or Test Engineer. The TEMP document provides a top-level outline of the major events and actions required.

Working through the ITT, the PM develops and communicates test requirements to the test centers through a Program Introduction Document. Test centers respond to the PM with a Statement of Capability, which identifies what work the center will conduct, and establishes the deliverables both during and at the end of testing. Actual deliverables from the test center will vary by program and PM requirements. Test center personnel work with each PM to understand their needs, develop cost-effective test plans, build up test infrastructure and instrumentation, conduct tests, process data, analyze results, and deliver reports. Contractor DT&E programs are provided with resources (e.g., airspace, airfield support, chase aircraft, control rooms, tanker support, and general coordination) and safety oversight with the contractor responsible for test conduct.

AFSPC programs are mainly developed and tested by contractors, so there is limited Government-conducted DT&E. The Program Office acts as the RTO and oversees and manages nearly all DT&E. The Program Office Test Manager co-chairs the ITT, maintains insight into contractor and Government T&E activities, and has overall responsibility for overseeing and managing all DT&E.

Within AFMC, each test center maintains metrics to track assigned DT&E personnel. Metrics include percent manned in three critical specialties: engineers, aviators, and flight line and facility maintainers. Test center planners align properly qualified test personnel to test events based on resource requirements. USAF Test Pilot School (TPS) graduates are required for all elevated risk flight testing, acting to ensure the rigor of independent assessment. Specific discipline requirements are mandated to augment personnel with general engineering backgrounds and acquisition certifications in order to effectively conduct tests and perform evaluations of systems.

DDT&E's assessment is that formal execution and evaluation should not be completed by the development contractor. This approach is a primary concern for DDT&E because these evaluations and reports may be accomplished by the prime contractor and would not represent an impartial evaluation of results. DDT&E will monitor the Air Force for compliance and will update in the FY 2010 annual report.

4.6.4 Air Force Ability to Attract, Develop, Retain, and Reward Personnel

The Air Force is currently working toward a strategic plan that will focus on initiatives to attract, select, develop, and foster talent with the competencies needed to do the current and future acquisition mission. The strategic plan establishes a competency management framework to support hiring and succession planning as well as initiatives to identify required critical skills, replenish the workforce, advance workforce development, and foster knowledge transfer. To accomplish these objectives, the Air Force is making full use of the Defense Acquisition Workforce Development Fund established under FY 2008 NDAA Section 852.

The Air Force re-delegated the use of EHA, as authorized in NDAA 2009, to installation commanders and other appointing authorities. Next, the AFPC disseminated implementation guidance, posted the requisite public notices and held a web cast with Air Force Human Resource offices. The Air Force has established streamlined hiring processes in support of EHA for all acquisition functional positions at the mid- and senior-level positions. The Air Force's goal is to fill positions within one pay period after receipt of the request for personnel action. The Air Force continues to use individual and open continuous internal and external vacancy announcements to attract internal Air Force candidates, other current Federal employees, veterans, and other noncompetitive appointment eligibles.

The Air Force is using a corporate recruitment strategy targeted to ensure the right talent applies for available acquisition positions. The acquisition community partnered with the Office of Personnel Management and the AFPC to create an employment brand, recruitment materials, Web site offering, vacancy announcements, and assessments and certification for featured vacancies. In addition, the Air Force established strategic recruiters at each Acquisition Center, who, in conjunction with their senior acquisition functionals, have overall responsibility for local recruitment plans, activities, and events to target highly qualified candidates. The acquisition community is seeking diverse quality

talent using external recruitment sources tailored to the types and levels of the positions such as professional organizations, alumni associations, professional conferences, job fairs, and contractor-to-civilian conversions. The Air Force is using the full range of recruitment flexibilities to include recruitment and relocation incentives, student loan repayment, work-life programs such as alternate work schedules, transportation subsidies, and tuition assistance along with available pay setting flexibilities.

To increase retention, the Air Force provides programs that reward T&E civilians and military personnel. Enhanced hiring, advanced education, and career-broadening opportunities are available for civilian professionals. To be competitive with industry when hiring T&E professionals, funds are available to offset student loans, provide signing bonuses, and accelerate promotion advancement. At the Air Force's expense, individuals are provided the opportunity to continue their education through T&E short courses and graduate degrees. Career-broadening opportunities are available that allow T&E professionals to work for headquarters and/or other test organizations and learn more about T&E across the Air Force.

The USAF TPS and Air Force Institute of Technology (AFIT) are education and development programs for the T&E workforce. The TPS selects a group of engineers and technical experts to attend a year-long class at Edwards Air Force Base. The class mixes all types of personnel enabling them to learn all aspects of testing from ground through flight test.

The program provides the opportunity to earn graduate degrees while allowing students to work with some of the world's latest leading-edge technologies. In addition, the AFIT Test and Evaluation Certificate Program (TECP) provides students with an understanding in basic concepts required for supporting analysis in the T&E Community. TECP targets individuals within the acquisition or analysis career fields working within research, DT, or OT stationed at engineering centers, test ranges, test centers, Program Offices, or headquarters. The TECP also provides an avenue for personnel interested in completing an AFIT Master's Degree in Operations Research.

Each test center has local unit, mission-specific training capabilities. The Air Force Flight Test Center at Edwards Air Force Base is home to the USAF TPS and is the Air Force Center of Excellence for training of all developmental flight test techniques and flight test methods. The Electronic Warfare University is located at the Air Force Flight Test Center. Curriculum includes test processes, procedures, and analysis training for electronic warfare testing. The Air Armament Center at Eglin Air Force Base offers armament/munitions test processes, procedures, and analysis training through the Air Armament Academy. The 46th Test Wing at Eglin Air Force Base offers a range of courses on DOE theory and methodology and provides assistance to DOE practitioners. The test centers offer professional development opportunities to their personnel by rotating T&E engineers through career-broadening assignments and giving them increasing levels of responsibility. The test centers use "succession planning," a concentrated effort to manage the engineering workforce, by providing experiences to engineers to support increased levels of responsibility.

The AFMC T&E Council reviews Command and Center metrics that monitor and track how AFMC attracts, develops, retains, and rewards T&E personnel. Metrics including turnover rates of trained, experienced personnel; position vacancies; fill rates; and center retention rates are used in identifying areas of concern and critical shortages in the DT&E career field.

Currently, the Air Force has no shortfalls in its current T&E-coded workforce. The training through the Air Force Flight Test School, rotational assignment opportunities, and incentives and rewards combined with the EHA should allow the Air Force to sustain the workforce and plan accordingly for future in-sourcing. DDT&E will monitor and update in the FY 2010 annual report.

4.7 DDT&E Assessment of the Missile Defense Agency Report

The MDA T&E workforce consists of civilian and military acquisition T&E personnel and systems engineering and technical assistance contractor support personnel. The MDA Director for Test (MDA/DT) is responsible for technical and programmatic direction and oversight of all Ballistic Missile Defense System (BMDS) common test resource support and the planning to cost-effectively enable the BMDS test programs to accomplish technical objectives. MDA/DT is responsible for determining and allocating the required resources through the Test Functional Manager (TFM). These resources, which include test infrastructure and personnel, support the BMDS test program. MDA/DT is responsible for establishing a common work breakdown structure for BMDS test support and execution. MDA/DT is responsible for aligning MDA test personnel under the TFM and assigning key test personnel.

In addition, the MDA provided details of its Independent Technical Evaluator, a recently created position that directly reports to the Deputy Director, MDA. The staff within this organization is responsible for the independent review and analysis of the test program at MDA. This new position has the potential to ensure DT&E objectives are clearly identified and complete for the MDA programs.

MDA executes a combined DT/OT program, which actively involves the Operational Test Agencies (OTAs), DOT&E, and the warfighter community in all phases of test planning, execution, and post-test analysis. Early OTA involvement during a development program provides significant value to the developer, the OTA, and the warfighter.

MDA represents a relatively small T&E workforce with 102 civilians and 9 military supporting one MDAP, the BMDS program. MDA is planning on in-sourcing and hiring to increase its T&E personnel within the next few years.

4.7.1 MDA T&E Resources for Contracting

MDA indicated key areas in which T&E personnel are engaged in the efforts for RFPs and source selection. T&E contracting professionals ensure that DT requirements are appropriately addressed in the translation of operational requirements into contract specifications, in the source selection process, and in the preparation of requests for proposal on MDAPs.

MDA noted that there are no T&E-coded personnel permanently assigned to the "contract-executing" organization within MDA; however, T&E-coded personnel in MDA/DT support the contracting process as needed. Test personnel review and comment upon RFPs for the acquisition of BMDS hardware and services, and prepare RFPs for test instrumentation, test support services, and test facilities. Test personnel act as contracting officers' representatives for services contracts. As

needed, test personnel participate on temporary details to source selection and evaluation boards. The number of detailed personnel varies according to the size and requirements in the RFPs.

The MDA has a source selection directive that establishes policies, assigns responsibilities, and implements guidance for preparing and conducting competitive source selections for the MDA. The MDA Source Selection Guide provides detailed procedures for conducting MDA source selections and establishes consistent source selection practices. A Source Selection Plan describes the conduct of the entire source selection process and adheres to the acquisition strategy documented in the approved Acquisition Plan.

The MDA, like the Services, does not have sufficient T&E-coded personnel during early life cycle activities. MDA often assigns personnel from PM and systems engineering disciplines to support the T&E mission. The implementation of the Program T&E Leader in DoDI 5000.66 should provide support to assign T&E resources. DDT&E will assess and update in the FY 2010 annual report.

4.7.2 MDA T&E Resources for Planning

MDA has processes and resources in place to participate in the planning of DT&E activities. Its self-assessment report discussed MDA's Integrated Master Test Plan (IMTP) for the overall test program. The IMTP is used in the place of the TEMP for MDA and covers all the programs within MDA. The IMTP is published annually to support the Presidential Budget Submission. Interim updates are published semi-annually, reflecting decisions by Flag Officer or Senior Executive Service personnel, as documented in decision memoranda from Corporate-Level Boards or various senior forums (e.g., Executive Test Reviews) or signed Test Objectives Letters.

The scope of the IMTP covers the Technical Baseline. Annually, depending on the POM cycle, 1 or 2 additional years will be added to the scope of the IMTP. The same process is used to create the current version of the IMTP; to review baselines for accuracy (e.g., fact-of-life changes, real-world contingencies, warfighter needs); to update Critical Engagement Conditions and Empirical Measurement Events; and for executability (funding, resources, and personnel). As new capabilities are projected in the evolving BMDS specifications for additional years, MDA reevaluates the modeling and simulation and critical factors, and ensures that data elements would adequately address the verification, validation, and accreditation.

The TFM ensures allocation of resources, responsibilities, and subfunctions within the functional area with the goals of reducing redundancy, increasing efficiency, lowering cycle time, and minimizing risk. To that end, the T&E workforce can be allocated across the test activities, including test planning, as required to support T&E planning activities.

DDT&E assessment of the MDA is that the use of the IMTP is adequate, based on its structure. DDT&E is actively involved in this process, and the current process and practice are sufficient to provide T&E planning.

4.7.3 MDA T&E Resources for Execution and Reporting

The MDA/Director for Engineering (DE) is accountable to the MDA Director for the success of the Analysis and Reporting Phase of BMDS test events. MDA/DE performs and reports systems engineering analysis, reports performance assessments, and prepares and publishes BMDS test reports. In conjunction with the Program Elements and MDA/DT, MDA/DE identifies test infrastructure requirements to support the MDA test program. MDA/DE and MDA/DT jointly manage BMDS test configurations during the test event. In conjunction with MDA/DT, MDA/DE, OTA, and Joint Functional Component Command–Integrated Missile Defense jointly provide scenario and threat environment for ground testing through the Joint Scenario Working Group. MDA/DE certifies scenarios and provides the ground test truth stimulation architecture and coordinates the integration of all new Elements/Components, and capabilities into this architecture. MDA/DE manages, develops, sustains, and modernizes ground test truth stimulation assets. In conjunction with MDA/DT, MDA/DE coordinates the developmental/integration testing in support of all ground tests. MDA/DE manages resources for non-MDA Element participation in BMDS integrated ground tests and other ground tests (e.g., pairwise test requirements, re-accomplishing prior test shortfalls, validating specific modeling and simulation anchor points, etc.).

An Integrated Event Test Team (IETT) is a multifunctional, test event team chartered to execute a specific test event. Each team is accountable to the MDA Director. The IETT supports the Office of Primary Responsibility, who provides continuity across all phases and ensures phase activities are accomplished. The IETT is the MDA equivalent to the T&E WIPT used by the other Services.

The MDA executes a combined DT/OT program, which involves the OTAs, the DOT&E, and the warfighter community in all phases of test planning, execution, and post-test analysis. Developers gain an understanding of what will be expected of a system and insight into what capabilities assist the warfighter's accomplishment of the mission. Operational testers gain insight into the system's evolving capabilities, thereby allowing the developer and operational tester to assess system operational capabilities. The warfighter can assess the Tactics, Techniques, and Procedures (TTPs) early and make adjustments to improve the effective implementation of the fielded capability. Overall benefits include reduced risk to the developer, increased operational utility to the warfighter, higher likelihood of reducing costs, and increased probability of operational test success.

The integrated testing approach used by MDA functions to use the T&E resources efficiently. As described in its self-assessment report and presentation, DDT&E has no concerns with test execution and evaluation within MDA.

4.7.4 MDA Ability to Attract, Develop, Retain, and Reward Personnel

One of MDA's key strategic goals is to achieve a high-performing and accountable workforce through enhanced retention, recruitment, and individual development, which is in line with DDT&E efforts. MDA believes its internship program is vital to the growth and capabilities maturity of its Agency. This staffing pipeline of young professionals contributes to succession planning, provides a broader experiential baseline, and contributes technical skills throughout their career development within MDA. MDA's goal is to convert 75 percent of all interns to competitive service positions as they complete their 2-year intern programs. MDA recognizes that the ability to retain these resources

is dependent upon communication and supervisory skills, assimilating and orienting the interns through mentoring, and providing each intern with work development plans. The MDA, like the Services, makes use of the Individual Development Plan to track the training and certification of T&E personnel.

The MDA/DT is responsible for organizing and conducting BMDS Test Program training for Test Functional Area (TFA) personnel. Working with the Functional Manager Support Team, MDA/DT identifies and addresses training needs for the TFA and the BMDS Test Program. TFA training includes training classes and briefings on test basics, terminology, test standards, range training, etc. This type of training provides TFA personnel with a high-level overview and insight into the BMDS Test Program. In addition, TFA supervisor/rating officials have the ability to nominate employees for awards to benefit employees with high levels of performance. Currently, awards and recognition for matrixed employees are the primary responsibility of the PMs, not the TFM.

The MDA developed the Human Capital Strategic Plan to manage MDA human capital strategies and determine how well MDA will carry out its core functions over the next 5 years. As of November 2009, MDA has also taken action to in-source 200 positions, 14 of which are T&E, to increase the number of civilian acquisition T&E Workforce positions. Additionally, MDA/DT is in the approval process for 50 additional Government personnel to support the test program. The MDA Director is delegated as an EHA. The MDA Director has the authority and responsibility to appoint qualified individuals to the specified shortage category positions.

MDA's planning for the period FY 2009 through FY 2013 has focused on obtaining Section 852 funding support to recruit 100 acquisition interns in various career fields, and to enhance their training, recruitment, and recognition incentives for implementing these initiatives. This effort was subsequently expanded by the MDA Director to recruit an additional 200 engineers and scientists per year under the direction of the Missile Defense Career Development Program.

In addition, during the self-assessment brief to DDT&E, MDA discussed success at job fair held in Huntsville, Alabama. The job fair attracted more than 250 attendees, resulting in more than 40 job offers for T&E professionals.

DDT&E has no concerns about MDA's ability to attract personnel due to noted success at job fairs as well as the internship program. The information on training, retention, and EHA should allow MDA to sustain its T&E workforce.

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5 ASSESSMENT OF MILITARY DEPARTMENT AND DEFENSE AGENCY SYSTEMS ENGINEERING REPORTS

5.1 Scope of Assessment

The Army, the Department of the Navy (Navy and Marine Corps), and the Air Force submitted systems engineering self-assessment reports to the Directorate of Systems Engineering (DSE). DSE's assessment focused on how well each Service has developed and implemented plans, policies, products, and resources for its respective systems engineering and development planning organizations to do the following:

- Provide rigorous systems analysis and systems engineering to support key requirements, acquisition, and budget decisions for each Major Defense Acquisition Program (MDAP) prior to Milestone A, B, and C approvals
- Incorporate robust reliability, availability, and maintainability (RAM) and sustainability improvement efforts as an integral part of the Systems Engineering Plan (SEP) for each MDAP
- Identify systems engineering requirements, including RAM and life cycle management and sustainability, during the Joint Capabilities and Integration Development System (JCIDS) process and subsequently incorporate them into contract requirements for each MDAP

DSE assessed each Service's approach to applying robust systems engineering across the life cycle consistent with Office of the Secretary of Defense (OSD) policy (e.g., DoD Instruction 5000.02) and the Defense Acquisition Guidebook. DSE also evaluated the quality of the systems engineering processes, ongoing initiatives, and any areas that the Services indicated were in need of improvement.

The Services were requested to identify additional authorities or resources needed to attract, develop, retain, and reward systems engineers with the appropriate levels of hands-on experience and technical expertise to execute MDAPs. DSE assessed the responses in this area focusing on human capital planning. None of the Services identified a need for additional authorities or resources in the area of workforce development.

5.2 Overview of the Services' Systems Engineering Organization and Capabilities

The reports provided by the Army, Navy, and Air Force demonstrate that the Services have established policies and guidance that flow from overarching DoD acquisition policy and guidance, including the DoD 5000 series, the Defense Acquisition Guidebook, the SEP Preparation Guide, and associated guidance described in Section 3 (Systems Engineering Activities and Oversight Functions). The Services continue to update policy and guidance as needed to reflect lessons learned, best practices, Service-unique requirements and direction from OSD.

The Services indicated that adequate governance is in place to support robust systems engineering execution. During Program Support Reviews, DSE has observed that program governance and program assessments are conducted as specified in the Service reports. The Services have established policies requiring each MDAP to incorporate RAM and sustainability improvement efforts into the SEP. The Services continue with efforts to ensure these policies are implemented across new and ongoing MDAPs.

According to the submissions, the Services are conducting development planning and incorporating systems engineering requirements into the JCIDS process. There are differing levels of maturity among the Services on development planning capabilities in terms of structure, culture, technology, and human resources. DSE is working closely with the Services to ensure a common understanding of development planning and to mature the Services' ability to perform development planning-related activities, including the following:

- Understanding user need in the context of operations and other systems
- Identifying ideas/concepts for solutions
- Assessing ideas/concepts to identify feasible materiel solution options
- Conducting technical analysis of the proposed concepts
- Continuing systems analysis and systems engineering support to solution development

Each Service provided information regarding the certification/experience levels of its Systems Planning, Research, Development, and Engineering (SPRDE) workforce and ongoing human capital initiatives to attract, retain, and train its workforce. Each Service also indicated that a full assessment of its ability to put appropriately qualified persons in the right positions based on new requirements is ongoing.

5.3 DSE Assessment of the Army Report

5.3.1 Service Assessment Summary

The Army reports that organizations responsible for the development, acquisition, and support of Army weapon systems are exercising sound systems engineering principles to achieve the Army's missions. While the Army reports that it currently has appropriate resources and adequate numbers of trained personnel in order to execute these systems engineering requirements, the Assistant Secretary of the Army for Acquisition, Logistics, and Technology (ASA(ALT)) is conducting an extended review in FY 2010 to ensure evolving systems engineering and development planning responsibilities continue to be adequately supported.

The Army identified five areas in which it has seen positive results in the implementation of systems engineering and development planning:

1. Improved coordination across Program Executive Offices (PEOs) and improved integration across formations based on the establishment of the System-of-Systems Engineering (SoSE) organization and associated processes

2. Establishment of PEO Integration to support successful implementation of the Army Modernization Strategy
3. Establishment of a technical authority in the Army (SoSE) for modeling, simulation, and analysis support in the execution of trades and the development of Capability Packages
4. Delivery of initial architecture products that define the Capability Packages to be delivered within the LandWarNet/Battle Command (BC) construct
5. Initial development of platform and C4ISR (command, control, communications, computers, intelligence, surveillance, and reconnaissance) open architectures to drive commonality, interoperability, and efficiencies across Army platforms

The Army also identified five areas it intends to focus on in the near term to improve and mature systems engineering and development planning capabilities:

1. Organization and business process transformation to better align with and execute the Army Network Modernization Strategy
2. Focus on recruiting, growing, and retaining qualified systems engineers
3. Reinforcing system of systems (SoS) responsibilities across PEOs and Program Managers (PMs)
4. Institutionalizing the processes and governance to develop and deliver Capability Packages in accordance with the LandWarNet/BC construct
5. Establishment of policies and processes for inserting development planning initiatives earlier in the program life cycle

5.3.2 Policy and Guidance

The Army has systems engineering and development planning policy and guidance in place that align with DoD acquisition policy and guidance. Table 5-1 summarizes key Army policies and guidance in these areas. Two Army documents (AR 70-1 and DA PAM 70-3) guide the Army's overall acquisition efforts including those associated with systems engineering and RAM by defining mandatory systems engineering requirements and processes the PM must implement. ASA(ALT) requires all PEOs and Direct Reporting Program Managers (DRPMs) to appoint a Chief Systems Engineer.

AR 70-1, "Army Acquisition Policy," released in 2003, has been updated to reflect the latest DoD 5000 policy and the December 4, 2009, Directive-Type Memorandum (09-027) from the Under Secretary of Defense for Acquisition, Technology, and Logistics (USD(AT&L)). AR 70-1 is currently in coordination with release planned in 2010. DA PAM 70-3 will be updated in 2010 as well.

Table 5-1. Army Policy and Guidance

Key Policy and Guidance References	Document Title	Systems Engineering Aspects
ASA(ALT) Memo June 13, 2006	Army Systems Engineering Policy (Systems Engineering Practice and Implementation)	• Establishes Army Systems Engineering Forum • Requires all programs, independent of ACAT category, to develop a SEP to support Milestones A, B, and C • Requires PEOs and PMs to designate Chief Systems Engineer • Requires PEOs to address interoperability/system of systems
ASA(ALT) Memo December 6, 2007	Reliability of U.S. Army Materiel Systems	• Requires establishment of a reliability test threshold for all pre-Milestone B and IT programs • Describes reliability test threshold process • Provides reliability best practices
U.S. Army RDECOM Memorandum April 11, 2007	Systems Engineering Policy	• Includes the following Guidance enclosures: a) Systems Engineering Reporting Guidance, April 2007, Version 1 (enclosure 1) b) Army Technical Objective (ATO) Research (R) and ATO Development (D) SE Process Guidance, April 2007, Version 1 (enclosure 2) c) SEP Guidance, April 2007, Version 1 (enclosure 3) d) Technology Readiness Level Assessment (TRLA) Guidance, April 2007, Version 1 (enclosure 4) e) Technology Readiness Level Assessment Report (TRLAR) Guidance, April 2007, Version 1 (enclosure 5)
Army Regulation 70-1 December 13, 2003	Army Acquisition Policy	• Implements acquisition policy in accordance with OSD policy • Requires PMs to establish systems engineering process including technical reviews • Discusses RAM • Incorporates value engineering, data/configuration management, integrated digital environment, standardization, interoperability, system of systems considerations
Army Regulation 70-47 August 19, 1985	Engineering for Transportability	• Describes policy and procedures for transportability to be considered as a primary system selection and when strategic and tactical deployment is a system requirement

(continued)

Table 5-1. Army Policy and Guidance *(continued)*

Key Policy and Guidance References	Document Title	Systems Engineering Aspects
Army Regulation 70-75 May 2, 2005	Survivability of Army Personnel and Materiel	• Implements survivability as outlined in DoDI 5000.2 and the Defense Acquisition Guidebook within the Army
Army Regulation 71-9 January 28, 2010	Warfighting Capabilities Determination	• Establishes policies and assigns responsibilities for the identification, determination, and integration of required warfighting capabilities • Implements the Joint Capabilities Integration and Development System (JCIDS) within the Department of the Army • Describes the Army's development planning organizational constructs and activities
Department of the Army Pamphlet 70-3 January 28, 2008 (Rapid Action Revision 001, April 1, 2009)	Army Acquisition Procedures	• Provides detailed systems engineering guidance including design considerations for value engineering, human systems integration, and value engineering • Provides detailed guidance on RAM including reliability growth, RAM assessment, and testing
Department of the Army Pamphlet 385-16, November 13, 2008	System Safety Management Guide	• Describes development of system safety programs to minimize risks throughout the system life cycle

Army systems engineers follow the Defense Acquisition Guidebook Chapter 4, Systems Engineering, and the DoD SEP Preparation Guide. The Army requires a SEP early in the development life cycle.

The Army report describes the Army's comprehensive RAM improvement efforts to develop processes and policy that fully implement the Sustainment Key Performance Parameter (KPP) and RAM policy. The Army's published RAM processes are in compliance with current AT&L RAM Policy, Section 3.8. The Army RAM improvement efforts indicate that significant resources are directed at solving reliability problems.

5.3.3 Organization

Figure 5-1 provides an overview of the Army's Acquisition, Logistics, and Technology organization. The following information provides a brief summary of roles and responsibilities for MDAP execution within the Army.

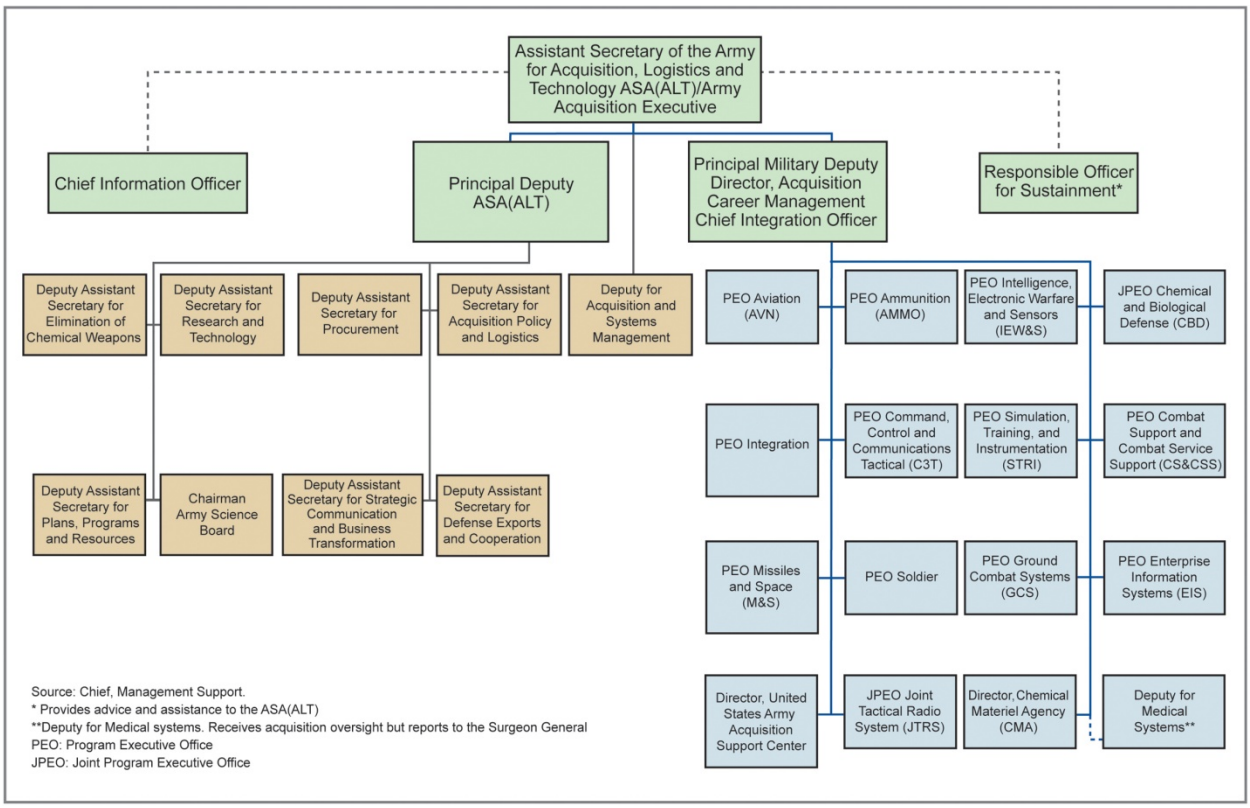


Figure 5-1. Overview of Army Acquisition, Logistics, and Technology

The Army Chief of Staff approves all warfighting capabilities submitted by the U.S. Army Training and Doctrine Command; the Army Requirements Oversight Council advises the Chief of Staff on warfighting capabilities. The Army Acquisition Executive is responsible for all Army acquisition and is the Single Decision Authority for acquisition.

The Army has developed a Capability Package approach to integrating new capabilities into Brigade Combat Team configurations in conjunction with the Army Force Generation (ARFORGEN) model. ARFORGEN involves a structured process, shown in Figure 5-2, that builds unit readiness over time, resulting in recurring periods of availability of trained, ready, and cohesive modular units. Specific steps include:

1. Coordinate schedules, resources, readiness assessments.
2. Task modular formations for training and mission preparation as soon as possible (dynamic, iterative process).
3. Align all validated requirements to force pools.
4. Codify (orders) at ARFORGEN Synchronization (Synch) Conference.

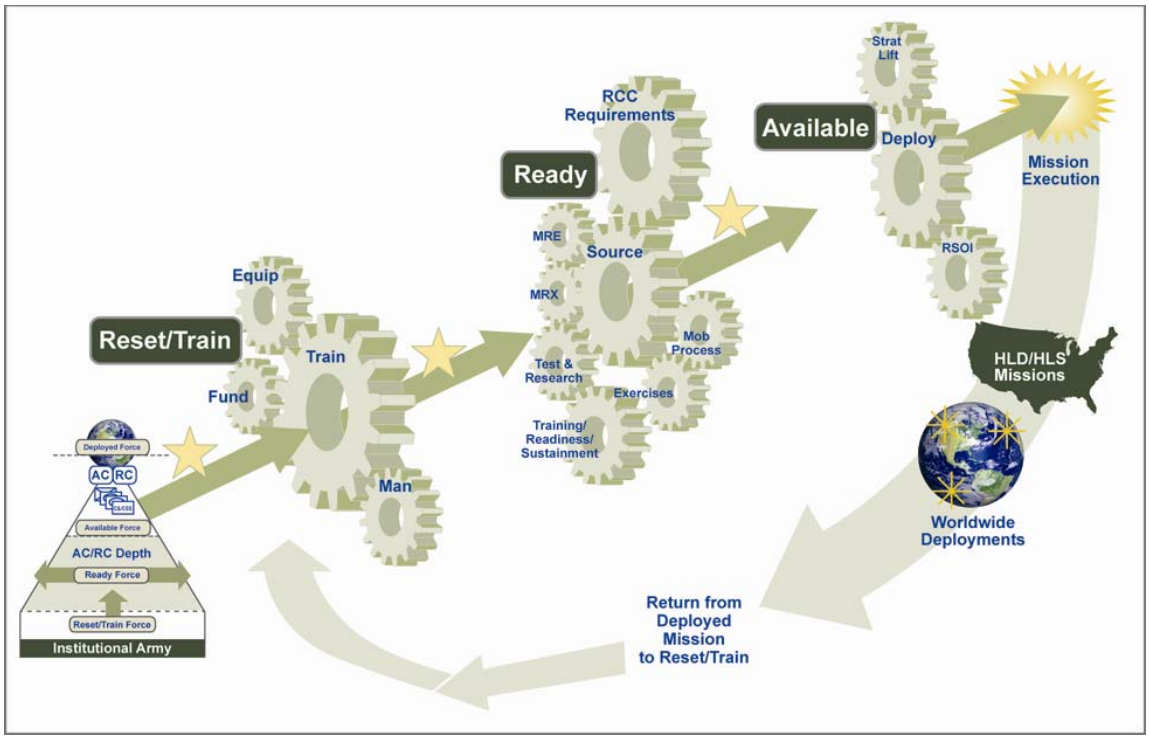


Figure 5-2. Army Force Generation Process

The Army Capabilities Integration Center leads identification, design, development, and synchronization of capabilities into the Modular Force.

Ongoing systems engineering processes typically occur within the programs of record. The linkage occurs when and where system dependencies are identified as part of an SoS construct. The Army's LandWarNet/ARFORGEN unit type construct provides the SoS framework in which individual programs interact operationally. Many of the individual system interdependencies are understood and worked as part of the standard systems engineering process among systems, but the SoS construct provides opportunities to better identify gaps and overlaps early and to resolve many of them earlier in the life cycle.

5.3.4 Systems Engineering Activities

ASA(ALT) directs that all PEOs are responsible for oversight of systems engineering practices and processes. PEOs appoint a Chief Systems Engineer and a Chief Software Architect for oversight and evaluation of systems engineering practices and products, including software engineering practices and products, across the PEO's areas of responsibility.

In accordance with Army acquisition policy, PMs are identified well before Milestone B decisions to provide systems engineering insights into the process. PMs are directed to use competitive prototyping to ensure programs benefit from the opportunity to choose from a range of well-designed options. The PM appoints a Chief Systems Engineer and a subordinate Chief Software Architect (if required). The PM is responsible for developing and implementing a systems engineering program to apply the functional engineering disciplines to the systems engineering process.

There are three levels of systems engineering within the new ASA(ALT) construct shown in Figure 5-3. At the top level (reporting directly to the Military Deputy) is the new SoSE organization. PEO Integration is responsible for integrating solutions into the force through the ARFORGEN process. The Task Forces test the implementation integration of the Capability Packages. These three levels augment the systems engineering functions within the PEO/PM organizations.

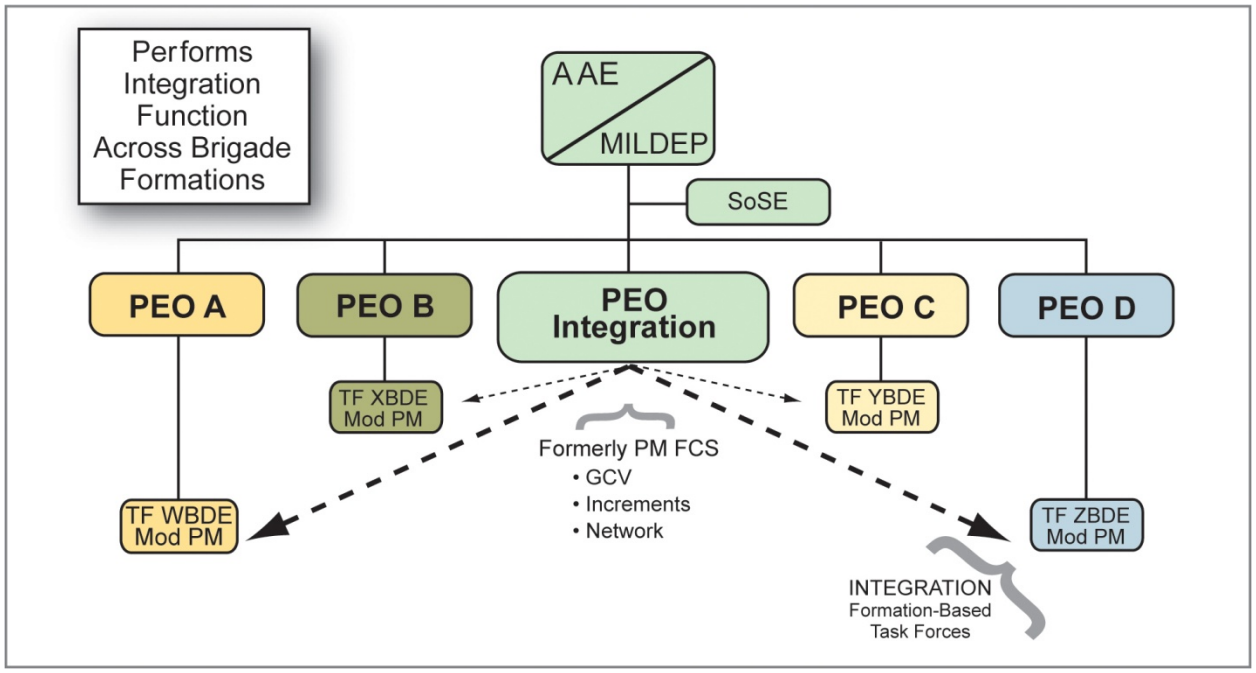


Figure 5-3. Proposed ASA(ALT) Structure with SoSE and PEO Integration

ASA(ALT) established the SoSE organization at the headquarters level for systems engineering oversight and for enterprise architectures. This is a major initiative to ensure synchronization of systems engineering and acquisition events. The SoSE organization is a direct report to the Army Principal Military Deputy to the Army Acquisition Executive and is led by a Senior Service Executive.

Although systems engineers within PEO and PM offices integrate systems within their purview with adjacent systems, the SoSE organization will provide Army Staff with the capability to integrate all materiel and network solutions across the entire Army and across the Program Objective Memorandum (POM) years. The SoSE organization works closely with the Army Capabilities Integration Center to ensure early systems engineering is part of the capabilities process.

The SoSE organization conducts cross-formation, cross-POM year analysis by:

- *Architecture:* Developing and maintaining comprehensive and authoritative systems architecture to inform:
- *Integration:* Conducting integration across all formation types and POM years to identify:
- *Trade Space:* Conducting trade space analysis in support of Army Interoperability (G-3/5/7) priorities and to inform Army Deputy Chief of Staff (G-8) funding decisions.

Through comprehensive integration and trade space analysis, the SoSE organization will increase warfighter capabilities by identifying shortfalls and fielding issues in accordance with ARFORGEN, while decreasing overall Army-wide expenditures by identifying redundancies and fielding priorities that support Army budget constraints.

The approved organization for SoSE is shown in Figure 5-4. Current organic manning for the organization is an Acting Director, Deputy Director, one supervisor, two engineers, and an executive assistant. The Army reports that it plans to add the Director, another supervisor, and one engineer in FY 2010. The Army will utilize contractor support while increasing manning, to augment capabilities as required.

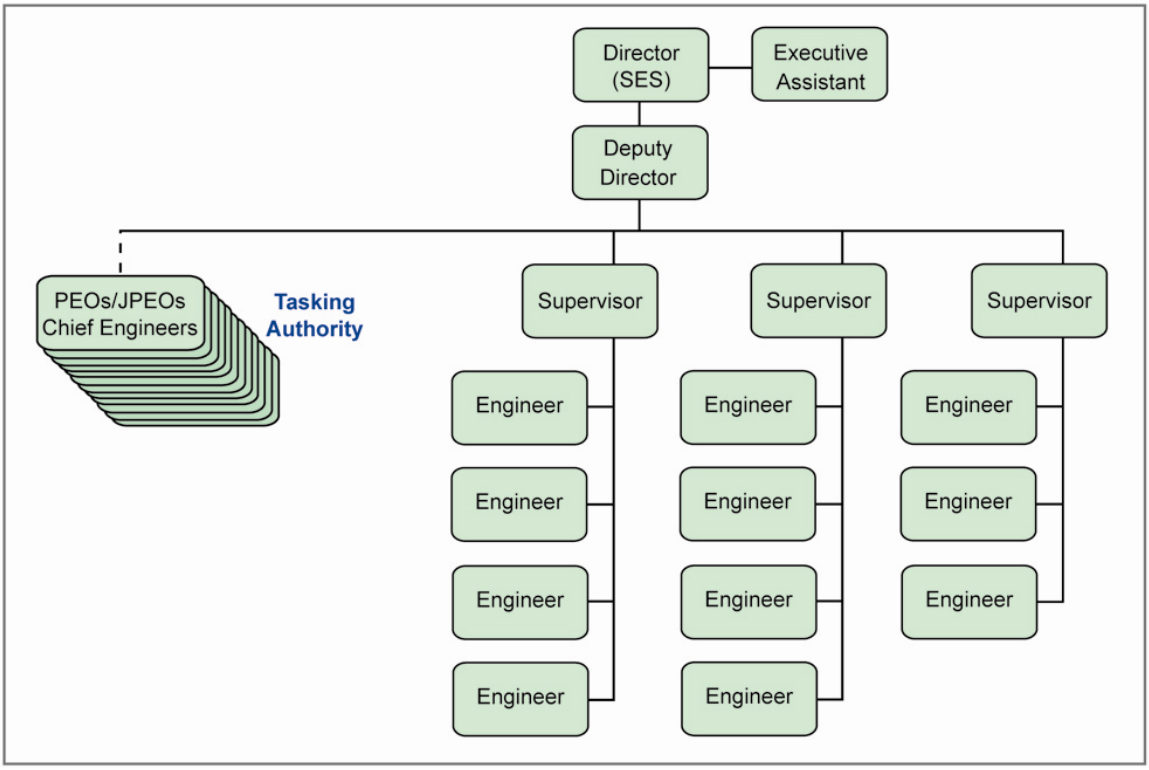


Figure 5-4. Army System-of-Systems Engineering Organization

The SoSE organization will have the following capabilities when fully staffed in FY 2010:

- Deliver products and services in support of LandWar Net/BC Capability Set Development process
- Perform trade studies to support operational value versus cost analysis and decisions
- Provide SoSE discipline across portfolio to achieve commonality, interoperability, and support decisions
- Perform core SoSE business operations
- Perform SoSE activities to deliver integrated Battle Command with and across formations

The U.S. Army Research, Development, and Engineering Command (RDECOM) is the Army's technology leader and largest technology developer. RDECOM develops technologies in its eight major laboratories and research, development, and engineering centers. RDECOM provided its command with specific policy and guidance on systems engineering:

- Systems Engineering Reporting Requirements Guidance requires each Army Technical Objective (ATO) program to submit its SEP annually. They are required to obtain adequate support personnel, trained personnel, funding, and tools to accomplish the systems engineering activities in the SEP.
- Systems Engineering Process Guidance provides the context for systems engineering practices, activities, products, and events within the systems engineering "V."
- Technology Readiness Level (TRL) Assessment/Report Guidance provides ATO PMs with how Technology Readiness Assessment should be conducted and how to report on the readiness of critical technology elements.

If a technology base-developed materiel solution is transitioned to an MDAP, the appropriate PEO/PM is assigned the responsibility to perform the systems engineering function. The PEO Chief Systems Engineer oversees this process.

The various design elements to be considered as part of systems engineering (e.g., human systems integration, environment, safety, and occupational health (ESOH), corrosion protection) are inherently the responsibility of the gaining PEO/PM and are incorporated in the program management processes. As SoS processes and capacity are developed and matured, interdependencies among programs will be identified and managed.

ASA(ALT) chairs an Army Systems Engineering Forum (ASEF), which is chartered to institutionalize effective systems engineering practices across the Army's workforce and programs as well as to promote collaboration across the Army's requirements, acquisition, logistics, and testing communities.

5.3.4.1 Reliability, Availability, and Maintainability

The Army has put in place comprehensive RAM improvement efforts to develop processes and policy that fully implement the Sustainment KPP and AT&L RAM policy. The Army RAM improvement efforts indicate that significant resources are directed at solving reliability problems. The Army has taken steps to require RAM assessments across all programs, including:

1. Updated Army PM charters to explicitly include a RAM focus.
2. Increased RAM scope within the Acquisition Program Baseline with an added focus on PEO/PM accountability.
3. Modified ASARC (Army System Acquisition Review Council) and other reviews to include a focus on RAM.
4. Ensuring reliability expertise resident within ASA(ALT) SoSE.
5. Increased RAM emphasis in capability documents and acquisition contracts.
6. Improved RAM training to the Army acquisition and logistics workforces.
7. Sponsoring RAM conferences and workshops.

8. Encouraging use of the Reliability Program Standard for Systems Design, Development, and Manufacturing (GEIA-STD-0009).
9. Applying a Reliability Scorecard early to evaluate progress during the development process.

5.3.5 Development Planning Activities

The U.S. Army Capstone Concept and the SoSE organization establish a strategic operations and system context as a basis to conduct the up-front technical preparation of development planning within the U.S. Army's Materiel Enterprise. The Army Capstone Concept places modernization decisions in a broader context of future armed conflict, and establishes the foundation for subordinate concepts that refine the Army's vision of how it will operate in the future and the required capabilities to execute the mission. The SoSE organization serves the Army Acquisition Executive and the Army Staff in ensuring that there is an integrated approach for the future development of solutions across the Materiel Enterprise, enabled by its mission: "Architect and enable the incremental delivery of relevant, integrated and affordable capabilities by formation type in support of the Army's guidance, modernization strategy, and Army Force generation model to enable decisions across the Program Objective Memorandum cycle."

Within this system and operational context, RDECOM works to ensure the dominance of Army capabilities by creating, integrating, and delivering technology-enabled solutions to Soldiers in eight major laboratories and research, development, and engineering centers and in partnership with an extensive network of academia, industry, and international partners. As a part of this process, RDECOM has provided its command with guidance and policy on systems engineering, requiring the application of systems engineering best practices during the maturation of ATO-Development (D) and recommends consideration of applying these principles to ATO-Research (R). RDECOM requires each ATO to submit a Pre-Milestone A SEP on an annual basis, as well as an analysis report of lessons learned, best practices, detriments, and benefits resulting from systems engineering practices.

The Army's establishment of the SoSE organization within ASA(ALT) exhibits strong leadership on the part of the Army in the area of enterprise-level management of the integration and interoperability of developing and legacy systems. The organization is a recent initiative, and its impact on enhancing Army capability to address the challenges created by the integration and management of SoS has yet to be determined, but the Army's commitment of significant resources in this area should keep the necessary focus on addressing SoS challenges in acquisition.

RDECOM is the lead organization for the creation, integration, and delivery of technology-enabled solutions with the Defense Advanced Research Projects Agency, the Army Training and Doctrine Command, the other Services, industry, the field, and academia also contributing to the generation of materiel solutions to address capability gaps. What is not clear yet is whether there is a sufficiently broad range of concepts considered in the Analyses of Alternatives (AoA) and whether the Army Materiel Enterprise currently generates and feeds those acquisition pre-programs with a broad range of adequate technically mature alternative materiel solution concepts. Further exploration will be required to understand whether the Army Materiel Enterprise and its acquisition and system development processes would benefit from greater investment and attention to pre-acquisition generation, development, and engineering of alternative materiel solution concepts.

Additional data will be required to adequately assess the resources applied to conducting adequate technical risk analysis and comparisons across alternatives during the AoA and the adequacy of engineering analyses during the Technology Development phase as well as sufficiency of resources and proper execution.

Although the Army has been executing the development planning mission for some time, it has not developed a comprehensive plan from a development planning perspective. The development planning process in the Army requires synchronization of activities across Training and Doctrine Command, RDECOM, and ASA(ALT) in coordination with the Army Staff. Challenges occur in the areas of disciplined future planning with tools and processes developed with short-term objectives and limited (system by system) scope in mind. That, coupled with the highly dynamic environment associated with equipping an Army at war (rapid fielding processes and non-programs of record), causes constraints in attempting to address this near-term vs. long-term challenge.

The Army has adopted the LandWarNet and ARFORGEN constructs to provide the mechanisms for working near-, mid-, and far-term planning simultaneously. The effort is still relatively new and is in the process of maturing. Significant progress has been made, but it still needs to be considered from the development planning perspective.

5.3.6 Workforce and Resources

5.3.6.1 Workforce

The Army reports that the Army Acquisition, Logistics, and Technology (ALT) workforce is made up of dedicated and well-trained civilian and military professionals who work every aspect related to the development and acquisition of systems, products, and services critical to the Army's daily operation and mission success. Civilian employees, military officers, noncommissioned officers, and members of the Army Reserve and Army National Guard are all valued members of the Army's ALT team.

The Army ALT workforce manages roughly 25 percent of the Army's current budget, and a diverse portfolio of more than 600 programs that range from the Abrams tank to the Army combat uniform; from the Apache Longbow helicopter to the advanced combat helmet; and from life-saving medical equipment to ongoing chemical demilitarization operations. The Army is focused on developing flexible acquisition officers, noncommissioned officers, and civilian leaders who possess a diverse and well-rounded background, can effectively support all phases of acquisition, and are prepared to lead any complex, multifunctional acquisition command, agency, organization, or team.

The Army reports that it has identified several programs and initiatives that enhance the development and synergy of its total ALT workforce of more than 40,000, while successfully supporting operational tempo. In February 2009, the USD(AT&L) released the draft Appendix 12 to the DoD Civilian Human Capital Strategic Plan. This document addresses the health of the entire DoD acquisition workforce, workforce life cycle models, and initiatives under Section 852 to recruit, develop, and retain the acquisition workforce. It also focuses on the following seven acquisition career fields: Business, Cost Estimating, and Financial Management; Contracting; Life Cycle Logistics; Program Management; Production, Quality, and Manufacturing; SPRDE; and Test and

Evaluation. When it is published, the Army plans to use this information to update its human capital plan.

Engineers are the largest community within the Army's ALT workforce, numbering 10,418 military and civilian personnel. These individuals participate in one of three engineering acquisition career paths:

1. Systems Planning, Research, Development, and Engineering–Systems Engineering (SPRDE-SE)
2. Systems Planning, Research, Development, and Engineering–Program Systems Engineer (SPRDE-PSE)
3. Systems Planning, Research, Development, and Engineering–Science and Technology Management (SPRDE-S&T))

They are qualified professionals and are offered additional opportunities to augment the minimum training, education, and experience certification standards. These professionals are located in organizations worldwide.

For systems engineering in particular, the Army defines the associated duties in broad terms. According to the Army report, systems engineers "plan, manage, or perform analysis, research, design, development, fabrication, installation, modification and disposal of systems or systems components across the entire life cycle and apply one or more of the DoD systems engineering technical processes or technical management processes for a specific domain subsystem or component level." Within the Army, those responsibilities include nutritional analysis of soldier's meals, developing new types of satellite sensors, and ensuring that fielded equipment is supported and supportable through its intended lifetime, as well as overall management of design, development, and fielding of major weapon systems. Therefore, systems engineers can be found in several organizations throughout the Army.

The numbers of SPRDE-coded personnel located in each Army command and product center are broken out by career paths in the following tables. Table 5-2 shows the number of SPRDE-S&T coded personnel; Table 5-3 the number of SPRDE-SE coded personnel; and Table 5-4 the number of SPRDE-PSE coded personnel at each command or product center. RDECOM has the majority of personnel from each career path.

Table 5-2. Civilian and Military SPRDE Acquisition Personnel by Command/Product Center: SPRDE–Science and Technology

Command Name	Civ	Mil	Total
U.S. Army Acquisition Support Center	5	0	5
U.S. Army Test and Evaluation Command	1	0	1
U.S. Army Corps of Engineers	1	0	1
U.S. Army Medical Command	32	0	32
U.S. Army Space and Missile Defense Command	4	0	4
Field Operating Agencies of the Army Staff (OA-22)	13	0	13
U.S. Army Aviation and Missile Command	18	0	18
U.S. Army Communications-Electronics Command	2	0	2
U.S. Army Chemicals Materials Agency	1	0	1
U.S. Army Materiel Acquisition Agency	1	0	1
U.S. Army Joint Munitions Command	3	0	3
U.S. Army Research and Development Engineering Command	118	0	118
U.S. Army Test, Measurement, and Diagnostic Equipment Activity	2	0	2
U.S. Army Materiel Readiness Activities	3	0	3
TOTAL	204	0	204

Source: CAPPMIS, September 30, 2009

Table 5-3. Civilian and Military SPRDE Acquisition Personnel by Command/Product Center: SPRDE–Systems Engineering

Command Name	Civ	Mil	Total
U.S. Army Central	4	1	5
U.S. Army Acquisition Support Center	647	0	647
U.S. Army Special Operations Command	9	0	9
U.S. Army Intelligence and Security Command	4	0	4
U.S. Army Test and Evaluation Command	87	0	87
U.S. Army Installation Management Agency	34	0	34
U.S. Army Criminal Investigation Command	1	0	1
U.S. Army Corps of Engineers	61	0	61
Office of the Chief of Staff of the Army	4	0	4
DoD Agency	0	1	1

(continued)

Table 5-3. Civilian and Military SPRDE Acquisition Personnel by Command/Product Center: SPRDE–Systems Engineering *(continued)*

Command Name	Civ	Mil	Total
U.S. Army Europe and Seventh Army	2	0	2
U.S. Army Forces Command	2	0	2
Network Enterprise Technology Command	10	0	10
Joint Activity	1	1	2
U.S. Military Academy	1	10	11
U.S. Army Medical Command	79	0	79
Office of the Secretary of the Army	7	0	7
Field Operating Offices of the Office of the Secretary of the Army	2	0	2
U.S. Army Space and Missile Defense Command	195	2	197
Field Operating Agencies of the Army Staff (OA-22)	112	0	112
Joint Services and DoD Activities of the Office of the Secretary of the Army	4	0	4
Special Operations Command	1	0	1
U.S. Army Recruiting Command	1	0	1
U.S. Army Training and Doctrine Command	7	0	7
U.S. Army Materiel Command (AMC-Rollup)	18	5	23
U.S. Army Headquarters, AMC	19	0	19
U.S. Army Training Activities, AMC	38	0	38
U.S. Army Aviation and Missile Command	126	0	126
U.S. Army Tank-Automotive and Armaments Command	112	0	112
U.S. Army Communications-Electronics Command	559	0	559
U.S. Army Chemicals Materials Agency	31	0	31
U.S. Army Sustainment Command	2	2	4
U.S. Army Materiel Acquisition Activity	15	0	15
U.S. Army Security Assistance Command	3	0	3
U.S. Army Joint Munitions Command	94	0	94
U.S. Army Research and Development Engineering Command	7,781	85	7,866
U.S. Army Materiel Readiness Activities	1	0	1
TOTAL	10,074	107	10,181

Source: CAPPMIS, September 30, 2009

Table 5-4. Civilian and Military SPRDE Acquisition Personnel by Command/Product Center: SPRDE–Program Systems Engineer

Command Name	Civ	Mil	Total
U.S. Army Acquisition Support Center	8	0	8
U.S. Army Test and Evaluation Command	2	0	2
U.S. Army Space and Missile Defense Command	3	0	3
Field Operating Agencies of the Army Staff (OA-22)	1	0	1
U.S. Army Tank-Automotive and Armaments Command	2	0	2
U.S. Army Communications-Electronics Command	1	0	1
U.S. Army Research and Development Engineering Command	16	0	16
TOTAL	33	0	33

Source: CAPPMIS, September 30, 2009

The Army plans to grow the SPRDE-coded workforce over the next 5 years. Table 5-5 shows the Army's implementation of the Secretary of Defense Growth Strategy FY 2009–2015. The Army plans an increase of 1,304 new employees in the SPRDE career field, of which 1,259 will be in-sourced contractor conversions and 45 will be new hires. This quantity is also reflected in the Army's component of the overall DoD target for new hires.

Table 5-5. SPRDE Hiring Plan (FY 2009–2015)

FY09	FY10	FY11	FY12	FY13	FY14	FY15	Total
45	275	250	225	200	185	124	1,304

Through National Defense Authorization Act (NDAA) 2008 Section 852 requests, the Army has already started hiring efforts. Table 5-6 outlines the actual number of SPRDE positions hired for FY 2008 and FY 2009. The total number of new hires for FY 2008 and FY 2009 was 65 employees, which exceeds the projected FY 2009 quantity of 45. As a result, the Army will need to reduce hiring targets in one of the future years by 20 positions.

Table 5-6. SPRDE Section 852 Hires (FY 2008–2009)

Position	FY08	FY09	Notes
Interns	17	18	
Journeyman	24	5	2 / SoS per PEO
Highly Qualified Experts	1	0	Currently on board
TOTAL	42	23	

The Defense Acquisition Workforce Improvement Act (DAWIA) was enacted in November 1990 to improve the effectiveness of the personnel who manage and implement defense acquisition programs. It called for establishing an Acquisition Corps and professionalizing the acquisition workforce through appropriate education, training, and work experience. The Army also considers having the right competencies at the right levels of certification and experience an important workforce tenet.

The Army has taken an active approach to ensure that its acquisition workforce members comply with both DAWIA position certification requirements and the DoD ATL requirements for completion of Continuous Learning (CL) activities. This approach includes monitoring certification and CL achievement, briefing leadership on compliance status, and strongly encouraging that certification and CL compliance be incorporated into acquisition employees' and supervisors' performance objectives and be discussed and considered during performance evaluations. As Army ALT workforce members complete the education and training standards for the position encumbered, they receive a personal e-mail encouraging them to apply for certification. Often, however, they lack the requisite experience requirements needed to achieve certification and need additional time in the position gaining acquisition experience before they are eligible for certification.

Table 5-7 depicts the certification achievement of Army SPRDE personnel for all three career paths. Workforce certification data are provided quarterly to the Defense Acquisition University (DAU) in accordance with the reporting requirements defined in DoD Instruction 5000.55, "Reporting Management Information on DoD Military and Civilian Acquisition Personnel and Positions." Army ALT workforce members have 24 months in which to achieve certification for the acquisition position encumbered.

Table 5-7. Army ALT Workforce Levels 1-3 SPRDE Certification Achievement

SPRDE-S&T Manager	Total Personnel	Total Certifications	% Certification
Level 1	2	0	0.00%
Level 2	60	24	40.00%
Level 3	142	70	49.30%
Total	204	94	46.08%
SPRDE-SE	**Total Personnel**	**Total Certifications**	**% Certification**
Level 1	475	181	38.11%
Level 2	2429	1151	47.39%
Level 3	7277	5529	75.98%
Total	10181	6861	67.39%
SPRDE-PSE	**Total Personnel**	**Total Certifications**	**% Certification**
Level 1	3	0	0.00%
Level 2	12	0	0.00%
Level 3	18	2	11.11%
Total	33	2	6.06%

Source: CAPPMIS, September 30, 2009

SPRDE personnel can generally complete their training requirements within 1 or 2 years, but then they must wait and acquire the necessary experience for Level II (2–4 years) and Level III (4–8 years) certification. This waiting period may account for any time lag between completing training requirements and obtaining certification.

The SPRDE-SE population has 10,181 members, the largest by far of the three SPRDE career paths. The SPRDE-SE certification achievement percentages are relatively high with a total average of 67.39 percent, which is close to the 75 percent objective set by the Army's Director of Acquisition Career Management. However, there are some potential problems in the other two SPRDE career paths of SPRDE-S&T and SPRDE-PSE:

- Separating the overall SPRDE career field into three components caused some employees to be no longer certified for their position, which led to a reduction in the certification percentages.
- Increasing the experience requirements for SPRDE-PSE from 4 to 8 years similarly caused some employees to be no longer certified for their position when it was re-coded to SPRDE-PSE.
- Although the Army requests quotas/seats for certain highly demanded classes, such as SYS302, DAU does not necessarily provide this amount. As a result, there are students on waiting lists for these courses.
- There is difficulty in attending required DAU courses due to high operational tempos within the organizations.

DSE is working with the Services and DAU to mitigate these issues.

The Army is also assessing the SPRDE workforce members' competencies in systems engineering, using the processes defined in the Defense Acquisition Guidebook as its basis. The goal is to achieve 100 percent participation by the Army SPRDE workforce in this assessment. The Army's functional leader for SPRDE fully supports the effort. The results will be used to determine where the Army has competency gaps and to provide additional training and education to remedy them.

In addition to acquisition training, the Army provides a wide array of other education and training opportunities to its workforce. The Army Civilian Training, Education and Development System (ACTEDS) is a Department of the Army (DA) program. Its main purpose is to provide Army employees and supervisors with a roadmap for career development throughout the employee's civilian career. It is a systematic, competency-based approach that provides technical and managerial employees with the right kinds of training at the right points in their careers.

ACTEDS blends formal training, on-the-job training, developmental assignments, and self-development activities. Requirements in the ACTEDS plans are tailored to the various Army Career Programs and also include prescribed Army civilian leader development training and activities.

The Army's Career Program (CP) 16 office ensures that Department of the Army Engineers and Scientists (Non-Construction) are provided with career development programs and opportunities to maintain the highest levels of technical and managerial competency. The Army and the CP-16 office recognize that this must be a continuous process; the career development program must reflect both

current and future needs for education, training, recognition, and developmental assignments in order to ensure that Army engineers and scientists bring state-of-the-art skills and knowledge to their jobs. Career development programs and recognition of Army engineers and scientists are critical to the success of Army technology base and Army acquisition.

CP-16 supports advanced degrees in both technical subjects and (where appropriate) engineering management as well as specialized job-appropriate classes. It also funds technology transfer and other knowledge exchange seminars to ensure historical knowledge will not be lost as employees leave the federal workforce. CP-16 offers its careerists financial support for rotational and developmental assignments. All applications for funding are endorsed by the employee's management and are reviewed by the career program to ensure they meet the Army's technical goals. Additional training in position-specific areas may be funded directly by the employee's command. In addition to the above-mentioned programs specifically crafted for scientists and engineers, the Army offers its ALT workforce members at all levels opportunities to be selected for programs, activities, and events that build cross-functional/leadership competencies through education, training, and experience. Examples of some of the acquisition programs in the Army's portfolio include:

- The *Competitive Development Group/Army Acquisition Fellowship (CDG/AAF) Program* is a 3-year leadership developmental program that offers expanded training, leadership, experiential, and other career development opportunities. This program is designed to develop future Army acquisition leaders.
- The *Acquisition Tuition Assistance Program (ATAP)* is designed for civilian ALT workforce members who wish to complete an undergraduate degree at an accredited college or university or to fulfill the 24 business hours required for Acquisition Corps membership.
- The *School of Choice (SOC) Program* is designed to assist entry-level to senior-level civilian acquisition professionals in obtaining an undergraduate or graduate degree in an acquisition-related discipline. This program is completed during duty hours, and selectees have up to 18 months to complete the approved degree program.
- The *Congressional Operations Seminar* training opportunity is offered to assist mid-level acquisition professionals to attend a 5-day course on Capitol Hill that provides a comprehensive look at congressional processes and procedures.
- The *Site Visit to the National Training Center* provides a unique, 2-day, firsthand experience to Army ALT workforce members regarding how the Army operates in a field environment.
- The *Leadership for a Democratic Society* is a program conducted at the Federal Executive Institute (FEI) in Charlottesville, Virginia, that focuses on personal leadership, organizational transformation, policy, and global perspectives.
- The *Excellence in Government (EIG) Program* with an Acquisition Concentration is conducted by the Partnership for Public Service in Washington, DC. This program provides selected fellows with a hands-on, results-based leadership development program and a transformational experience that concentrates on leadership and management challenges specific to Government. It meets the interagency training requirements necessary for Office of Personnel Management-approved candidate development programs and is designed to complement the core qualifications for members of the Senior Executive Service.
- *Senior Service Colleges (SSC),* including the Defense Acquisition University Senior Service College Fellowship (DAU-SSCF), the Industrial College of the Armed Forces (ICAF), the

Army War College (AWC), and the National War College (NWC), are recommended for Army ALT workforce members. Completion of one of these SSCs prepares Army professionals for positions of greater responsibility in the Department. Specifically, the DAU-SSCF develops civilian acquisition leaders for critical senior leadership roles such as product and project managers, PEOs, systems engineers, and other key acquisition positions. ICAF prepares selected military officers and civilians for senior leadership and staff positions by conducting postgraduate, executive-level courses of study, and associated research dealing with the resource component of national power. The AWC prepares military and civilians for leadership responsibilities in a strategic security environment during peacetime and wartime; and the NWC provides military and civilians with a broad understanding of national security policy and strategy. Completion of SSC provides a senior level master's and, in some cases, training for Level III DAWIA certification.

Table 5-8 shows the number of personnel including SPRDE-SE (SE) and SPRDE-PSE (PSE) that have attended the various programs.

Table 5-8. Army Educational Program Enrollments (FY 2008-2009)

Program	FY 2008	FY 2009	Notes
SOC		2 (SE)	Civilian only
Congressional Operations		9 (SE)	Civilian only
CDG/AAF	1	3	
EIG		0	
CMU		1	Civilian only
DAU SSCF	3 (SE)	6 (SE) and 1 (PSE)	Civilian only
NPS-MSPM	12 (SE)		Civilian only

5.3.6.2 Resources

The Army is conducting an analysis of the adequacy of the resourcing of development planning processes across the Army acquisition community. Additional authorities or needed resources are still to be determined based on the implementation of current plans for its tiered systems engineering system (SoSE, PEO Integration/Task Forces).

5.4 DSE Assessment of the Department of the Navy Report

5.4.1 Service Assessment Summary

The Department of the Navy (DON) has been successful at instituting the systems engineering discipline throughout the acquisition process and continues to strengthen systems engineering through a number of initiatives. The DON identified the following five areas in which it is strong:

1. Improved governance and insight into the development, establishment, and execution of acquisition programs via the (SECNAVINST 5000.2D) Two-Pass/Six-Gate Review Process

2. Use of Technical Authorities to provide risk-based options to the programmatic authorities via the Systems Engineering Technical Review Process
3. Use of an established Systems Engineering Stakeholders Group (SESG) to collaborate and implement cost-effective, integrated business and technical practices across the Naval Enterprise
4. Established processes to enhance systems engineering competencies in the DON workforce
5. Systems Engineering Workforce Initiatives to attract, hire, and retain individuals in the engineering and scientist fields

The DON also identified the following five areas for planned improvement:

1. Bolstering systems engineering processes that translate operational requirements into specifications and design
2. Developing a prototyping handbook to guide systems engineers and PMs on prototyping methodologies
3. Reinforcing the DON Naval Systems Engineering Career Roadmap, Training, and Appointment
4. Folding in predictive capabilities for mid- to long-term systems engineering workforce projections
5. Strengthening STEM K-12, undergraduate, and graduate alignment

5.4.2 Policy and Guidance

The DON has developed well-conceived acquisition implementation policy and guidance that aligns with DoD acquisition policy and guidance. Tables 5-9 and 5-10 summarize key DON implementation policy and guidance, which define the DON's acquisition implementation process, organization, capability development, and systems engineering activities. For an in-depth description of Naval policy and guidance, see https://acquisition.navy.mil/rda/home/policy_and_guidance.

Table 5-9. Summary of Key DON Acquisition and Systems Engineering Policy Documents

Key Policy References	Policy Document	Systems Engineering Aspects
SECNAVINST 5000.2D October 16, 2008	Implementation and Operation of the Defense Acquisition System and the Joint Capabilities Integration and Development System	• Implements DON acquisition process in compliance with DoD acquisition policy • Establishes the role of the Chief Systems Engineer who is the senior technical authority within the acquisition structure for integration of DON weapon and IT systems • Establishes the Capability Development and Acquisition Management Process • Establishes the Two-Pass/Six-Gate Process for DON Requirements and Acquisition Governance • Establishes systems engineering and specialty engineering policy, including RAM and human systems integration (HSI)
SECNAVINST 5430.7P June 26, 2008	Assignment of Responsibilities and Authorities in the Office of the Secretary of the Navy (SECNAV)	• Defines SECNAV administration responsibilities for the DON • Assigns responsibilities for Assistant Secretary of the Navy (Research Development and Acquisition) (ASN(RD&A))
SECNAVINST 5400.15C September 13, 2007	Department of the Navy (DON) Research and Development, Acquisition, Associated Life-Cycle Management, and Logistics Responsibilities and Accountability	• Assigns responsibility to the ASN(RD&A) ensuring that requirements are properly transformed, within allocated resources, into executable research, development, and acquisition programs • Assigns responsibility to ASN(RD&A) to lead the acquisition management structure, provide programmatic oversight and manage risk
VS-22A-JI January 31, 2007	Virtual SYSCOM Joint Instruction	• Establishes engineering and technical authority policy • Describes the interrelationship among the systems engineering, technical authority, programmatic authority, technical processes, certification authority, and certificate holders • Establishes the Virtual Systems Command (SYSCOM)-Systems Engineering Hierarchy
SYSCOM Joint Instruction January 19, 2010	Naval SYSCOM Systems Engineering Policy	• Establishes use of the Naval Systems Engineering Technical Review Handbook, Version 1.0 • Includes figures consistent with DoDI 5000.02

ASN(RD&A): Assistant Secretary of the Navy (Research, Development and Acquisition)

Table 5-10. Summary of Key DON Acquisition, Capability Development, and Systems Engineering Guidance Documents

Key Guidance Documents	Summary
Acquisition and Capabilities Guidebook SECNAV M-5000.2 December 2008	• Companion document to the 5000.2D; parses policy text and provides enabling guidance • Explains SEP approach including design considerations (e.g., RAM, HSI, Open Architecture, Modeling and Simulation, etc.)
Naval Systems Engineering Guide February 20, 2004	• Documents a common Naval Systems Engineering Process that has been accepted by the Naval Virtual Systems Command • Characterizes the contents of the systems engineering discipline, to promote a consistent and common view of systems engineering across the Navy, to clarify the boundary of systems engineering with respect to other disciplines, and to provide a foundation for curriculum development and systems engineering certification • Describes a rigorous process to assist the systems engineer in defining, performing, managing, and evaluating systems engineering efforts in Naval acquisition and technology development programs
Naval "Systems of Systems" Systems Engineering Guidebook Vol. I and II November 6, 2006	• Focuses on a systems engineering process that enables the realization of successful "systems of systems" that provide needed capabilities and functionality within the Net Centric Operating and Warfare environment • Provides recommended processes, methods, and tools to aid PMs, their systems engineering integrated product teams (SE IPTs), support teams, and contractors in delivering systems that satisfy the originating capability needs documents and that are integrated and interoperable
Naval PoPS, Program Health Assessment for Naval Acquisition Programs Guidebook, Version 1 September 2008	• Naval PoPS provides Navy and Marine Corps senior leadership with an objective and quantifiable method for comparing and evaluating the likely success of acquisition programs during DON gate reviews. • Additional guidance and tools are provided for consistent implementation o Naval PoPS Criteria Handbook o Naval PoPS Visual Handbook o Naval PoPS Criteria Spreadsheets o Naval PoPS Visuals Spreadsheets
System Design Specification (SDS) Guidebook July 18, 2008	• Provides guidance and templates that facilitate the development of: o Derived platform-specific Mission Performance requirements and attributes from higher level capability documents o Defines Naval and industrial design criteria and standards used for systems development o Defines expected producibility, operability, maintainability, and supportability of the system

5.4.2.1 Systems Engineering Initiatives

As complexity in DoD's technologies and products throughout the life cycle have grown, the importance of systems engineering also has grown. The DON reports that through strategic initiatives it is developing methodologies and strategies to enhance Naval systems engineering approaches and to align with recent changes in the law to successfully deliver high-quality and affordable systems to the warfighter. To this end, the following initiatives are under way:

Prototyping Working Group

ASN(RD&A) Chief Systems Engineer sponsored the establishment of a cross-systems command (SYSCOM) working group to develop guidelines for acquisition personnel to assist in the use of prototyping as a pre-Milestone B acquisition strategy. In addition, the group was commissioned to examine ways by which prototyping can help develop the technical workforce. The goal of this cross-SYSCOM prototype working group is to develop prototype guidelines that contain best practices and common processes to aid the PM.

Strengthening the Technical Acquisition Workforce

DON relies on an organic technical workforce to ensure that it is a smart buyer of platforms and systems. A key component of the smart-buyer capability is a healthy systems engineering competency aligned to the needs of the DON acquisition enterprise. Developing and validating the systems engineering workforce technical competency is part of the DON's practice of continuous improvement to monitor and enhance its workforce skills and abilities. DON considers DAWIA SPRDE certification as a good foundational start for the development of systems engineering thinking and encourages its engineers to obtain Level III. The Naval SYSCOMS are planning to update their Technical Authority Instruction to further bolster the current Systems Engineering Career Roadmap, training, and appointment of its key systems engineering personnel.

Workforce Planning Strategy

Analyzing acquisition workforce gains and losses and developing inventory projection models that enable testing of assumptions to understand the impact on the future workforce size are critical to performing quality workforce planning. The DON is pursuing the adoption of workforce analysis tools to support better targeting of resources for workforce initiatives.

Systems Engineering Educational Continuum

DON desires to improve the capability of today's systems engineering workforce and to address future systems engineering workforce educational requirements. The Systems Engineering Educational Continuum is developing a strategy that integrates a K-12, undergraduate, and graduate systems engineering educational continuum to support requirements of the future SYSCOM acquisition workforce.

5.4.3 Organization

The DON acquisition organization (Figure 5-5) consists of an immediate staff to ASN(RD&A), PEOs, DRPMs, and the Naval SYSCOMs and their field activities. PEOs and DRPMs are responsible for the development and acquisition of assigned programs. Naval SYSCOMs and their field activities are also responsible for systems acquisition and supporting those systems in the operating Fleet.

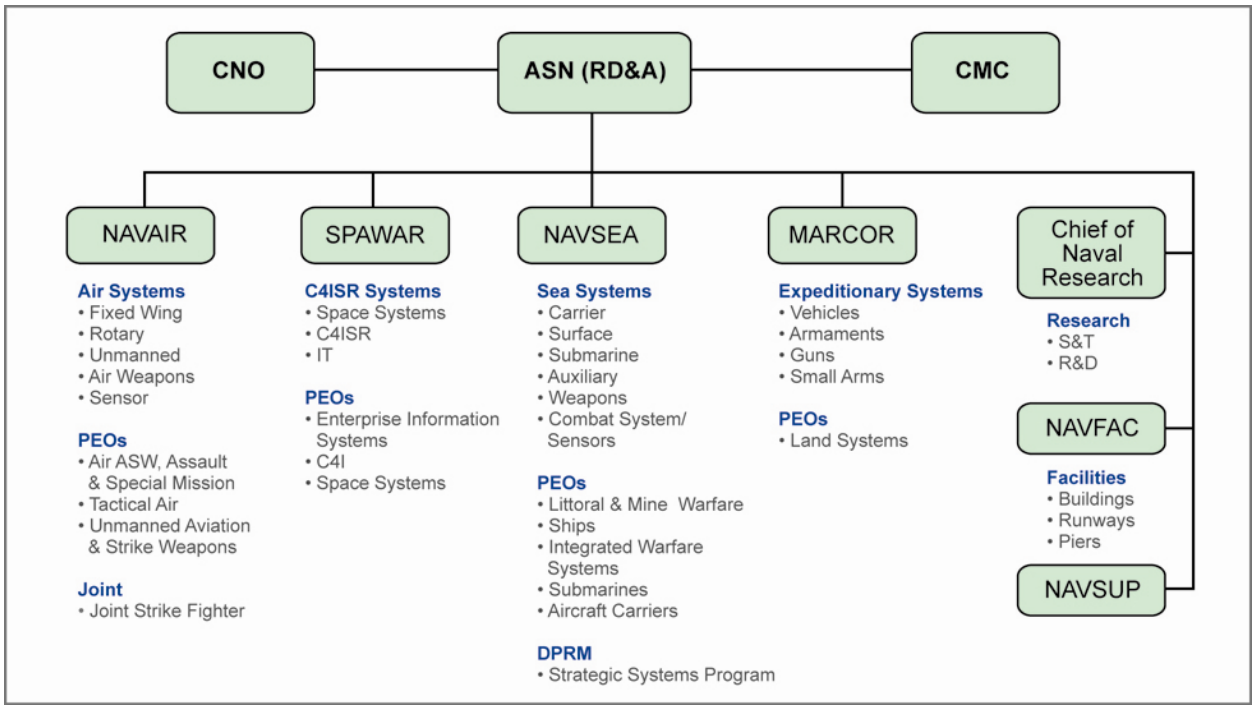


Figure 5-5. DON Acquisition Organization Chart

Assistant Secretary of the Navy (Research, Development and Acquisition) Responsibilities

ASN(RD&A) has authority, responsibility, and accountability for all acquisition functions and programs and for enforcement of OUSD(AT&L) procedures. The ASN(RD&A) represents the DON to OUSD(AT&L) and to Congress on all matters relating to acquisition policy and programs. ASN(RD&A) establishes policies and procedures and manages the DON's Research, Development and Acquisition activities in accordance with DoD 5000 Series Directives. ASN(RD&A) serves as Program (Milestone) Decision Authority on Acquisition Category (ACAT) IC programs and recommends decisions on ACAT ID programs.

ASN(RD&A) is the reporting senior for PEOs and DRPMs. ASN(RD&A) provides performance input to the Chief of Naval Operations (CNO) and the Commandant of the Marine Corps (CMC) for SYSCOM Commanders for assigned acquisition programs and for Commander Naval Supply Systems Command for assigned logistics support. ASN(RD&A) staff positions include the following:

ASN(RD&A) Chief Systems Engineer

ASN(RD&A) Chief Systems Engineer is responsible for ensuring that requirements are properly transformed, within allocated resources, into systems. ASN(RD&A) Chief Systems Engineer is the senior technical authority within the acquisition structure for systems engineering, and is responsible for the following:

- Advise ASN(RD&A) on systems engineering practices.
- Review emerging systems engineering techniques to enhance Naval Enterprise capabilities.

- Support systems engineering practices to enable open architecture, modular system design and product line strategies; ensure alignment of systems engineering practices with related disciplines including program management, logistics, and test and evaluation; and support acquisitions by reviewing and approving SEPs.

Program Executive Officers

Program Executive Officers supervise program management. They work with the SYSCOMs to ensure that the technical authority processes are an integral part of program execution, and they exercise management authority, including selection and application, over capabilities that support the programs.

Program Managers

Program Managers are vested with the authority, accountability, and resources necessary to manage all aspects of assigned programs and obtain approval for, and consistently implement, requirements changes, including, but not limited to, waivers and deviations from specifications.

Naval SYSCOM Commanders

Naval Air Systems Command (NAVAIR), Naval Sea Systems Command (NAVSEA), SPAWAR, Marine Corps Systems Command (MARCORSYSCOM), Naval Supply Systems Command (NAVSUP), and Naval Facilities Engineering Command (NAVFACENGCOM) exercise authority within their purview. SYSCOMs serve as the technical authority, and operational safety and assurance certification authorities. SYSCOM Commanders oversee the core processes required to support the acquisition, in-service support, and disposal of weapon and IT systems. Core processes include technical authority responsibility and accountability.

Systems Engineering Stakeholders Group

The SESG was established in 2002 to collaborate and implement cost-effective, integrated business and technical practices to better support the Naval Enterprise. Led by the Naval SYSCOM Chief Engineers, the competency leaders for Research and Engineering in the DON, along with ASN(RD&A) Chief Systems Engineer and the Naval Postgraduate School (NPS), the SESG is based on three elements: (1) linkage with the sponsors and the Fleet; (2) a strengthened cross-SYSCOM working relationship based upon formal collaboration among the Naval SYSCOM Commanders and PEOs; and (3) focus on providing the Fleet with the best warfare systems. The SESG develops common SYSCOM-level systems engineering and technical authority policies, processes, tools, standards, training, and career development to deliver highly capable, networked warfare systems to the Fleet. The SESG assists the SYSCOM Commanders in meeting the Navy business model to operate and sustain the most efficient infrastructure needed to support acquisition, fielding, and in-service support of weapon systems and IT systems. The SESG assists ASN(RD&A) Chief Systems Engineer to develop and implement DoD and DON systems engineering policy.

5.4.3.1 DON Technical Authorities

A goal of the Virtual SYSCOM is to establish technical authorities and engineering support capabilities independent of organization boundaries, using technically competent and accountable individuals throughout the Virtual SYSCOM. The Virtual SYSCOM Engineering and Technical Authority Policy (VS-JI-22A) instruction defines, empowers, and organizes technical authority roles and responsibilities at all Naval SYSCOMs. The technical authorities must work closely with the programmatic and certification authorities. The following paragraphs define the roles and responsibilities of the technical, programmatic, and certification authorities:

Technical Authority

The technical authority is responsible for establishing, monitoring, and approving technical standards, tools, and processes in conformance with applicable DoD and DON policy, requirements, architectures, and standards; safety certification authority; and all aspects of systems engineering. The technical authority is inherently a Government function assigned to the Naval SYSCOM Commanders by the Secretary of the Navy.

Programmatic Authority

The programmatic authority manages all aspects of an assigned program from concept to disposal, including oversight of cost, schedule, and performance; and direction of life cycle management. Programmatic authority is exercised by PMs, the Commander, Navy Installations Command (CNIC), and by the Fleet, depending on funding and program assignments.

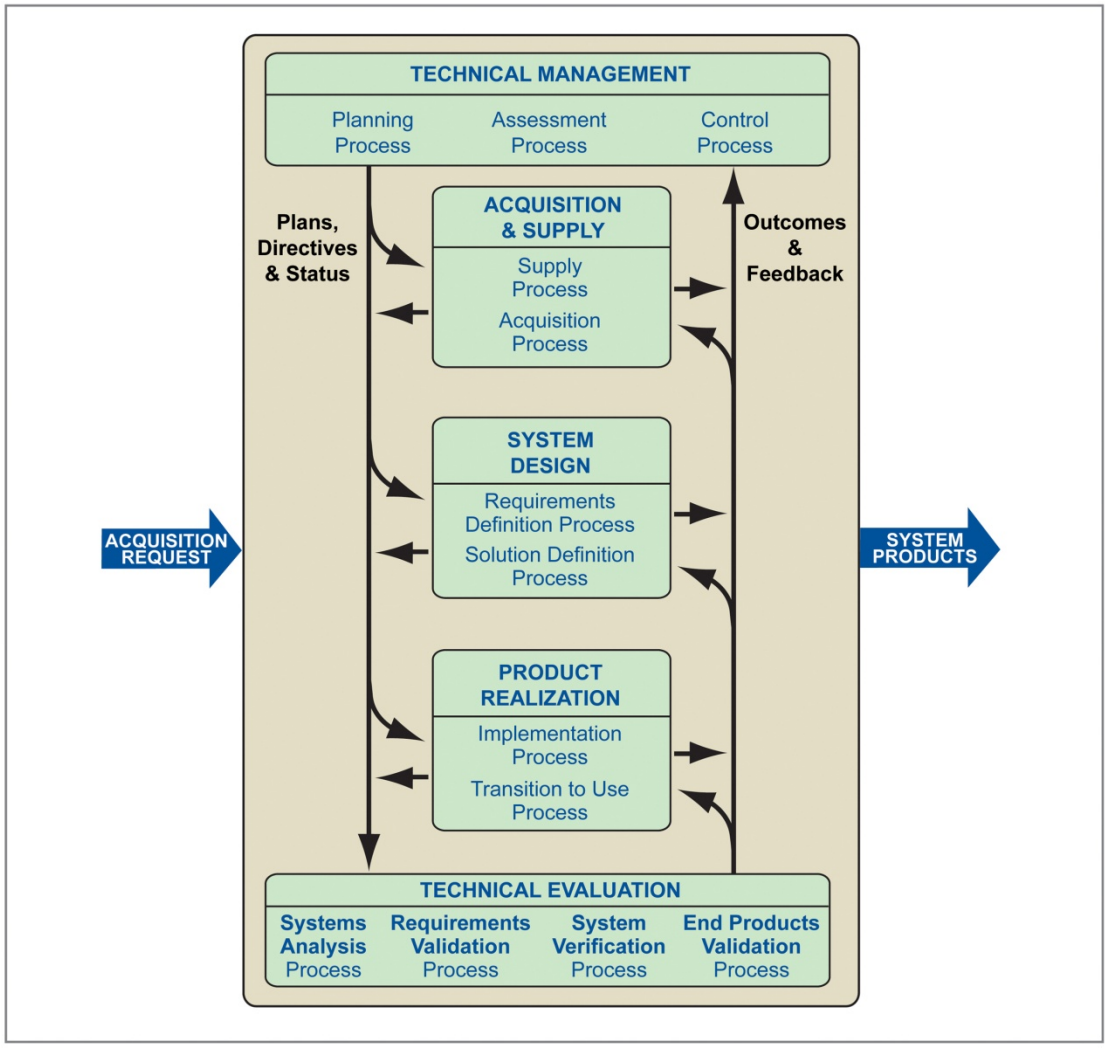
Certification Authority

Certification authority is the authority to certify that products meet established standards. Specific certification authority is defined or recognized by the technical process documentation established by the cognizant technical authority. Technical authorities, programmatic authorities, and others may be certification authorities, depending on what the specific technical process documentation defines.

5.4.4 Systems Engineering Activities

The Naval Systems Engineering Process is documented in the Naval Systems Engineering Guide. The process represents a tailoring of ANSI/EIA-632, Processes for Engineering a System. The Naval Systems Engineering Guide emphasizes the relationship between the technical management process and the systems engineering process. It documents a common process that has been accepted by the Naval Virtual Systems Command.

The process as represented in Figure 5-6 is executed within the acquisition process. The following paragraphs describe specific acquisition and systems engineering activities applied within Naval acquisition.



Source: Naval Systems Engineering Guide, 2004

Figure 5-6. Naval Processes for Engineering a System

5.4.4.1 DON Gate Review Process

SECNAVINST 5000.2D implements the Two-Pass/Six-Gate review process to provide governance and insight into the development, establishment, and execution of acquisition programs in the DON. The review process, shown in Figure 5-7, provides alignment between Service-generated capability requirements and acquisition, and it improves senior leadership decision making through better understanding of risks and costs throughout a program's development cycle. The process is implemented in an integrated, collaborative environment that includes participation by appropriate elements of the Office of the Secretary of the Navy (SECNAV), CNO, Office of the Chief of Naval Operations (OPNAV), the Headquarters Marine Corps (HQMC), and CMC, in developing Joint Capabilities Integration Development System (JCIDS) and acquisition documents.

During the First Pass, requirements are established, while during the Second Pass, acquisition is executed. Gate Reviews are a combination of "Core" detailed information germane to the Gate Decision and a holistic view of overall program health and readiness to proceed via a Probability of Program Success (PoPS) assessment. The Core Content of the Gate Reviews and the Program Health Metrics address systems engineering attributes such as Technology Readiness Assessments (TRAs), risk management, open architecture, interoperability, safety, software, human systems integration, RAM, and system integration.

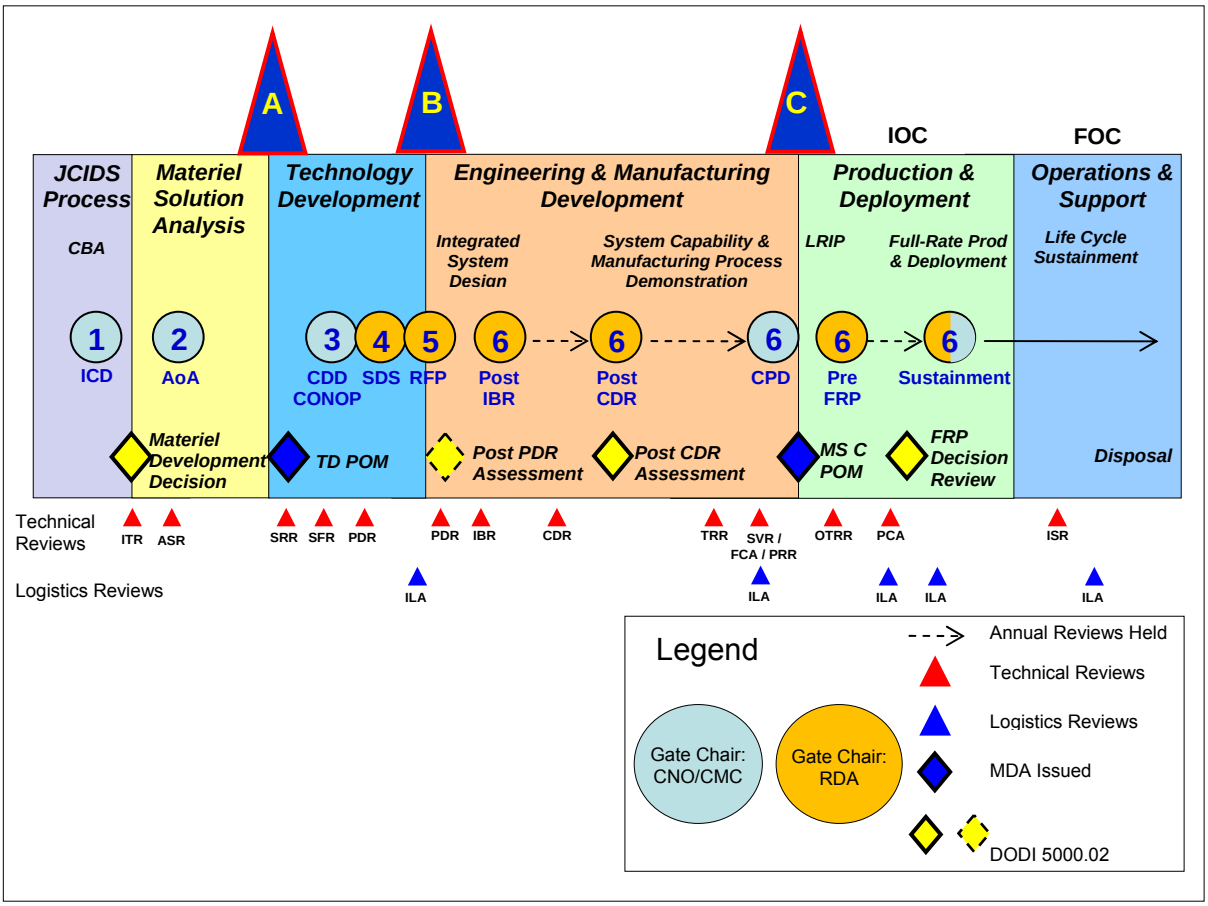


Figure 5-7. Two-Pass/Six-Gate Review Process

5.4.4.2 Probability of Program Success

DON acquisition programs are required to use the DON PoPS at all DON Gate Reviews. PoPS serves as the standard DON method of representing program health for all ACAT programs and other programs subject to the DON acquisition process; it serves as a consistent means to assess program health and is required any time program health is discussed. The PoPS Framework Components (Figure 5-8) consist of four key Factors (Program Requirements, Program Resources, Program Planning and Execution, and External Influencers) to assess and display current program health and to identify significant issues that may adversely affect successful program execution; Metrics (major subcategories that collectively define the scope of a Factor); and Criteria (parameters, qualitative and quantitative, used to evaluate a Metric, enabling traceability between Naval PoPS documents and tools). Management and senior leadership use PoPS to identify systemic issues and to track and establish action teams to address those issues. For technical health, PoPS provides insight into how well the systems engineering functional areas are being addressed during all phases of acquisition. The DON uses PoPS as part of individual program reviews to identify matters that affect program health and as part of PEO Portfolio reviews to assess the health of all ACATs within a PEO.

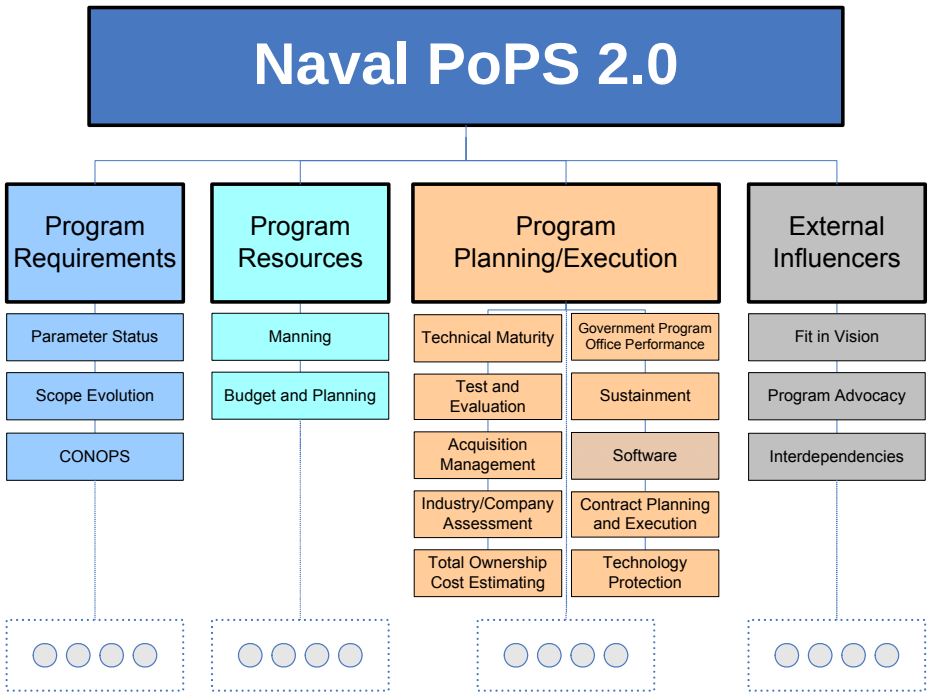


Figure 5-8. PoPS Framework Components

5.4.4.3 Systems Engineering Technical Reviews

Systems Engineering Technical Reviews (SETRs) are required throughout the acquisition life cycle. SETRs implement a technical assessment process that evaluates the maturing design over the life of the program. SETRs provide a framework for structured systems engineering management, including assessment of predicted system performance. SETRs also provide the PM with a better understanding of program technical health. Gate Reviews serve a distinct purpose in relation to

acquisition program maturity and do not replace the requirement to conduct SETRs. SETR results provide evidence as input to the conduct of reviews at each gate.

5.4.4.4 Systems of Systems Net-Centric, Integration, and Interoperability

ASN(RD&A) Chief Systems Engineer is identified as the senior leadership and focus within the Naval acquisition structure on integration and interoperability and has the responsibility of Mission-Level SoS engineering. This responsibility consists of conducting integration and interoperability assessments of SoS to determine adherence to interoperability requirements, architecture standards, Joint Technical Architecture (JTA) technical standards, and interface specifications. This approach includes the allocation and verification of requirements from the top level (operational) to the lowest level (component). At the highest level, operational concepts (force level focused) are decomposed to mission capabilities. Mission capabilities (capabilities focused) are decomposed to system requirements. System requirements (functional focused) are decomposed into component requirements. Finally, component functions (end item focused) are translated to end item requirements. In the evaluation and verification process of SoS engineering, the process is conducted via re-aggregation of component to Mission level. Requirements are typically verified in this order as they are re-aggregated back up, component, system, platform/SoS, to the Mission level.

5.4.4.5 System Design Specification

The System Design Specification (SDS) is a requirement for Gate 4. It translates Capability Development Document performance parameters and system attributes into technical requirements that characterize the performance specifications as clearly as practical for developing the preliminary system design. The SDS derives the platform-specific mission performance requirements and attributes from higher level capability documents; it reveals a complement of derived system requirements appropriate at the Preliminary Design Level and lists the family of specifications that define the system. It details the expected producibility, operability, maintainability, and supportability of the system and provides greater insight into capabilities, schedule, costs, and risks of the system earlier in the acquisition process, thus reducing risk associated with the design and acquisition of the system.

5.4.4.6 Independent Logistics Assessments

SECNAVINST 5000.2 Series requires that the logistics support strategy shall be assessed, developed, and integrated concurrent with the capability to ensure that short-term logistics support will be in place at system Initial Operational Capability (IOC). Independent Logistics Assessments (ILAs) are required prior to proceeding to Milestones B and C and the Full-Rate Production Decision Review. The ILA is the basis for logistics certification. Guidance for conduct of the ILA is documented in NAVSO P-3692, DON Guide for Conducting Independent Logistics Assessments of September 2006. The ILA provides the PM and Milestone Decision Authority (MDA) with a measure of Integrated Logistics Support (ILS) planning and implementation. The assessment provides an effective methodology for evaluating risk, life cycle cost, supportability, and support system performance from a Total Life Cycle Systems Management perspective. ILA results provide evidence as input to the conduct of supportability at each gate.

5.4.4.7 Reliability, Availability, and Maintainability

To address the OUSD(AT&L) memorandum "Implementing a Life Cycle Management Framework" of July 31, 2008, SYSCOMs have implemented the RAM requirements of the DoD Reliability, Availability, Maintainability and Cost (RAM-C) Rationale Report Manual throughout the life of the program. The Naval Systems Engineering Guide details how RAM KPPs are addressed in DON acquisition programs per the requirements of OPNAVINST 3000.12A, "Operational Availability of Equipment and Systems," of September 2, 2003, and OPNAV 4700.7, "Maintenance Policy for U.S. Navy," of July 11, 2003. ASN(RD&A) Chief Systems Engineer is working with DSE and DDT&E to reenergize and institutionalize the Reliability Growth Management process.

5.4.5 Development Planning Activities

The Chief of Naval Operations (CNO) Assessment Division [Office of the Chief of Naval Operations (OPNAV) N81] is the lead analytic body for the CNO. As such, N81 is chartered to lead the execution of the Navy's analytic agenda by conducting capability analysis of warfare and support areas for OPNAV and by conducting all the Navy's force structure requirements analyses. In executing these duties, N81 establishes and approves the baseline assumptions, threats, and scenarios used in all OPNAV-initiated warfare analysis to ensure Joint alignment. In addition, the Director of Assessment Division approves study plans for all Navy-led AoA and Capabilities-Based Analyses (CBA) and serves on their oversight boards. N81 also coordinates with Fleet Force Command to ensure Fleet inputs are considered in OPNAV's analytic efforts and with the United States Marine Corps for capability-based analytic efforts.

The CNO Strategic Studies Group is chartered with generating revolutionary naval warfighting concepts. The Navy works with industry, academia, Government, non-governmental, and foreign entities to accomplish this tasking. Naval Warfare Development Command (NWDC) champions rapid generation and development of innovative concepts and doctrine to enhance maritime capability at the operational level across the full spectrum and to enable seamless integration in the joint and coalition arena. NWDC develops concepts and validates them by means of various venues including analytical studies, war games, exercises, and experimentation. NWDC is supported by selected subject matter experts from other commands and organizations, drafting and developing the concept paper, planning and executing development and validation venues, and submitting the final document to the CNO.

The Marine Corps's Expeditionary Force Development System (EFDS) develops future warfighting capabilities to meet national security objectives. EFDS guides the identification, development, and integration of warfighting and associated support and infrastructure capabilities for the Marine Air-Ground Task Force (MAGTF). The Deputy Commandant for Combat Development and Integration leads the execution of this process and, in conjunction with MAGTF and functional advocates, Commander, Marine Corps Forces, and Commander, Marine Corps Systems Command, conducts the integration tasks across the seven pillars of combat development (Doctrine, Organization, Training, Materiel, Leadership and Education, Personnel, and Facilities) and six warfighting functions (Command and Control, Fires, Force Protection, Intelligence, Logistics, and Maneuver).

In addition, the Marine Corps Warfighting Laboratory (MCWL) improves current and future naval expeditionary warfare capabilities across the spectrum of conflict for current and future operating forces. MCWL conducts concept-based experimentation to develop and evaluate tactics, techniques, procedures, and technologies in order to enhance current and future warfighting capabilities.

The Navy's approach to early acquisition and development planning places the emphasis on finding the right mix of capabilities and conducting engineering and technical analysis during and following an AoA. Prior to major OSD milestones and decision points, the Two-Pass/Six-Gate process has brought the technical and requirements communities together early in the process to ensure there is a cooperative relationship moving into each phase of the acquisition process, where requirements can be negotiated based on acquired technical knowledge and the associated risks. The Navy has taken steps to establish Mission Area Chief Engineers to ensure a cross-cutting technical view of the systems and operational context. Despite the positive steps toward establishing organizational changes to address the Navy-wide view across systems, the challenge of addressing cross-Department collaboration remains, and the Navy must demonstrate that the resourcing of these up-front technical activities is sufficient to match the mission.

5.4.6 Workforce and Resources

The Navy maintains that a healthy systems engineering competency aligned to the needs of the DON acquisition enterprise is fundamental to the delivery of new systems and support to those already in service. Therefore, the Navy is sponsoring several systems engineering acquisition workforce initiatives, including the Systems Engineering Competency Board (SECB), Oversight Council, engineering townhall meetings, and the Educational Continuum Working Group, that can serve as models for the other Components. The SECB was one of three Competency Boards established by the Navy to enhance critical acquisition functions. The other two boards were established for Program Management and Contracting.

The Navy's Chief Systems Engineer chairs the SECB, made up of systems command chief engineers. The SECB utilizes the SESG as the executing arm of its initiatives to systems engineers training, education, and work assignment strategies. This body is also influencing and guiding the Systems Engineering Educational Continuum, training initiatives at the systems commands, DAU systems engineering training, and with the Oversight Council, Naval Postgraduate School systems engineering curriculum and embedded program efforts.

The Systems Engineering Educational Continuum is a forum that coordinates cross-command systems engineering certification initiatives, which expand upon DAWIA certification. The forum considers programs for the entire workforce life cycle: future, undergraduate, and in-service. The Systems Engineering Certificate for the in-service workforce encompasses training, education, demonstrated performance, and breadth of experience.

The Systems Engineering Certification supports the building and maintaining of the technical authority construct. The systems commands also align to this construct. The Systems Engineer Development Roadmap shown in Figure 5-9 illustrates the Navy's roadmap for developing systems engineers. The roadmap aligns work, workforce tasks, and workforce development. This roadmap is designed to help employees establish career goals within the competency by providing a roadmap for

enhancing capabilities and laying the foundation for future tasks as an individual's career progresses. This roadmap also supports DSE's recent initiative to establish a competency model and subsequent education, training, and enhanced experience standards for executive leaders in the systems engineering career field who have been assigned to key Functional Leader positions on MDAPs.

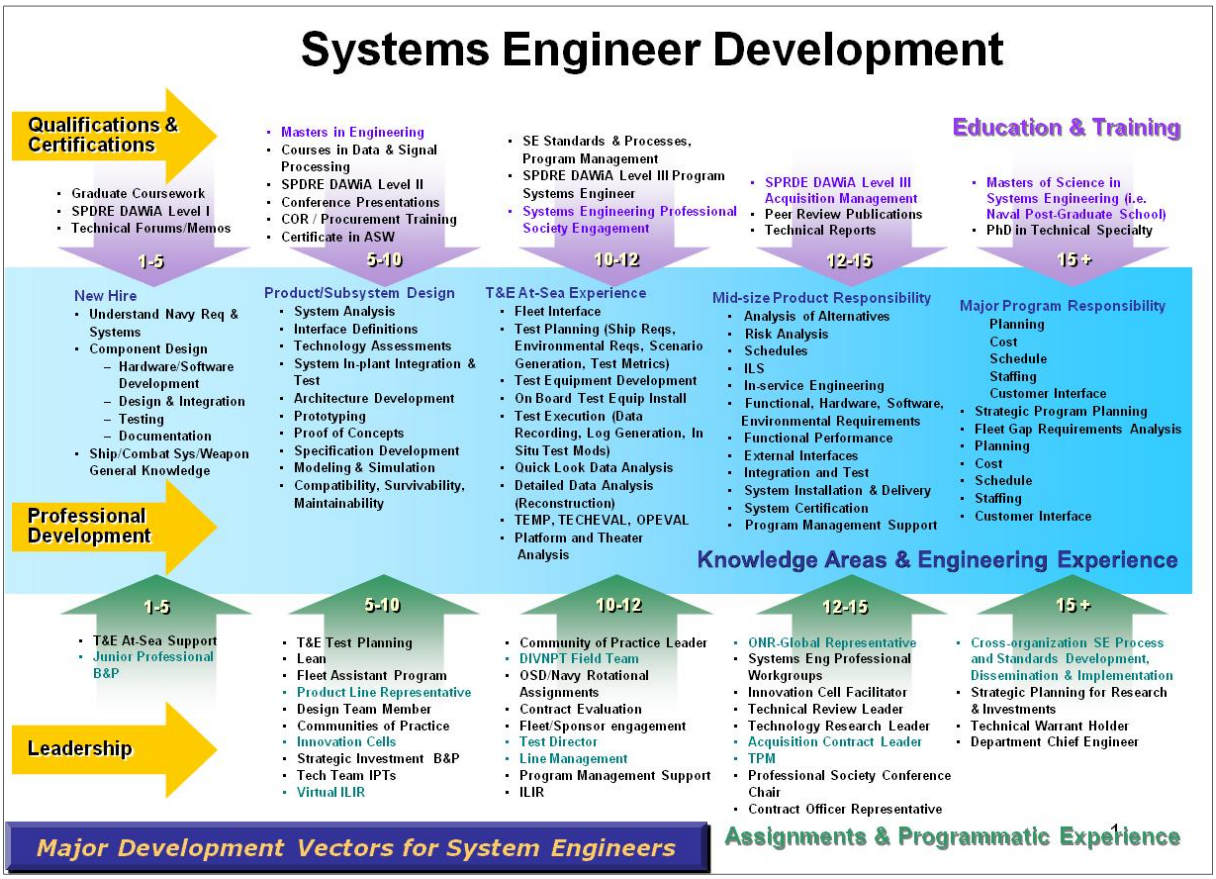


Figure 5-9. Navy Roadmap for Systems Engineer Development

In-service workforce systems engineering programs offer education, training, and experience to develop the desired knowledge, skills, and abilities. Graduate-level education from the Naval Postgraduate School and other institutions is also available and encouraged. Systems engineering training includes both standard and systems command-unique training, with a rigorous qualification and certification program for Chief/Lead Systems Engineers.

The Navy reports a robust population in the SPRDE career field. The following tables show a breakout of the personnel serving in the SPRDE-S&T and the SPRDE-SE/PSE career field paths for the Navy systems commands and other commands. Table 5-11 represents the breakout of SPRDE-S&T and a combined SPRDE-SE/PSE by command.

Table 5-11. Civilian and Military SPRDE Acquisition Personnel by Command

	SPRDE-S&T		
CLMNT ABBREV	**Civilian**	**Military**	**Grand Total**
OCNR	96	25	121
NAVSEA	58		58
SPAWAR	38		38
NAVFAC	8		8
NAVAIR	5	1	6
ALL OTHERS	10	3	13
Grand Total	**215**	**29**	**244**

ALL OTHERS = USMC, CNO, NSMA, SSP, BUPERS

	SPRDE-SE and PSE		
CLMNT ABBREV	**Civilian**	**Military**	**Grand Total**
NAVSEA	10,235	52	10,287
NAVAIR	5,323	73	5,396
SPAWAR	1,233	28	1,261
NETC	323		323
USMC	252	23	275
SSP	263	3	266
NAVFAC	161		161
ALL OTHERS	95	22	117
Grand Total	**17,808**	**196**	**18,086**

ALL OTHERS = FFC, NSMA, CPACFLT, NAVSUP, CNO, CNI, AAUSN, OCNR, BUPERS, DNA, SDIO, SDEF, BUMED, NAVRESFR

The Navy reports high percentages of DAWIA certification achievement as well. Table 5-12 contains certification achievement data for SPRDE-S&T and SPRDE-SE and PSE career paths. The percentage certification includes personnel within the 24-month new-hire grace period.

Table 5-12. Civilian and Military SPRDE S&T, SE/PSE Acquisition Personnel Certification Achievement

Certification Achievement for SPRDE-S&T Workforce Levels 1–3			
Level	**Total Personnel**	**Total Certifications***	**% Certification**
1	9	8	89%
2	44	41	93%
3	191	143	75%

Certification Achievement for SPRDE-SE and PSE Workforce Levels 1–3			
Level	**Total Personnel**	**Total Certifications***	**% Certification**
1	1,284	1,249	97%
2	3,359	2,936	87%
3	13,443	11,946	89%

* Includes personnel within the 24-month new-hire grace period

The Navy plans to increase its acquisition workforce at all levels to rebuild the science and engineering depth that has been reduced over the years. Table 5-13 shows the projected new hires for the systems engineering career field over the next 5 years, as of December 1, 2009. The Navy also plans to hire 60 highly qualified experts (HQEs) over the next 5 years. However, these have not been allocated among career fields or fiscal years at this time.

Table 5-13. Projected New Hires

	FY10	FY11	FY12	FY13	FY14	FY15	Total
Associates	28	22	0	24	21	0	95
Interns	94	62	61	60	17	0	294
Total	122	84	61	84	38	0	389
Cum	122	206	267	351	389	389	

The Navy is using a combination of strategies and tools to support, invigorate, and maximize the quality of its science and engineering workforce over the next 5 years. NDAA 2008 Section 852 and Section 219 efforts are especially complementary to the Navy's plan. The focus of Section 852 is to recruit and bring into the DON acquisition workforce the best scientific and engineering talent. The primary focus of Section 219 is to invigorate the DON scientific and engineering capabilities. Accordingly, Section 219 funding will be used to support innovative research and development (R&D) activities that are attractive to the most talented scientists and engineers, offering unique and challenging hands-on R&D work and mentoring opportunities.

The Navy is currently staffing a department-wide Science, Technology, Engineering, and Mathematics (STEM) plan to focus its efforts to attract and nurture its future workforce K-12. Several outreach programs encourage STEM participation through science fairs, technical competitions, partnering with educators in tutoring and influencing curriculum, and creating practical connections.

Other complementary existing tools include the Science, Mathematics and Research for Transformation (SMART) and the Graduate Assistance Program (GAP). Consistent with the provisions of Section 219, funding will be used to sustain the work of approximately 50 new post-doctorate hires for the next 2 years starting in FY 2010 and TBD for the out years. It will be leveraged with other available mechanisms in a strategic approach to attract, recruit, and retain the highest quality scientific and engineering talent for the DON workforce.

Section 833, Acquisition Workforce Expedited Hiring Authority (EHA), enabled the Navy to hire most personnel within 60 days of implementation. Figure 5-10 shows the numbers hired for each career field. The Navy was also able to achieve the following time goals and rates:

- 72-hour standard (RPA Receipt to Initial Offer): 91–99 percent
- End-to-End (RPA Receipt to EOD): less than 20 days, 21 percent
  less than 30 days, 45 percent
  less than 60 days, 89 percent
  less than 90 days, 99 percent

This workforce market requires fast response in order to secure new hires before they have accepted employment elsewhere. The capability provided by EHA to quickly process a hiring action is highly valuable to the Navy's commands to enable mid-grade hiring.

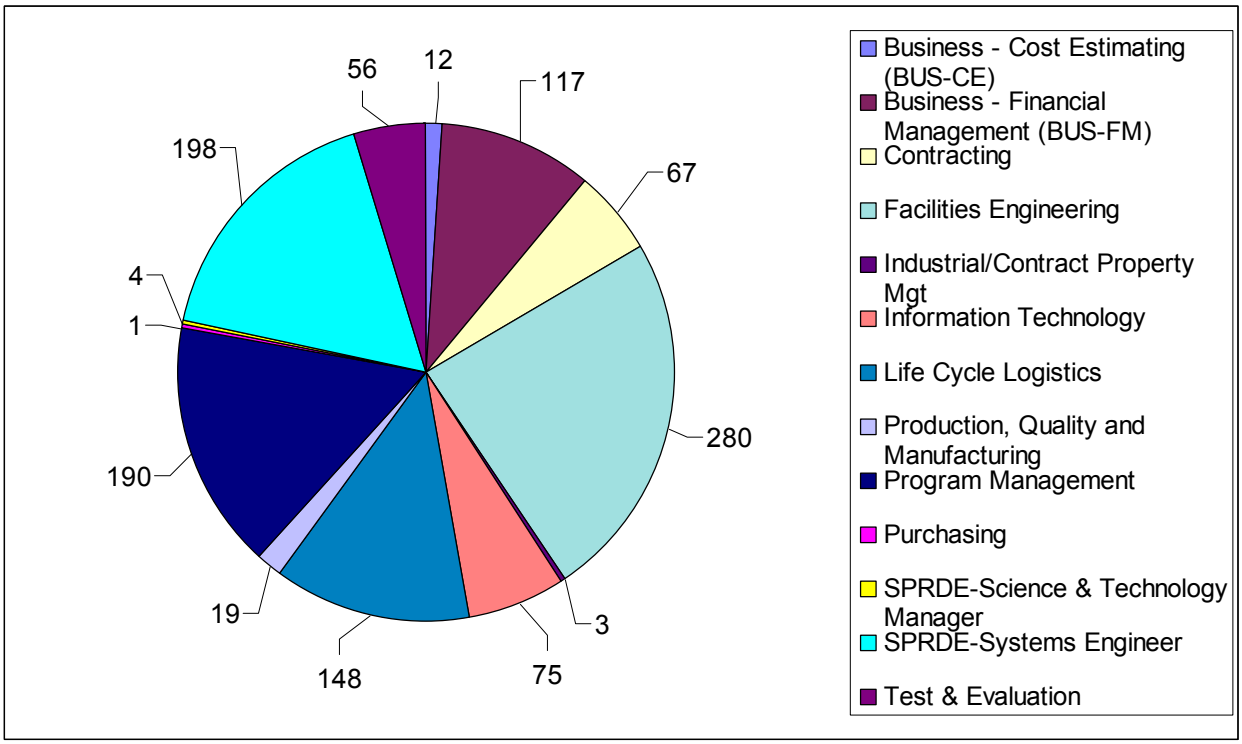


Figure 5-10. Expedited Hiring Authority Career Category Hires

Another initiative, the Naval Acquisition Intern Program (NAIP), hires approximately 125 systems engineering interns annually. The program has been highly successful, resulting in a 3-year program retention rate of more than 96 percent and a 5-year graduate retention rate of more than 85 percent. The program produces GS-12 graduates with Level II DAWIA Certifications, many of whom quickly achieve GS-13 and beyond grades.

The Naval Air Systems Command (NAVAIR) is also doing an outstanding job in developing its systems engineering workforce. DSE used the NAVAIR Systems Engineering Technical Reviews training module material as the basis for the DAU Technical Reviews continuous learning module, required for SPRDE-SE and PSE certifications. DSE also used the NAVAIR Engineering Change Proposals course material as the basis for another module included in DAU Core Plus training.

The Naval Sea Systems Command (NAVSEA) uses a structured business model to shape its workforce. The business model allows agility while meeting workload demands. NAVSEA maintains Customer Service Agreements and builds Integrated Program Teams in which the team members possess appropriate knowledge, skills, and abilities to respond to specific tasks or requirements. The team structure aligns well with OSD's approach to interdisciplinary integrated training at the executive level. The NAVSEA Qualifications Cards for Ship Design Managers concept may be useful in DSE's future model for SPRDE-SE certification, especially in the experience standards area.

5.5 DSE Assessment of the Air Force Report

5.5.1 Service Assessment Summary

The Air Force has been successful at instituting the systems engineering discipline throughout the acquisition process and continues to strengthen systems engineering through a number of initiatives. The Air Force reported the following eight acquisition areas of strength in which it is either implementing the listed activity to improve systems engineering and development planning, or it is conducting significant planning efforts with the intent to implement the plans in the future:

1. Incorporating workforce revitalization, establishing clear lines of authority and accountability in acquisition organizations, and incorporating improved requirements generation process initiatives into the Air Force Acquisition Improvement Plan (AIP)
2. Developing the Concept Characterization and Technical Description (CCTD) Guidebook to clarify the technical and programmatic description process for materiel solution concepts
3. Reinforcing the Air Force Program Support Review (PSR) and technical assessment process by updating Air Force policy to institutionalize the new process, which focuses on acquisition phases after the Materiel Development Decision (MDD) and through Milestone A, B, C, and which is connected with OSD PSRs
4. Establishing specific best practices to indicate what is required for good systems engineering via the Systems Engineering Assessment Model (SEAM)
5. Developing the Risk Identification, Integration and 'ilities (RI3) process to identify technical risk early, which is a part of the Air Force PSR tool chest
6. Reinstating a select set of standards that will drive contractor work effort, resource allocation, and workforce training
7. Revitalizing the Product Center Engineering Functional Staff Offices to centralize systems engineering career development and personnel management
8. Establishing STEM organization and activities to address technical workforce requirements that include development planning and early systems engineering

The Air Force reported the following four areas as needing improvement, and it is working to address these areas (the list includes activities for which external assistance is required):

1. Revising Air Force acquisition policy to strengthen the RAM/Program Protection Planning process on reliability growth as an integral part of design and development
2. Strengthening Air Force acquisition workforce training, which will include OSD assistance with planning, training course availability, and funding
3. Identifying systems engineering and development planning resources across the Air Force
4. Developing an Independent Technical Authority (ITA) program to improve systems engineering authority, independence, credibility/trust, and visibility

5.5.2 Policy and Guidance

The Air Force has developed acquisition implementation policy and guidance aligned with DoD acquisition policy and guidance. Tables 5-14 and 5-15 list key Air Force acquisition documents.

Table 5-14. Summary of Key Air Force Acquisition Policy Documents

Key Policy References	Document Title	Systems Engineering Aspects
AFI 63-1201 July 23, 2007	Life Cycle Systems Engineering	• Provides an integrated framework for the implementation of Integrated Life Cycle Management • Provides for a seamless governance, transparency, and integration of all aspects of weapon systems acquisition and sustainment management.
*AFI 63-101 April 17, 2009	Acquisition and Sustainment Life Cycle Management	• Defines Air Force acquisition organizational structure and governance. • Acquisition management responsibility for all ACAT programs flows from the Service Acquisition Executive to the Program Executive Officer or Designated Acquisition Official to the accountable PM.
*AFI 10-601 July 31, 2006	Capability-Based Requirements	• Establishes the guidelines, policies, and procedures for defining, developing, documenting, validating, approving, and managing capabilities-based requirements. • Facilitates rapid development and fielding of affordable and sustainable operational capabilities needed by the combatant commander.

* Update currently in coordination

Table 5-15. Summary of Key Air Force Acquisition Guidance Documents

Key Guidance Documents	Summary
AFPAM 63-128: Guide to Acquisition and Sustainment Life Cycle Management October 5, 2009	• Provides guidance and recommended procedures for implementing ILCM for Air Force personnel who develop, review, approve, or manage systems, subsystems, end-items, and services procured under DoDD 5000.01.
*Early Systems Engineering Guide March 31, 2009	• Provides system stakeholders with an understanding of systems engineering processes and products used during the early (pre-Milestone A) stages of the acquisition process • Describes how each process and product contributes to the eventual delivery of a system with the desired capabilities.
*Development Planning Strategic Plan, FY 2010	• Development Planning efforts are prioritized for Air Force corporate value, efficiency, effectiveness, feasibility and resource impact. • Resource-based roadmap of materiel development planning efforts to fulfill Air Force warfighter materiel needs.
* Concept Characterization and Technical Description (CCTD) Guide, FY 2010	• Describes a pre-acquisition concept that contains the parametric and trade space studies performed over the concept's lifetime, including supporting documentation.

* Update or first issuance in CY 2010

5.5.3 Organization

5.5.3.1 Systems Engineering Organization

Air Force programs have a clear governance chain of authority in which management is characterized by clearly defined lines of responsibility, authority, and accountability (Figure 5-11). Acquisition management responsibility for all ACAT programs flows from the Service Acquisition Executive to the PEO or Designated Acquisition Official to the accountable PM.

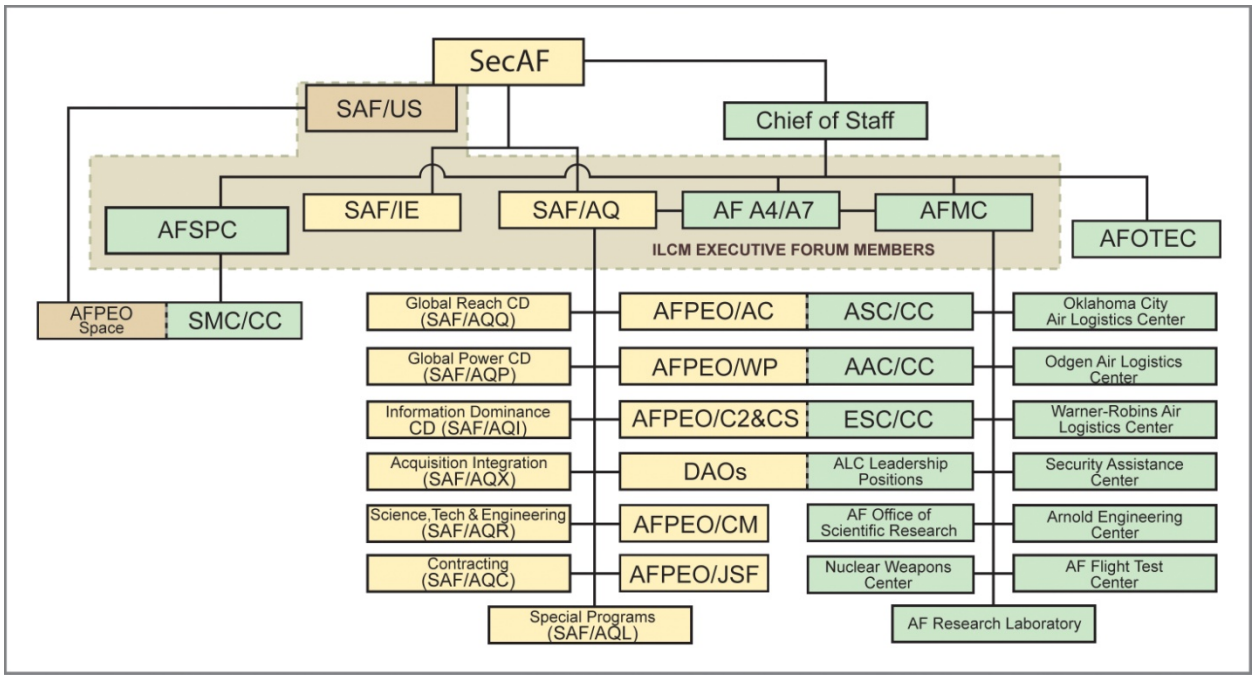


Figure 5-11. Integrated Life Cycle Management Acquisition and Sustainment Life Cycle Organizations

To support Integrated Life Cycle Management (ILCM) execution, all programs must establish clear lines of program execution authority within the management organizational structures. There are two primary programmatic execution chains in which the majority of Air Force programs are managed for acquisition and for sustainment, as shown in Figure 5-12. The Air Force will establish and document specific lines of programmatic execution authority for each program.

5.5.3.2 Development Planning Organization

Organizations Performing Development Planning and Capabilities

Development planning within the Air Force is conducted by the personnel of Air Force Materiel Command (AFMC) and Air Force Space Command (AFSPC) in collaboration with Air Staff, and operational major commands. Specifically, both AFMC and AFSPC use their materiel centers' development planning directorates to conduct the majority of development planning activities.

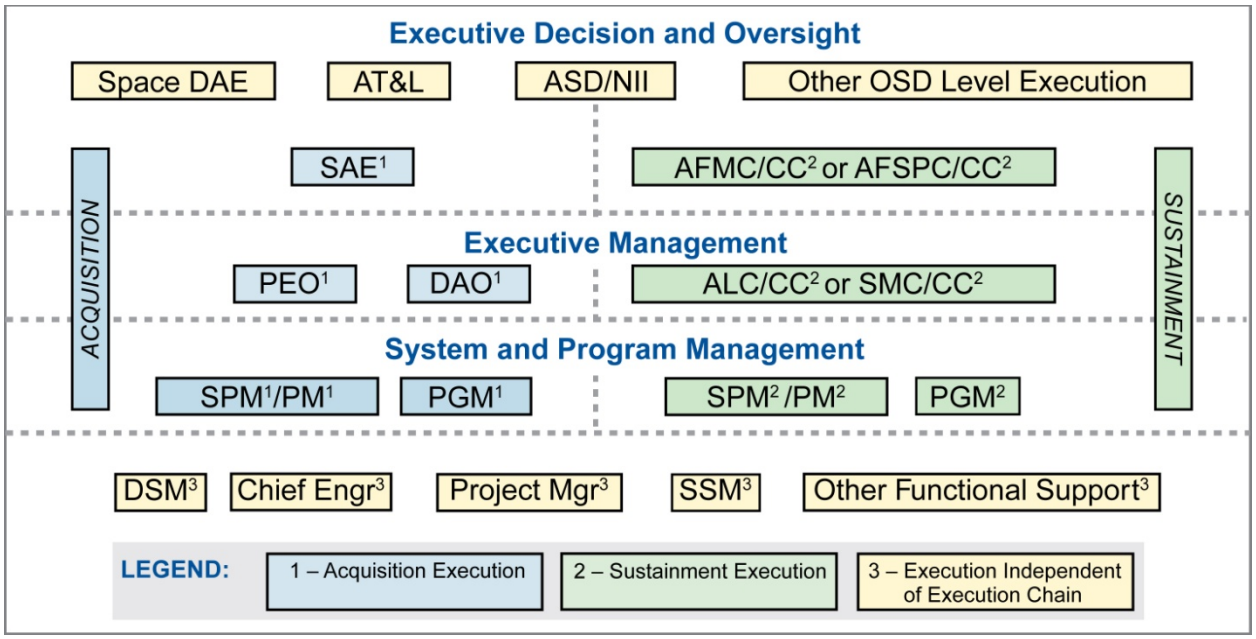


Figure 5-12. Integrated Life Cycle Management Programmatic Execution Chains

Development Planning Governance

The Air Force has created a development planning Governance Structure consisting of an O-6 Working Group, 1- and 2-Star Board, and 3-Star Council to provide oversight of Air Force development planning. They ensure timely feedback to all stakeholders and comprise the forums for validation and approval of products within their scope. At a Working Group level, the governing body uses the Value-Focused Thinking prioritization tool, a decision-analysis technique commonly used in the DoD. Value-Focused Thinking applies a hierarchy of values to proposals based on the tasks, conditions, and standards developed as part of a capabilities-based assessment, in which Major Commands (MAJCOMs) spell out priorities and articulate what the acceptable capability trade space includes and what the warfighter values most. Quarterly working groups support semiannual board meetings in which General Officers/Senior Executive Service employees review ongoing and proposed work. A Development Planning Council meets at least annually. The Air Force reports that this technique allows decision makers clear insight into the importance of requirements and the trade space available to the system designers to optimize cost and performance of the system.

Development Planning Governance Structure Scope

The Air Force Materiel Enterprise includes AFMC and AFSPC associated Product, Logistics, and Specialized Centers, the Air Force Research Laboratory, and Test Centers. It serves as the Air Force materiel solution provider for warfighter materiel needs. The Air Force Materiel Enterprise Capability Materiel Team (CMT) works directly with the requesting warfighter customer to be responsive to changing system and operational requirements. The CMT is a multidisciplinary team of Air Force Materiel Enterprise subject matter experts tasked to assess the operational requirements generation process, while analyzing proposed materiel solution alternatives to address warfighter-identified materiel needs.

In order for Materiel Enterprise decision makers to gain visibility and give thorough consideration to warfighter materiel requests, the development planning governance process stipulates a single Air Force Materiel Enterprise entry point for new efforts within the development planning governance structure scope, which results in centralized management. Decentralized execution will require a coordinated Materiel Enterprise response that will ensure the development planning effort is satisfactorily defined, the implication and impact on materiel resources are understood, and the effort required to satisfy the request is properly identified and assigned. The Air Force plan is that, while adhering to the approach of centralized management and decentralized execution, the CMT will utilize the information and processes in the Continuous Capability Planning (CCP) Guide and Early Systems Engineering Guide to support the launch of programs with higher probability of success.

5.5.4 Systems Engineering Activities

The Secretary of the Air Force for Acquisition (SAF/AQ) and AFMC have been developing initiatives to strengthen systems engineering discipline, assess technology maturity and manufacturing readiness, and review program readiness for milestone decisions. The Air Force's AIP (Acquisition Improvement Plan) has provided strategic guidance for recent systems engineering process improvements.

The AIP, started in May 2009, includes five major initiatives with 33 specific actions associated with the initiatives addressing specific steps to improve Air Force acquisition excellence. These initiatives focused on: (1) revitalization of the Air Force acquisition workforce; (2) improved requirements generation process; (3) budget and financial discipline; (4) improved source selections; and (5) clear lines of authority and accountability within acquisition. The workforce revitalization and requirements generation process initiative have direct impact on systems engineering and development planning processes. These ongoing activities will result in products and processes to be institutionalized in policy/best practices as completed. At the end of 2009, the AIP was substantially complete with 14 actions closed and 11 actions almost closed. The AIP will be completed by the end of FY 2010.

Pre-dating the AIP, Develop and Sustain Warfighting Systems (D&SWS) core processes laid the foundation for life cycle management reinvigoration. SAF/AQR's integrated program review and assessment process in concert with AFMC's SEAM (Systems Engineering Assessment Model) are improving the tactical level execution of systems engineering within Program Offices in preparation for milestone reviews. Workforce revitalization efforts are discussed in Section 5.5.6.

5.5.4.1 Requirements Generation Process

The Air Force is undertaking the following action items in support of an improved requirements development process:

1. Ensure acquisition involvement and leadership in support of the lead command early in the development of program requirements.
2. Require that the Service Acquisition Executive and, when applicable, the Commander, Air Force Materiel Command or Commander, Air Force Space Command, when appropriate, certify that the acquisition community can successfully fulfill the requirements in the

Capability Development Documents in conjunction with the Air Force Requirements Oversight Council (AFROC).

3. Require the PEO to coordinate the SRD packages with the lead Command (MAJCOM) Commander or his/her designee based on ACAT level.
4. Minimize the number of KPPs and other requirements to the appropriate level for acquisition programs; ensure all requirements are finite, measurable, prioritized, and can be evaluated during a source selection.
5. Require incremental acquisition strategies that reduce cost, schedule, and technical risk and produce operational capability earlier.
6. Freeze program requirements at contract award, and require subsequent changes to MDAP KPPs be accompanied with adequate funding and schedule considerations that are reviewed and agreed upon by Chief of Staff of the Air Force prior to JROC validation; and similarly require changes to other requirements be reviewed or proposed by the lead Command (MAJCOM) Commander or his/her designee before presentation to AFROC.

Currently Actions 2-6 above have a projected completion of 2nd quarter FY 2010 and completion of Action 1 by end of FY 2010.

5.5.4.2 Develop and Sustain Warfighting Systems Core Process

The following D&SWS Core Process initiatives are samples of the 40+ D&SWS initiatives to improve acquisition and life cycle management processes.

- *Life Cycle Affordability (LCA):* The LCA initiative integrates the Acquisition and Sustainment (A&S) Tool Kit, the Independent Logistics Assessment (ILA), and the Logistics Health Assessment (LHA). The A&S Tool Kit, owned by AFMC/A4A, provides standard, repeatable processes to guide the acquisition and sustainment workforce and facilitates life cycle up-front planning and programming. ILAs provide an impartial evaluation of a program's product support planning and implementation by a small team of subject matter experts who are independent of the system developers and are standardized, systematic, and repeatable evaluations that target the early acquisition phases. The LHA provides the Air Force with a standard, measurable, and user-friendly logistics health assessment tool and ensures long-term sustainment and availability considerations are integrated early into decisions.
- *Systems Lifecycle Integrity Management (SLIM) Implementation Plan:* SLIM will standardize systems engineering processes and tools associated with optimizing resources and improving weapon system life cycle management to increase aircraft availability and reduce operational and support cost throughout the life cycle.
- *Improved Technology Maturity Assessments (TMA):* This initiative presents a comprehensive means to assess complete maturity of technologies and provides the Integration and 'ilities (RI3) Methodology Guidebook that describes risks associated with integration and 'ilities incurred when developing and integrating technologies into systems, enhancements to software Technology Readiness Level description, and Technology and Manufacturing Readiness courses that are training for individuals who will become technology and manufacturing readiness assessment team members.

- *Risk Identification, Integration and 'ilities (RI3) Process:* This initiative assists PMs and systems engineers in the development and transition of new technologies by helping them to identify technical risks that have hindered previous programs. This is a technical risk management methodology and tool used to identify technical risk early and is a part of the Air Force PSR tool chest. The Air Force intends that if the process is used as part of a coherent systems engineering strategy, programs can accomplish risk management early enough to enable sound decisions and avoid cost overruns and schedule delays. This Web-based tool development is projected for completion in March 2010; updates to the methodology and training are planned for end of FY 2010; and updates to policy are planned for the end of FY 2010. The Air Force used the approach on a PSR pilot program and plans to include it as a key part of the Air Force PSR initiative on all programs.
- *High Confidence Technology Transitions:* This initiative ensures early and documented planning for technology development at Milestone B through a collaborative effort between system Program Managers and technology managers. The initiative provides a Technology Development and Transition Strategy (TDTS) Guidebook, a Stage-Gate Process, which is a disciplined way to execute TDTS via stage activities and gate (or exit) criteria, and a Turbo Technology Program Management Model (TPMM) tool, which facilitates implementation of the stage-gate process and provides a repository for required documentation.
- *Identify and Prioritize Technology Needs:* This initiative is an Air Force-wide process to identify and prioritize technology needs linked to capability gaps and program requirements. This strategic collaboration between AFRL, Product Centers, and Logistics Centers ensures S&T investments are in concert with the Air Force's highest priority needs and makes certain that capability planning influences AFRL's "Tech Push" investments.

5.5.4.3 Integrated Program Review and Assessment Process

The Air Force is integrating the OSD existing Program Support Review (PSR) process with existing Air Force specialty reviews and tools to form a single, standardized review process. This process is a collaborative process between OSD and the Air Force that includes the application of systems engineering best practices on programs through the responsible AFMC or Space and Missile Systems Center engineering staffs, the assessment of programs with sufficient lead time to ensure Program Offices time to address identified risks and issues, to propose recommendations to mitigate those risks and to minimize the burden on the Program Offices resulting from an ever-growing list of reviews and oversight processes. This new integrated program review and assessment process is focused on acquisition phases after MDD and through Milestones A, B, and C. The Air Force is working to update Air Force policy to institutionalize the process across the Air Force acquisition enterprise with a projected policy update summer 2010.

The following pre-existing reviews, assessments and processes are incorporated within the new process: (1) Defense Acquisition PSR; (2) Technology Readiness Assessment (TRA); (3) Manufacturing Readiness Assessment (MRA); (4) Logistics Health Assessment (LHA); ESOH Review; (5) Engineering, Integration, and Test (EI&T) Process including the RI3 Guidebook; and (6) Systems Engineering Process including SEP and Life Cycle Management Plan (LCMP). The Risk Identification, Integration, and 'ilities (RI3) Process is designed to be used as an evaluation aid as part of the program's systems engineering process. After evaluating all of the program risk areas, the

RI3 Process is then used to calculate and display risk as a traditional 5x5 matrix and is used to compare and evaluate candidate technologies or concepts and to report upward status and progress to management (Probability of Program Success (PoPS)) as depicted in Figure 5-13.

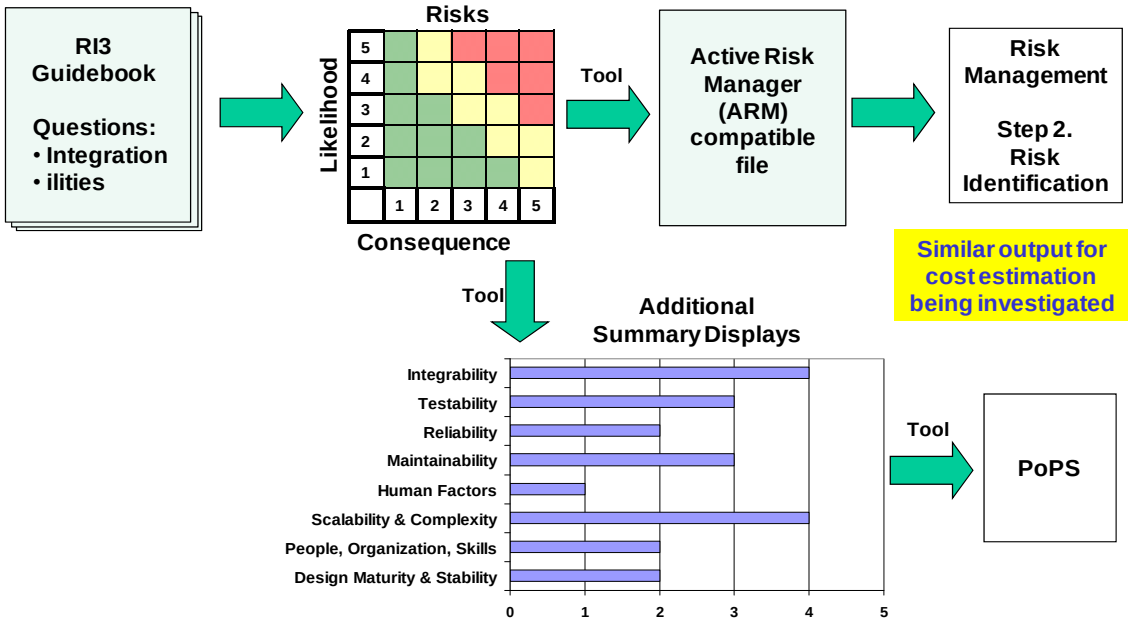


Figure 5-13. Use of RI3 to Feed Risk Management Processes

5.5.4.4 Air Force Systems Engineering Assessment Model

The Air Force SEAM, based on the Capability Maturity Model® Integration (CMMI) from the Carnegie Mellon Software Engineering Institute, describes what is required for good systems engineering. SEAM establishes, standardizes, and maintains a clear understanding of systems engineering practices and their importance to mission success and is intended to assist in successfully integrating systems and systems of systems. SEAM, published in August 2008, is their first standard systems engineering process-based assessment model. The model includes specific references to "ilities" and integration practices, which makes it complementary to the RI3 Guidebook. The synergy between these two documents is that SEAM asks the high-level questions, and the RI3 Guidebook asks the more detailed questions to evaluate the potential to reduce mission risks. The Air Force has released an interim guidance memorandum. The programs are using SEAM to self-assess. The Air Force Materiel Command (AFMC) has instituted its use in a guidance memorandum and will include it in the upcoming AFMC Instruction 63-1201 update.

5.5.4.5 Reliability, Availability, and Maintainability

In July 2008, the USD(AT&L), after a review of the Defense Science Board Task Force on Developmental Test and Evaluation and a DoD Reliability Improvement Working Group effort, directed the Services to establish an acquisition policy to improve reliability. Air Force Instruction 63-101, Acquisition and Sustainment Life Cycle Management, published in April 2009, emphasized

the PM's responsibility to conduct analyses to arrive at RAM parameters that minimize costs while delivering effective and suitable operational capability meeting the user requirements. The policy requires the analyses to be documented to ensure a balance is achieved between RAM parameters and technical, cost, schedule, and risk constraints of the program; that trade-offs made in the development of RAM requirements are linked to measures of effectiveness and suitability used in the AoA and the measures stated in the capability documents; and that RAM requirements are testable. The policy requires the PM to document the RAM parameters and methods of calculation that, at a minimum, include availability, reliability, cost of ownership, and mean down time. The policy also requires translation of the operational RAM requirements into technical contract specifications.

The Air Force originally directed programs, by this policy, to implement a reliability growth program, if the initial Sustainment KPP and supporting Key System Attributes are not met. AFI 63-101 will be clarified in the next revision, planned for publication in mid-2010, to require all programs to execute a RAM strategy that includes a reliability growth program as an integral part of design and development. Specific wording of the requirement to be incorporated into AFI 63-101 will be coordinated with OSD and may be issued earlier in an Acquisition Policy Direction memorandum, dependent on the actual timing of the formal AFI 63-101 update. In addition, AFI 63-1201, Life Cycle Systems Engineering, 23 July 2007, guidance on program protection will be updated in its next revision.

The Air Force also sought the assistance of the Air Force Science and Engineer Advisory Council and the National Research Council to develop a 5-year strategic plan to address the systemic problem of a lack of reliability experience within the STEM career fields of the workforce. As part of an increased emphasis on Air Force acquisition program oversight as programs neared acquisition milestone decision points, reliability considerations were included topics for OSD-led Program Support Reviews and the Air Force integrated program review and assessment process.

5.5.5 Development Planning Activities

The Air Force has put significant effort into examining performance improvement areas for systems engineering during early phases of acquisition programs. For the past several years, OSD, SAF/AQ, and AFMC together developed numerous initiatives to strengthen systems engineering discipline, assess technology maturity and manufacturing readiness, and review program readiness for milestone decisions.

With the establishment of the Single Entry Point, Air Force acquisition programs receive their needs in the form of user requirements from one source, enabling a centralized and managed requirements collection process. The Air Force's Acquisition Organization and Continuous Capability Planning provide the framework to develop and manage capabilities in the context of the Air Force's greater capability set. A major focus for Continuous Capability Planning is to reinvigorate development planning to support the launch of programs with a high confidence of success. The Air Force defines development planning as the Materiel contribution to AF-level Capabilities-Based Planning. It is a collaborative process bridging warfighter-identified capability needs to planning for acquisition of materiel solutions.

This planning process supports the trade-space evaluation of emerging capability needs incorporating comprehensive life cycle planning, identification, and assessment of technology maturity and risk drivers, and inclusion of SoS assessments. The Air Force's Development Planning Strategic Plan states that development planning extends from the JCIDS time frame until shortly before Milestone B and includes early systems engineering focused on concept development. The Air Force's Early Systems Engineering Guidebook, released in March 2009, describes these systems engineering activities during concept development, which include providing technical input to the AoA process, performing a Military Utility Assessment, and developing a CCTD for each alternative being evaluated.

Development planning is executed within AFMC and Air Force Space Command in collaboration with Air Staff, and operational major commands through Development Planning directorates. Operational users and concept developers work together through the directorates to identify and evaluate options for filling capability gaps. In this effort, affordability and technical feasibility must inform user requirements at the same time that user needs founded on the Concept of Operations (CONOPs) and mission threads inform the technical trades. Figure 5-14 depicts these principal activities associated with early systems engineering during concept development.

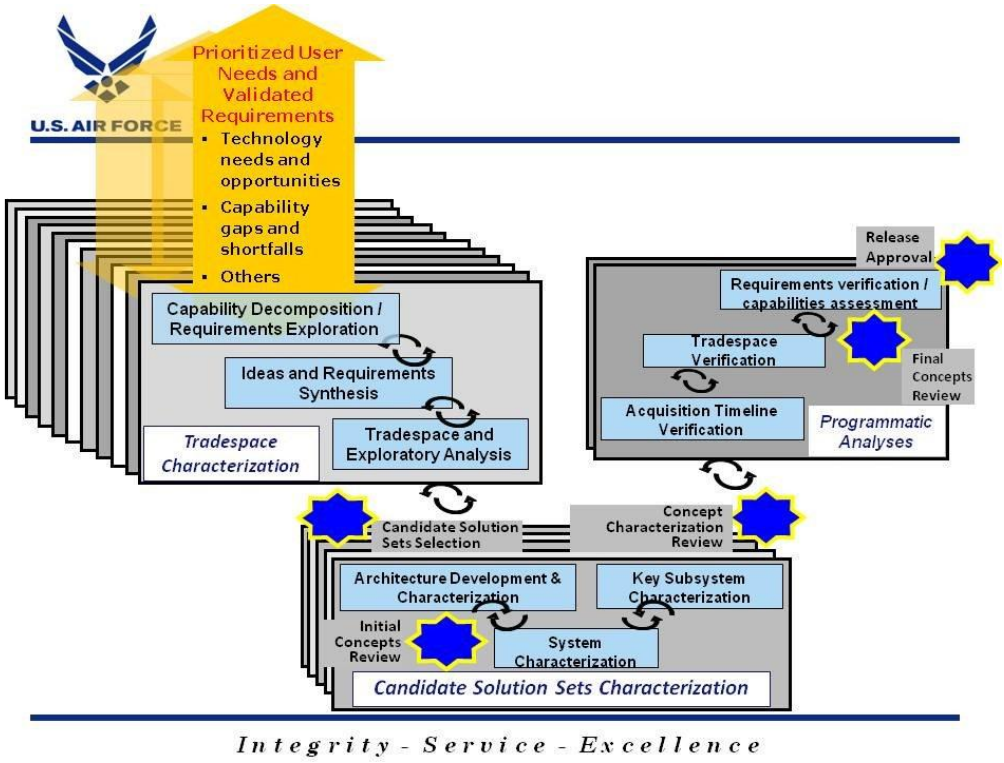


Figure 5-14. Early Systems Engineering–Concept Development

The Air Force has developed and is currently institutionalizing Early Systems Engineering processes to ensure disciplined and repeatable concept definition and trade space characterization during development planning. This rigorous analysis, starting early during Capability-Based Assessment (CBA) and continuing through the AoA, culminates in the development of CCTD documents. The CCTD is a description of a pre-acquisition concept that contains the parametric and trade space studies performed over the concept's lifetime, including supporting documentation and other deliverables. The CCTD documents every aspect of the concept and its development decisions for future reference, ensuring the "knowledge bridge" required for continuity from Development Planning into the development phases of the acquisition process.

Following the MDD, the CCTD serves as the starting point for the Technical Description Document or Alternative Description developed during the AoA, and the framework for the specification of the sponsor-selected Preferred System Concept developed after the AoA. Figure 5-15 depicts CCTDs, as outputs of development planning efforts that emerge from capability planning, feeding both the AoA Study Guidance and the AoA Study Plan. The Air Force plans to clarify CCTD descriptions and start the publication coordination process for a CCTD Guidebook in March 2010, which will simplify implementation and provide a template for authors to follow, with a projected policy update May 2010.

The Air Force intends that the requirement for prototyping be incorporated as a fundamental part of a program's risk mitigation approach and documented in the SEP. Critical technology elements identified in the Concept Characterization and Technical Description Document and the Technology Development Strategy form the basis for prototyping and risk reduction efforts. The Air Force stated that prototyping and competition efforts should reduce risk, improve systems engineering planning and execution, and better quantify cost estimates for Milestone B.

The Air Force has been the most active service in defining development planning as an independent function, developing policy and process, and committing significant resources to its execution. With the creation of the directorates and the creation of a development planning governance structure, the Air Force has created a community and potentially a workforce to fulfill this function. The Air Force focuses on developing a bounded solution set of proposed concepts going into the AoA with emphasis on technical analysis being performed on the proposed concepts. It is not yet clear whether this approach is adequate for the Air Force to conduct planning for all systems, nor whether such robust early technical work is necessary.

The Air Force has recognized that the Milestone Decision Authority at MDD has a clear need for a better technical understanding of potential materiel solutions to support a well-informed decision and has taken the lead to capture that process in their development planning initiative. The valuable time and resources necessary to achieve this understanding must be balanced and avoid any disproportionate application of time and engineering resources prior to the MDD, before the MDA has made a determination to proceed with a Materiel Solution Analysis phase. Disproportionate investments prior to MDD can place those resources at greater risk should the MDA determine against proceeding. Defining and preserving that balance and the optimal level of pre-MDD analysis is a challenge facing the acquisition community as we develop policy and guidance for development planning.

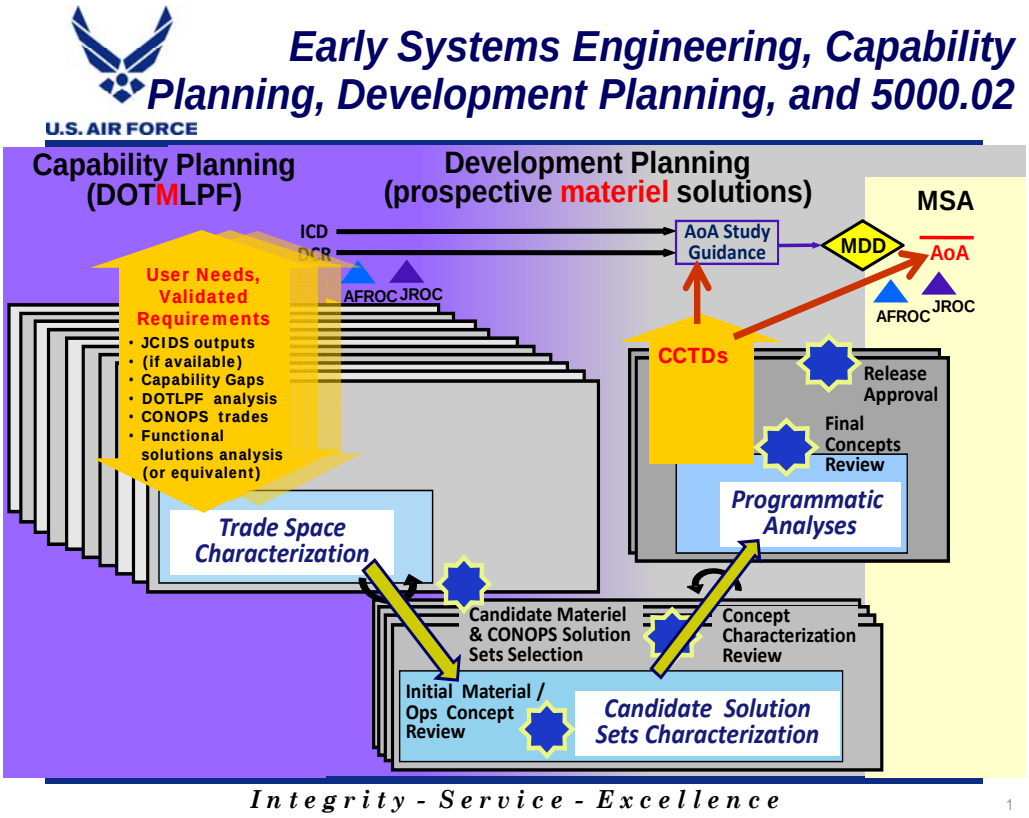


Figure 5-15. CCTDs as Development Planning Products Support MDD and AoA

5.5.6 Workforce and Resources

5.5.6.1 Workforce – Development Planning

At the end of 2008, SAF/AQ partnered with Air Force acquisition Functional Leaders and the acquisition commands to develop an Air Force Human Capital Strategic Plan for the acquisition workforce, which was published in February 2009. Sizing acquisition manpower to requirements is the first goal of the Air Force Human Capital Strategic Plan. To accomplish the goals of the plan, the Air Force is also making full use of the Defense Acquisition Workforce Development Fund established under FY 2008 National Defense Authorization Act (NDAA) Section 852. The Air Force plans to grow the acquisition workforce by more than 9,000 positions over the FYDP through a combination of new hires and in-sourcing. With the renewed emphasis on early engagement in the acquisition cycle, the Air Force recognizes that additional expertise will be necessary to support the improvement and revitalization of development planning.

The Air Force has a strong workforce development process, led by the Air Force Director of Acquisition Career Management (DACM). The Air Force Acquisition Professional Development Program (APDP), IAW AFI 63-101, implements the requirements of the DAWIA and facilitates the development and sustainment of a professional acquisition workforce. APDP also implements DoDD 5000.52 and DoDI 5000.66, which establish experience, education, and training standards for the acquisition functional career categories.

The Air Force plans to identify the correct ratio between Government and contractor personnel by April 2010 under the AIP Initiative 1.9, "Assess acquisition workforce to determine right organic/contractor mix." The Air Force is in-sourcing to bring more of the support contractor workforce with acquisition experience and expertise into Government positions. For FY 2009, 70 SPRDE positions were added from in-sourcing. For FY 2010 through FY 2015, in-sourcing opportunities are now being analyzed and identified for conversion. Although the FY 2010 conversions are the first to be identified, they will not be fully complete for a few more months; to date, 206 SPRDE in-sourcing conversions have been identified. The precise numbers will not be available until the specific contracts are identified for potential in-sourcing.

To further substantiate that the Air Force is intent on improving its systems engineering workforce, it indicates that efforts are under way to determine the appropriate workforce number and skill mix. For example, the Air Force is currently conducting a study through the RAND Corporation to determine science and engineering future requirements. Systems engineering is only a part of this study, but questions seek to address major changes in systems and acquisition in the near (less than 5 years) and longer (10–15+ years) term. Development planning is not an OSD or an Air Force career field and is not specifically tracked; but, will be included in this analysis. This study also seeks to address the effectiveness of the skills mix within the acquisition community. The Air Force looks forward to building on this through the STEM initiative to ensure the Air Force has the appropriate number and skill mix of STEM-related personnel. In particular to development planning early resource estimates, the D&SWS team at AFMC has plans to produce first order estimates by February 10, 2010.

The Air Force is also exploring the need for development planning certification and suggests that these personnel could be covered under the DAWIA certification areas of SPRDE-SE or PM with some domain-specific acquisition experience. This is an important area in which OSD should work with the Air Force toward developing assignment-specific training or perhaps requiring PM-type training at the Journeyman level.

5.5.6.2 Workforce – Systems Engineering

At this time, the Air Force is still awaiting results of its scientists and engineers future requirements call to help shape projected SPRDE-SE career field numbers. Current SPRDE-SE positions total 5,931 civilians and 2,189 officers and SPRDE-PSE positions total 123 civilians and 19 officers. Table 5-16 identifies the manning as of the end of June 2009.

Table 5-16. June 2009 SPRDE-SE and PSE Manning

Career Field	Civilian	Officer	Total
SPRDE–Systems Engineering	4,939	1,863	6,802
SPRDE–Program Systems Engineer	65	8	73
TOTAL	5,004	1,871	6,875

Product Center/Program Executive Office requirements were reviewed, vetted, and submitted in the FY 2010 POM as part of the overall Acquisition Excellence effort. New SPRDE positions programmed to be added over the FYDP (FY 2010–FY 2015) include 543 civilian and 62 officer positions. In addition, more than 300 other SPRDE positions have been validated but not yet funded—these will be vetted in the FY 2012 POM deliberations.

Figure 5-16 shows the numbers and percentages of workforce members who achieved the necessary certifications at the appropriate levels. These data are valid as of the 3rd quarter FY 2009. Only 60 percent of the SPRDE-SE coded workforce members achieved the appropriate certifications for their positions. For the SPRDE-PSE coded workforce members, only 23 percent achieved the necessary certifications. These numbers need to be improved.

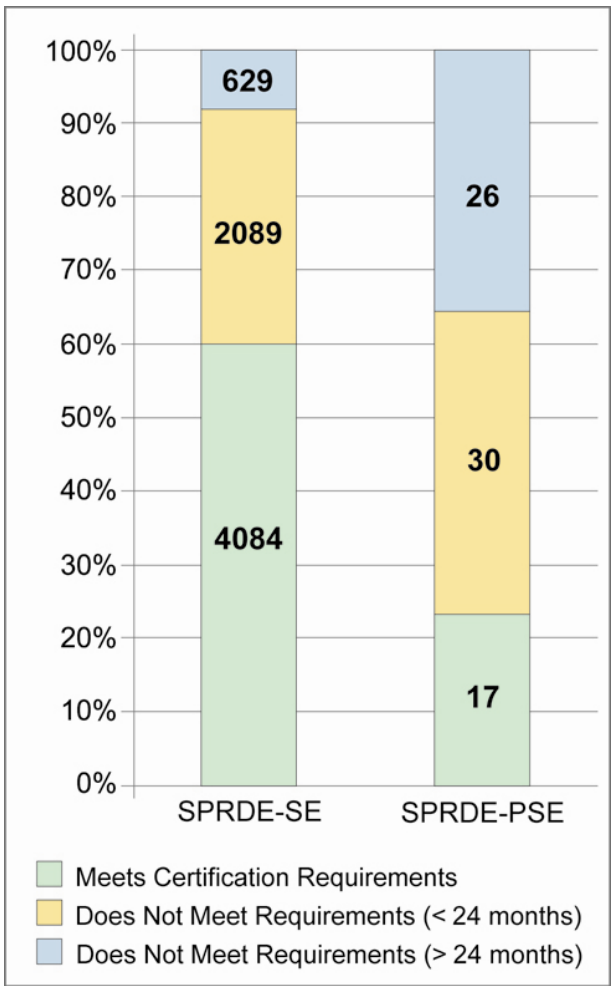


Figure 5-16. Third Quarter FY 2009 SPRDE-SE and PSE Manning

The Air Force currently operates under a decentralized competency management system and thus has no central emphasis or control. This has led to stovepipes preventing cross-functional workforce management and no focal point for managing or sustaining efforts. The Air Force is developing and

phasing in a new system under the Competency Development Initiative (CDI). This is another excellent initiative that enables strategic workforce planning and individual career development through a common language focusing on a consistent approach to personnel management across the total force.

Outside the Defense Acquisition University, the Air Force has three formal education and certification programs for education, training, and development of the systems engineering workforce. These include programs at the U.S. Air Force Academy, Air Force Institute of Technology (AFIT), and the Air Force Center for Systems Engineering (AF CSE). The Air Force is developing a multi-day introductory course on development planning at AFIT. This is an important area, in the early stages of development itself, and offers an opportunity to leverage the Air Force efforts to ensure the acquisition workforce is well educated and trained in development planning.

5.5.6.3 Resources

The Air Force is preparing a plan for identifying acquisition resources needed in its upcoming Acquisition Improvement Plan (AIP) and resulting initiatives. It has a total of 27,188 personnel in the acquisition workforce as September 30, 2009. The workforce is composed of 18,519 civilians and 8,669 military. Out of the current acquisition workforce, 7,252 are scientists and engineers, of which 5,335 are civilians and the remaining 1,917 military. Through FY 2015, the Air Force plans to grow the acquisition workforce to 32,812, dependent upon corporate Air Force support in the POM.

In addition, the Air Force is making full use of the Defense Acquisition Workforce Development Fund established under FY 2008 NDAA Section 852 to develop the workforce. The Air Force is also working with OSD to define what resources and funding should be reported and how best to report that data so OSD can review, assess, and report on the Air Force and other Services in a comprehensible, consistent, and correct manner.

Finally, the Services are working to develop an estimate of additional resources needed to implement required reviews, including periodic reviews and assessments of the technological maturity and integration risk of critical technologies of the MDAPs. The Air Force estimates that approximately 14 MDAPs "under [Air Force] purview" would be reviewed and assessed each year. Based on historical resource use to conduct an average technology readiness assessment, the Air Force estimates it will need 14 additional full-time equivalent employees to fulfill this responsibility.

ASSESSMENTS OF MAJOR DEFENSE ACQUISITION PROGRAMS

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6 ASSESSMENTS OF MAJOR DEFENSE ACQUISITION PROGRAMS

This section includes assessments of 42 Major Defense Acquisition Programs (MDAPs), Major Automated Information Systems (MAISs), and special interest programs that involved significant developmental test and evaluation (DT&E) or systems engineering activity in FY 2009. Depending on a program's activity for the year, an assessment may include a summary of only DT&E activity, only systems engineering activity, or both DT&E and systems engineering activity. Assessments are as of the end of FY 2009 (September 30, 2009); however, some assessments may include information on program status through the 1st quarter FY 2010 (December 31, 2009).

The assessments are organized by Service: Army, Navy, Air Force, and Joint programs. Following the program assessments are summaries of systems engineering special assessments completed in FY 2009.

6.1 Assessments of Army MDAPs

6 programs:

- Advanced Threat Infrared Countermeasures/Common Missile Warning System (ATIRCM/CMWS)
- Apache (AH-64D) Block III (AB3)
- Early-Infantry Brigade Combat Team (E-IBCT)
  - Formerly known as Spin Out 1 of Future Combat Systems
- Extended Range/Multi-Purpose (ER/MP) Unmanned Aircraft System (UAS)
- Integrated Air and Missile Defense (IAMD)
- Stryker Family of Vehicles

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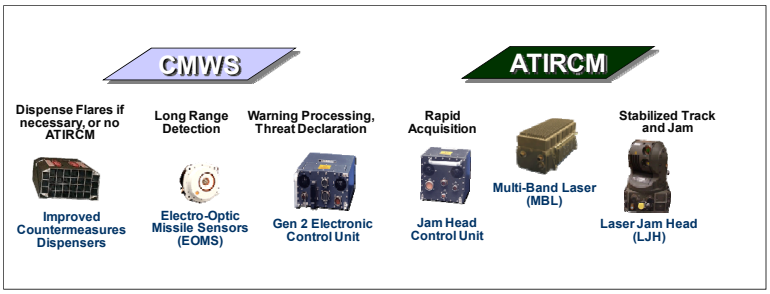
Advanced Threat Infrared Countermeasures/ Common Missile Warning System (ATIRCM/CMWS)

Prime Contractor: BAE Systems



Executive Summary

The Advanced Threat Infrared Countermeasures/Common Missile Warning System (ATIRCM/CMWS) has been in Low-Rate Initial Production since 2003 and Full-Rate Production since 2005. In September 2008, the Army Acquisition Executive directed that the ATIRCM/CMWS program immediately transition to the Production and Deployment phase for execution of ATIRCM Quick Reaction Capability (QRC). The acquisition strategy is currently under review and includes the Army's intent to initiate the CIRCM subprogram at Milestone (MS) A in the 4th quarter FY 2010. Key FY 2009 systems engineering activities included a Nunn-McCurdy (like) review on ATIRCM in October–November 2009. Developmental test and evaluation activities concluded in 2007.

Mission Description

The ATIRCM/CMWS integrates defensive infrared countermeasures capabilities into existing, current generation aircraft for more effective protection against a greater number of guided missile threats than is afforded by currently fielded infrared countermeasures. The Defense Acquisition Executive determined that ATIRCM/CMWS is most effectively managed as three subprograms: (1) CMWS, the threat warning system; (2) ATIRCM/ATIRCM QRC, a limited, urgently needed fielding of ATIRCM to protect CH-47 aircraft in Operations Enduring Freedom and Iraqi Freedom; and (3) the planned Common Infrared Counter Measure (CIRCM) programs. The CIRCM subprogram is to provide next-generation laser-based countermeasures suitable for all applicable rotary wing aircraft.

System Description

AN/AAR-57 Common Missile Warning System: The Electronic Control Unit (ECU) for ATIRCM and CMWS controls the other line-replaceable units, provides countermeasures selection and initiation, controls Built-in Test, and provides the platform interface. The Electro-Optic Missile Sensors passively detect the presence of energy within a specific band of interest and transmit information to the ECU. Once the system identifies a threat missile launch, the ECU directs the Improved Countermeasure Dispensers to dispense a flare cocktail. AN/ALQ-212 ATIRCM: ATIRCM adds two Jam Head Control Units (JHCU), two Multi-Band Lasers, and two Infrared Jam Heads. The CMWS provides missile detection information to the JHCU. The JHCU then slews the Infrared Jam Head to the missile location. Also added are (1) a Multi-Band Laser (baseline two), which provides laser energy to the Infrared Jam heads, and (2) an Improved Countermeasure Dispenser. The replacement of current second-generation (GEN 2) ECUs with third-generation (GEN 3) ECUs is due to begin in 2011, and a new subprogram CIRCM is expected to begin at MS A in FY 2010. CIRCM is expected to provide increased reliability and decreased weight compared with ATIRCM.

Summary of FY 2009 Systems Engineering Activities

- **Systems Engineering Plan (SEP)** – This program was an ACAT IC until April 15, 2009, when it was declared a special interest ACAT ID. As such it had no requirement or DoD-approved SEP. The program is working on a CIRCM SEP in support of MS B.

- **Requirements** – The Joint Requirements Oversight Council revalidated the Operational Requirements Document on November 10, 2009. The ATIRCM/CMWS program has four Key Performance Parameters (KPPs). Two of the four KPPs are on track; the other two, however, fall short of meeting their Threshold values for Reliability and Weight. This has led to fielding ATIRCM as a QRC and development of a CIRCM subprogram as an ATIRCM replacement. A CIRCM Capability Development Document (CDD) is under development. ATIRCM has demonstrated remarkable requirement stability, which may be attributed to the program's Configuration Management processes and the Configuration Management Board. A Configuration Steering Board was held in May 2009.

Critical Technologies – The ATIRCM/CMWS program has critical technologies related to infrared detection and laser countermeasures. A Technology Readiness Assessment was conducted in December 2009 on the five vendor systems participating in the CIRCM Broad Area Announcement. None met the TRL 6 required to proceed to the Engineering and Manufacturing Development phase.

Technical Reviews – No systems engineering technical reviews were conducted in FY 2009. Two technical reviews are scheduled for FY 2010. Requirements, funding, and schedule are balanced.

Technical Issues and Risks – Issues being worked include ATIRCM reliability and weight. Plans to resolve the issues are on track and include CIRCM Broad Area Announcement and ultimately the CIRCM program itself. Risks being addressed include lack of ability to meet Tier 1 Threat List (CMWS) and lack of Department of the Army Authenticated Technical Manuals and Supply Support (ATIRCM). Plans to resolve the risks are on track and include enhanced capability and additional processing capability; fielding of CMWS GEN 3 ECU.

Reliability – The ATIRCM program failed to meet its threshold reliability after executing a 2-year reliability growth plan. The result was a system operating at a reliability 50 percent of threshold; however, 26 aircraft operating in theater under the QRC deployment are experiencing a reliability at 120 percent of threshold with more than 5,000 hours of operational flying in a hostile environment.

Systems Engineering Support of Life Cycle Management and Sustainability – The program has an effective sustainment plan for both ATIRCM and CMWS. CMWS product is now executing to that plan, and ATIRCM will also commence sustainment production at end of QRC.

Software – Current software development is for sustainment of CMWS. The next release, Foxtrot release for the GEN 2 ECU, was planned for December 2009 but has been moved to early 2010.

Integration – Integration of ATIRCM is ongoing in the 83 QRC aircraft already equipped with CMWS in theater. Twenty-six installations are complete as of December 31, 2009. The ATIRCM/CMWS program has eight System Integration Laboratories, which will evaluate these integration efforts.

Manufacturing – The only manufacturing efforts currently under way are the ATIRCM A- and B-Kits in support of the QRC and sustainment items for CMWS. When CIRCM enters production, it will replace the limited ATIRCM deployment in addition to the fleet-wide fielding requirement of all applicable rotary wing aircraft.

Summary of FY 2009 Systems Engineering Assessments

Program Support Reviews (PSRs) – No PSRs were conducted in FY 2009. The program had a Nunn-McCurdy (like) review in October–November 2009. The review team's recommendations will be presented to the Defense Acquisition Board at a future date to be determined.

Systems Engineering Principles and Best Practices – The program has demonstrated a good understanding of systems engineering practices and received good reviews in a 2007 PSR and in the recent Nunn-McCurdy (like) review.

Program Health Metrics – ATIRCM/CMWS is on track to meet its Technical Performance Measures with the exception of ability to meet all Tier 1 Threat List missiles, reliability, and weight.

Conclusion – ATIRCM QRC (deployment on all CH-47s in Iraq and Afghanistan) is assessed as low risk. Program Manager weekly reports show the deployment is within cost and ahead of schedule.

Apache Block III (AB3)

Prime Contractor: Boeing Integrated Defense Systems

Executive Summary
The Apache Block III (AB3) is the Army's heavy attack helicopter of the current and future force. The program is completing its Engineering and Manufacturing Development effort and is scheduled for a Milestone (MS) C decision in April 2010. A Program Support Review is currently scheduled in January 2010 to support the MS C decision. This review will build upon the March 2009 Critical Design Review, which demonstrated that the program is well situated to enter into Low-Rate Initial Production (LRIP) in FY 2010.

Mission Description
The AB3 is a twin-engine, four-bladed, tandem seat, attack helicopter with 30mm ammo, 2.75" rockets, laser, and Radio Frequency Hellfire missiles. It will 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.

System Description
The AB3 is a pre-planned upgrade program of the older Block I and Block II AH-64D Longbow Apaches. It is capable of being employed day or night in adverse weather and obscurants, and can effectively engage and destroy advanced threat weapon systems on the air-land battlefield. The AB3 program will phase in total capability in three phases. The first phase includes all hardware changes that will require a depot-level or above facility, while phase three is primarily software related and will be incorporated via field retrofits.

Summary of FY 2009 Systems Engineering Activities

- **Systems Engineering Plan (SEP)** – The AB3 SEP was initially approved in March 2006 to support a MS B decision. An update is planned in 2nd quarter FY 2010 to support a MS C decision in April 2010.
  - There are no approved waivers or deviations from the SEP.
  - The objectives of the SEP are being met.
- **Requirements** – The Capability Production Document is currently in Army Staffing and is planned to be validated in the 2nd quarter FY 2010.
  - The AB3 program has five Key Performance Parameters to include net-ready, performance, reliability, survivability, and force protection. All are on track to be demonstrated by April 2010.
  - Requirements are stable and reasonable.

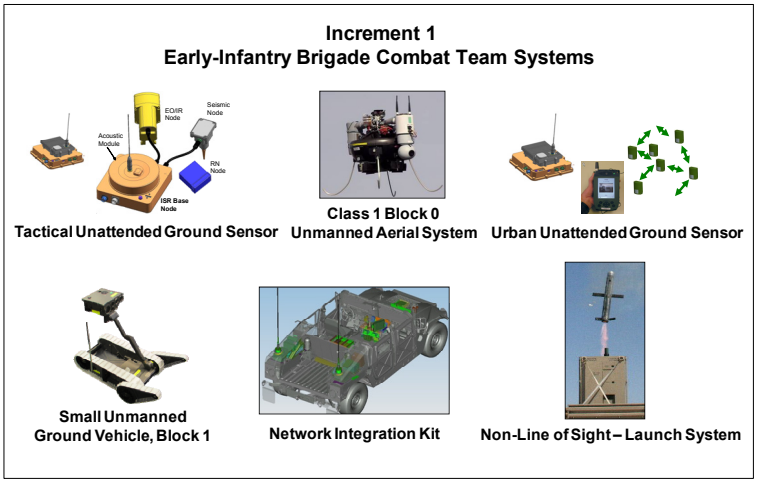
- **Critical Technologies** – The AB3 program has one critical technology related to the main gearbox design. The current Technology Readiness Level (TRL) is 6. The technology is expected to be at TRL 7 by MS C. The next Technology Readiness Assessment (TRA) will be conducted in the 2nd quarter FY 2010.
- **Technical Reviews** – One system engineering technical review was conducted in FY 2009. A Production Readiness Review (PRR) is scheduled for FY 2010.
  - **Critical Design Review (CDR)** – The CDR was successfully conducted in March 2009 to establish the initial production baseline. This was an event-driven review, and the post-CDR assessment conducted found that the program is well situated to continue onto the System Capability and Manufacturing Process Demonstration phase.
  - The AB3 program requirements, funding, and schedule are balanced, and the funding is adequate and appropriately phased.
- **Technical Issues and Risks** – The main gearbox top cover fatigue failure has been corrected with a top cover redesign that has completed fatigue testing and begun initial flight testing.
  - Risks being addressed include availability of Link-16 to meet interoperability requirements. Plans to resolve risks are on track and include an off-ramp if Link-16 capability is late.
- **Reliability** – The AB3 program has a reliability requirement of 17 flight hours between mission failures and is currently on track to achieve this requirement by MS C as planned.
  - The AB3 program has a requirement for improved maintainability over the currently fielded aircraft and is on track to demonstrate its requirement of 2.9 mean flight time between essential maintenance actions by MS C as planned.
- **Software** – Current estimate of software size for the AB3 program is 1,317,867 source lines of code. Build and test schedules are progressing on schedule. No software issues were discovered in either the CDR or the PRR.
- **Integration** – The AB3 program will integrate Level 4 control of an unmanned aircraft system (UAS) with the AB3 onboard systems. The AB3 has demonstrated this capability with a surrogate UAS.
- **Manufacturing** – The AB3 program has an LRIP entrance criterion to demonstrate an Engineering Manufacturing Readiness Level of 3. The Army conducted a PRR of the AB3 program in October 2009. No major issues or risks were discovered. The program is expected to be assessed a Manufacturing Readiness Level of 8 when the final report is released in the 2nd quarter FY 2010.

Summary of FY 2009 Systems Engineering Assessments

- **Program Support Reviews (PSRs)** – A PSR is scheduled for January 2010 to support the MS C decision and entry into the LRIP phase.
- **Post-CDR Assessment** – DSE conducted a post-CDR assessment of the AB3 program. The AB3 program was determined to be well situated to continue onto the System Capability and Manufacturing Process Demonstration phase.
- **Program Health Metrics** – Fourteen of the 15 Technical Performance Parameters (TPPs) have been met or are projected to be met prior to MS C.
  - The aircraft drive system weight is exceeding TPP allocation by 25 pounds.
- **Conclusion** – The program is on schedule and budget as demonstrated by the Critical Design Review and is well situated to enter into LRIP in FY 2010.

Increment 1 Early-Infantry Brigade Combat Team (E-IBCT)
(Formerly Known as Spin Out 1 of Future Combat Systems)

Prime Contractor: Boeing Integrated Defense Systems (sensors and network; Netfires LLC (NLOS-LS)



Executive Summary

Increment 1 E-IBCT conducted a number of single-system and system-of-systems developmental tests in preparation for a Milestone (MS) C Low-Rate Initial Production (LRIP) decision in December 2009, which resulted in approval to enter LRIP for one Infantry BCT set of Increment 1 systems. The program faces significant risk in completing all required integration, testing, and corrective actions before planned production and fielding dates.

Mission Description

Increment 1 E-IBCT fields systems that will perform all tactical operations—offensive, defensive, stability, and support—that are currently conducted by light infantry forces. The Army intends the Increment 1 systems to enhance brigade intelligence, surveillance, and reconnaissance, precision indirect fires, and command and control capabilities.

System Description

Increment 1 is a networked series of sensors and weapons that provide Soldiers with real-time information and new precision kill capabilities. The initial Army Modernization acquisition will produce systems developed under the former Future Combat Systems (FCS) program for nine Infantry BCTs. Follow-on Army modernization increments will continue to upgrade the remaining Infantry, Stryker, and Heavy brigades with current or upgraded systems as well as additional systems that are sufficiently mature. Increment 1 comprises the following systems:

- **Tactical Unattended Ground Sensor (T-UGS).** Tactical-UGS systems are self-organizing networks of remotely deployed, long-range sensors designed to enhance perimeter defenses of forward operating bases and other facilities.
- **Urban Unattended Ground Sensor (U-UGS).** Urban-UGS are small, leave-behind imaging and intrusion detection sensors, similar to commercial burglar alarms, that are emplaced in buildings, caves, or tunnels. Information is transmitted to the tactical network via a gateway.
- **Small Unmanned Ground Vehicle (SUGV) Block 1.** The SUGV Block 1 is a remotely driven, man-portable reconnaissance vehicle used in urban terrain and subterranean battle spaces, intended to support force protection by providing survivability, mobility, and information-gathering missions for the Current Force.
- **Class I Block 0 Unmanned Aerial System (UAS).** The Class I Block 0 UAS is a man-portable, tactical reconnaissance, surveillance, and target acquisition system with hover-and-stare

capability. The system uses real-time electro-optical and infrared imagers to transmit still images to the Operator Control Unit and Network Integration Kit.

- **Non-Line of Sight Launch System (NLOS-LS) with the Precision Attack Missile (PAM).** An extended-range, precision attack missile used against armored, lightly armored, and other stationary and moving targets during day, night, degraded weather conditions, and in environments with countermeasures present.
- **Network Integration Kit (NIK).** The NIK is a joint software programmable radio with multiple waveforms used to share information, connect to unattended sensors, and connect to the network. The NIK will be installed in Infantry BCT vehicles such as High Mobility Multipurpose Wheeled Vehicles (HMMWVs) and Mine Resistant Ambush Protected (MRAP) vehicles. The Joint Tactical Radio System (JTRS) Ground Mobile Radio (GMR) is being developed as a complementary program and is a subsystem in the NIK.

Developmental Test and Evaluation Activity

- In January 2009, program test planners coordinated a new Acquisition Strategy and Test and Evaluation Master Plan (TEMP), based on July 2008 direction from the Army Acquisition Executive to migrate from Heavy (Armored) BCTs to Light (Infantry) BCTs.
- In April 2009, Defense Acquisition Executive approved entrance criteria for MS C, LRIP of Increment 1 E-IBCT, planned for December 2009. This effectively set DT&E test criteria for remaining testing in FY 2009.
- The program completed Technical Field Test (TFT) A, Performance, Sensors to Network, and tested networked sensor capabilities in May 2009.
- In June 2009, the Secretary of Defense directed a new Network strategy, continuation of Increment 1 E-IBCT systems and re-formulation of systems developed under FCS into appropriate MDAPs. Increment 1 test events continued as previously planned.
- The program completed TFT B, Performance, and Network upgrades in June–July 2009, using corrections from previous testing.
- The program completed TFT C, Performance, Radios, Sensors and Range Extension, using all sensors and options in July 2009.
- The program completed Force Development Test and Experimentation (FDT&E), evaluating training and supportability issues, in July–August 2009.
- In August 2009, OSD approved the TEMP resubmitted before the restructure, with the stipulation that it define test and resources spanning only from the Secretary of Defense June 2009 direction to MS C in December 2009.
- The program completed a Limited User Test (LUT) using operational crews and a DOT&E-approved test plan in August–September 2009. The final report is expected in November 2009.
- NLOS-LS completed eight missile shots during FY 2009. Seven missiles hit the target; one missed. Two of the seven missiles failed to arm the fuze, meaning the warhead would not have detonated. In addition, the program identified several issues with cold weather capability, triggering design changes and delays in testing until January 2010.

Developmental Test and Evaluation Assessment

- TFT, FDT&E, LUT Test Plans were thorough and detailed and spanned all appropriate conditions within limitations of the test environments. New TEMPs are expected for Ground Combat Vehicle (GCV), Increment 1 E-IBCT and Network testing after E-IBCT MS C.

- Increment 1 tests were completed as outlined in the OSD-approved FCS TEMP (August 2009). Sufficient resources were available for all tests as planned. The program will complete additional reliability testing (beyond that planned in the TEMP) in support of MS C in December 2009.
- TFTs identified development deficiencies and corrections in all systems in preparation for the LUT. FDT&E identified training and supportability issues, in support of the LUT and eventual fielding of the systems. Predominant concerns were individual system reliability, data latency, training and operator familiarity, battery and system weight, and network compatibility and performance.
- Reliability issues found during testing led program management to add post-LUT reliability testing to increase test data supporting MS C. The Service may need to consider alternate strategies for implementing the Increment 1 system based on lagging development, or consider fielding systems similar to those used during the LUT as an interim measure.
- Qualification testing (i.e., durability, life cycle, harsh conditions) lags the planned LRIP decision point; this represents a risk if it identifies a correction that would delay production after approval. Current battery technology allows the sensor systems to meet requirements but exceeds weight requirements; users may need to trade battery capability for transportability. The program has planned a high-risk schedule with almost no flexibility to complete all planned testing and integration between MS C in December 2009 and a Full-Rate Production (FRP) decision planned for December 2011.

Summary of FY 2009 Systems Engineering Activities

- **Systems Engineering Plan (SEP)** – The updated Increment 1 SEP was approved in December 2009 and describes the overall systems engineering technical approach through LRIP. There are no anticipated waivers or deviations from the SEP. The objectives of the draft SEP are being met. The Increment 1 E-IBCT system of systems (SoS) engineering process is used to define, analyze, functionally integrate, and verify the SoS and each system composing Increment 1 E-IBCT.
- **Requirements** – The Capabilities Production Document was validated in April 2009.
  - The Increment 1 E-IBCT program has seven Key Performance Parameters (KPPs). The Increment 1 systems have met two of seven KPPs (T-UGS target classification and Class I UAV recognition), and the program is working toward achieving the remaining five by FRP (NLOS-LS lethality, Net Readiness, U-UGS Detection, Operational Availability, and SUGV Recognition (at night)). Based on developmental test (DT) and operational test (OT) results, achieving the Operational Availability and NLOS-LS Lethality KPPs by FRP will be a challenge.
  - Program requirements are stable and reasonable.
- **Critical Technologies** – The Increment 1 E-IBCT program has 10 Critical Technologies (CT). The Independent Review Team (IRT) assessed eight of the CTs at Technology Readiness Level (TRL) 7, one CT was assessed less than TRL 7 pending resolution of cold weather operation issues (32A – UAV Class I Ducted Fan), and one CT will not be assessed until after it is demonstrated in 2010 testing (3A – Cross Domain Solution (ability to transfer information in a secure, timely, and accurate fashion between security domains)). DDR&E Research initial review of Increment 1 E-IBCT critical technologies indicates that network technologies are less mature than expected at MS C.

- **Technical Reviews**
  - The systems composing the Increment 1 E-IBCT effort conducted system-level Critical Design Reviews between December 2008 and September 2009. The program baseline was established to support LRIP. The Increment 1 specification was traceable to the Capability Production Document, and decomposition of requirements to the Increment 1 E-IBCT systems is understood. Design gaps in the areas of weight, cold weather performance, and limitations of off-the-shelf equipment identified at the Critical Design Review or during the post-MS C qualification testing described above might require updates to configurations; these may pose risk to the program and additional costs to make necessary fixes.
  - Increment 1 E-IBCT conducted a Production Readiness Review in October 2009. As of the Production Readiness Review, two of the systems were not Engineering Manufacturing Readiness Level 3, and the integration line was not validated.
- **Technical Issues and Risks** – Program risks include: Reliability is not at planned growth levels and requires additional testing and design for reliability efforts; network capability is still maturing; late delivery and integration of the JTRS Ground Mobile Radio will require upgrades starting after FRP; availability of Battle Command full functionality software to support the LUT in 2010; NLOS-LS missile lethality is pending evaluation of flight testing; and remaining qualification testing must be completed prior to operational test.
- **Reliability** – Reliability for the Increment 1 E-IBCT systems as reported at the Critical Design Review was less than 20 percent of the planned growth requirement for Mean Time Between System Abort except for the NLOS-LS Container Launch Unit. The program is pursuing actions to improve reliability to required levels by IOT&E.
- **Systems Engineering Support of Life Cycle Management and Sustainability** – The SEP addresses systems engineering support of Life Cycle Management and Sustainability.
- **Software** – Software development is on track to support the LUT in 2010. The program has acted rapidly on trouble reports identified during testing to improve performance, and there are no major issues.

Summary of FY 2009 Systems Engineering Assessments

- **Program Health Metrics** – The Increment 1 E-IBCT program is on track to meet its Technical Performance Measures with the exception of Reliability; Class I UAS cold operating temperatures; SUGV Personnel Recognition at night; the SUGV platform weight. The program has mitigation efforts in place for each area. NLOS-LS lethality is not fully assessed until DT and OT flight test corrective actions have been implemented and validated in flight testing.
- **Conclusion** – The Increment 1 E-IBCT program is executing to the SEP as intended. The Increment 1 E-IBCT program faces significant schedule and reliability risks. There is also significant schedule risk due to dependence on the JTRS Ground Mobile Radio and Non-Line of Sight Launch System schedules. The program will conduct its Initial Operational Test and Evaluation in 4th quarter FY 2011, and the FRP decision is planned for 1st quarter FY 2012.

Extended Range/Multi-Purpose (ER/MP) Unmanned Aircraft System

Prime Contractor: General Atomics – Aeronautical Systems Incorporated

Executive Summary
The ER/MP is an unmanned aircraft system (UAS) providing multiple sensor and weapons capability. The program is in the Engineering and Manufacturing Development phase; Milestone (MS) B was August 2005, and MS C is planned for January 2010. The ER/MP airframe is a near commercial off-the-shelf (COTS) product; there has been limited opportunity to instill rigorous systems engineering design principles into the development. The program is supporting traditional development while simultaneously producing and fielding Quick Reaction Capability (QRC) systems to the current war effort. Key FY 2009 systems engineering activities included a Defense Support Team (DST) Software and Information Systems Assessment.

Mission Description
The ER/MP UAS company executes reconnaissance, surveillance, security, attack, and command and control missions to provide dedicated mission-configured UAS support to assigned Army and Joint Force units based upon the Division Commander's mission priorities.

System Description
The MQ-1C ER/MP UAS consists of weapons-capable unmanned aircraft equipped with Synthetic Aperture Radar and Electro-Optical/Infrared/Target Designation payloads, Ground Control Station (GCS), Tactical Common Data Link (TCDL), satellite communication, and other equipment. There is one initial program increment. The Block 0 version of the UAS is based on legacy sensors and ground control and communications and the MQ-1C aircraft. This block, along with the QRC units, is being deployed to theater to support emergent operations. The Block 1 configuration will be the first unit equipped for the program of record and is expected to meet approved system requirements.

Summary of FY 2009 Systems Engineering Activities
- **Systems Engineering Plan (SEP)** – The ER/MP UAS SEP was initially approved in April 2005 to support MS B. The program plans to update the SEP in April 2010 in support of MS C and as the ER/MP UAS moves from ACAT II to ACAT ID. There are no approved waivers or deviations from the SEP.
- **Requirements** – The Capability Production Document was approved March 24, 2009.
  - The ER/MP UAS program has seven Key Performance Parameters (KPPs). Five, to include payload/weight, sensors, and weapons load, are on track to demonstrate by Initial Operational Test and Evaluation (IOT&E) (August 2011); the exceptions are Net-Ready and Sustainment.
  - The Net-Ready KPP is at risk due to software development and integration difficulties. The Sustainment KPP is at risk due to equipment setup times and GCS reliability concerns.
  - Program development requirements have changed based on emerging warfighter requirements and improvements to the fielded activities. End-state functionality is stable; however, demands of early fielding activities have added short-term priorities over program requirements and have affected program development.

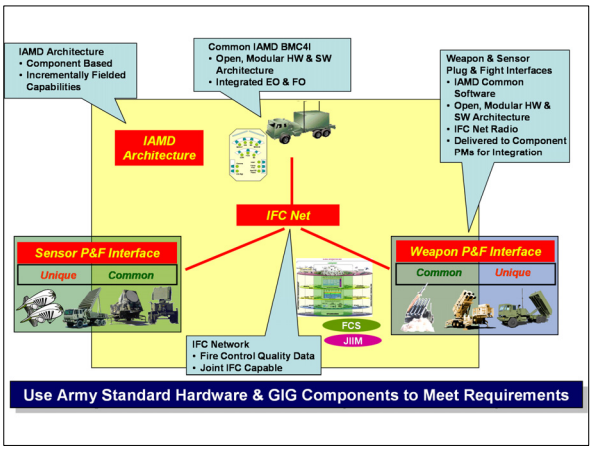
- **Critical Technologies –** The ER/MP UAS program has critical technologies related to TCDL, manned-unmanned operations, and automatic takeoff and landing. Technology Readiness Levels (TRLs) are expected to be TRL 6 by MS C.
- **Technical Reviews** – No systems engineering technical reviews were conducted in FY 2009. No technical reviews are scheduled for FY 2010.
- **Technical Issues and Risks –** The primary technical issue is the verification of complete system performance prior to MS C. The plan to resolve this issue is on track and includes prioritization of fielded system performance and use of early fielding data.
  - Risks being addressed include software development and integration, TCDL, and automatic takeoff and landing development. Plans to resolve the risks are on track and include improved technical management processes and onsite program management presence.
- **Reliability –** The ER/MP uses the operational availability KPP as its driver for reliability. With the exception of the GCS setup time, the system components are on track to meet their requirements by IOT&E. The program does not have a documented reliability, availability, and maintainability growth program but is considering the use of reliability growth tests to promote design growth prior to production decisions.
- **Systems Engineering Support of Life Cycle Management and Sustainability** – The ER/MP UAS program has not linked systems engineering to life cycle management and sustainability. The current approach to life cycle processes is to use flight test and deployment lessons learned to improve upon the baseline Contractor Logistics Support approach. The intent is to move to a Government maintenance capability.
- **Software –** The DST assessment accomplished in 2009 identified several risks and issues with requirements management, estimation, and verification. The contractor is in the initial stages of addressing these concerns, but adverse effects of software development shortfalls will most likely be encountered in production and operations. Total software lines of code are estimated at 4.5 million, with 3.5 million reused or off-the-shelf and 1 million new or modified.
- **Integration** – The program has developed Interface Control Documents and system architectures that define the functional and physical characteristics and are verified through testing in system integration laboratories at the contractor site.
- **Manufacturing** – The Army conducted a Production Readiness Review and assigned a Manufacturing Readiness Level of 8.

Summary of FY 2009 Systems Engineering Assessments

- **Program Support Reviews** – DSE completed a DST Software and Information Systems Assessment during FY 2009. The DST indicated the program was fulfilling near-term requirements, adding new capability, and concurrently executing the program of record, which may result in delays in meeting all required capabilities at Initial Operational Capability. A MS C systems engineering review was conducted in November 2009.
- **Systems Engineering Principles and Best Practices –** The program has attempted to balance systems engineering principles with the increased emphasis on unmanned warfare in current operations. This effort has resulted in an ad hoc application of SE on a "non-interference" basis. Deployments, such as the QRC, have accelerated development of emergent capability over life cycle performance.
- **Program Health Metrics** – The program originally identified three Technical Performance Measures (TPMs) but has moved away from tracking TPMs as an indicator of technical progress.
- **Conclusion –** The ER/MP UAS is scheduled to enter the Production and Deployment phase with a MS C decision in February 2010 with some risk to completing necessary software development on schedule to support IOT&E.

Integrated Air and Missile Defense (IAMD)

Prime Contractor: Northrop Grumman



Executive Summary

The Integrated Air and Missile Defense (IAMD) program provides a network-centric Battle Management, Command, Control, Communications, Computers, and Intelligence (BMC4I) capability to integrate Patriot, Sentinel, SLAMRAAM (Surface-Launched Advanced Medium Range Air-to-Air Missile), and JLENS (Joint Land Attack Cruise Missile Defense Elevated Netted Sensor). IAMD has completed Technology Development. A Milestone (MS) B Defense Acquisition Board held in December 2009 approved entry into Engineering and Manufacturing Development (EMD).

Mission Description

IAMD provides a network-centric system of systems capability (also referred to as "plug and fight" (P&F)) that integrates Army Air and Missile Defense (AMD) sensors, weapons, BMC4I, functioning interdependently, to provide total operational capabilities not achievable by the individual element systems. This future architecture will enable the distributed support of engagements with available sensor assets not limited to system-centric organic sensors.

System Description

IAMD Major End Items include an Integrated Battle Command System (IBCS) Engagement Operations Center that provides the common IAMD BMC4I capability, the Integrated Fire Control (IFC) Network capability to provide fire control connectivity and enabling distributed operations, and the IBCS Common P&F Kits that will network-enable multiple sensor and weapon components. Development of the component-unique part of the P&F Kits remains within the purview of the affected component's project/product office.

Summary of FY 2009 Systems Engineering Activities

- **Systems Engineering Plan (SEP)** – The EMD SEP is being developed. Due to competition issues, the final SEP will be completed 90 days after MS B.
- **Requirements** – The IAMD Capability Development Document was approved December 11, 2009. The program has five Key Performance Parameters (KPPs), covering net-centric operations, common command and control, and integrated defense effectiveness, as well as force protection/survivability and materiel availability. All of the KPPs are on track for being demonstrated by FY 2016.
- **Technical Reviews** – Three technical reviews were conducted in FY 2009. One technical review is scheduled for FY 2010.
  - IAMD held two contractor IBCS Preliminary Design Reviews (PDRs) in May 2009, and one Government IAMD System PDR in August 2009. The scope of the PDRs was tailored to take into account the competitive environment, and the Program Office will hold an Incremental Design Review (delta PDR) in FY 2010 to establish the allocated baseline.
  - A Post-PDR Assessment is in progress, pending completion of the delta PDR.

- **Technical Issues and Risks** – Issues the program is working include Track Management, Integration of P&F Kits with PATRIOT, and Integrated Fire Control Network. Plans to resolve the issues are on track and include digital simulation, hardware in the loop technology demonstrations, and Interface Control Document development.
- **Reliability** – The IAMD program has a reliability requirement of 90 percent and is currently on track to achieve this requirement by FY 2016. The program has a reliability growth program, developed in coordination with Army Test and Evaluation Command. The IAMD Reliability, Availability, and Maintainability (RAM) Working Group will be the forum that evaluates the progress of the prime contractor's design effort and addresses all RAM program issues.
- **Systems Engineering Support of Life Cycle Management and Sustainability** – The IAMD Program Manager uses an Integrated Product Team approach to coordinate supportability strategy, data, and issues, and Systems Engineering is a member of the Supportability Working Integrated Product Team. A draft Life Cycle Sustainment Plan/Supportability Strategy addresses all current statutory and regulatory requirements.
- **Software** – The IAMD program will be a software-intensive development. The contractor's software development plan will be better understood after contract award, and will be tracked through the delta PDR.
- **Integration** – The core of Army IAMD is integrating multiple programs of record into an Integrated Fire Control network. The IAMD SEP identifies detailed processes and facilities focused on integration.
  - Both the Government and the contractor will have software/hardware in the loop integration facilities, whose use is further detailed in the Test and Evaluation Master Plan.
  - The SEP establishes an IAMD Interface Control Working Group, which will coordinate the efforts of IAMD, Lower Tier Program Office, Cruise Missile Defense Systems, and other participants.
  - Interfaces with programs of record will be controlled by formal Interface Control Documents.
- **Manufacturing** – As IAMD is primarily a software/networking program, manufacturing is not expected to be a significant issue. A Production Readiness Review will be required as an exit criterion for this phase.
- **Critical Technologies** – The IAMD program has critical technologies related to weapons planning and network functionality. An Army Technology Readiness Assessment assessed all at Technology Readiness Level 6. DDR&E concurred on December 9, 2009.

Summary of FY 2009 Systems Engineering Assessments

- **Program Support Reviews (PSRs)** – An initial PSR was conducted May–August 2009 to support MS B and entry into the EMD phase to assess the technical planning and management of the program prior to MS B. The scope of the PSR was affected by competition sensitivity, which limited both the review team membership and any interaction between the review team and either of the contractor teams. The PSR included the finding that the PDR was incomplete, due to competition issues. This finding supported the 2366B certification waiver. Further PSR findings are competition sensitive.
- **Program Health Metrics** – The IAMD Program Office will use Technical Performance Measures as part of their systems engineering process.
- **Conclusion** – Risks were assessed as part of the MS B process and will be worked now that the EMD contract has been awarded, which will carry the program to MS C.

Stryker Family of Vehicles

Prime Contractor: General Dynamics Land Systems (GDLS)

Executive Summary
The Stryker Family of Vehicles (FoV) comprises 10 eight-wheel-drive combat vehicle configurations built on a common chassis. Eight of the 10 configurations are in Full-Rate Production (FRP), while the Mobile Gun System (MGS) and Nuclear, Biological and Chemical Reconnaissance Vehicles (NBCRV) are in Low-Rate Initial Production (LRIP). More than 2,600 vehicles have been delivered to the Army, with a fleet of 3,795 vehicles planned. The pending Stryker Modernization (S-MOD) program will incorporate modifications, improvements, and new technology into the Stryker FoV, including MGS long-term deficiency corrections.

Mission Description
Currently, all 10 Stryker vehicle configurations are deployed in seven Stryker Brigade Combat Teams (SBCTs). Three SBCTs are involved in combat operations in Iraq and Afghanistan. The SBCT optimizes organizational effectiveness and balances the traditional domains of lethality, mobility, and survivability, all with a reduced in-theater footprint. The SBCT has utility in all operational environments against all projected future threats; however, it is designed and optimized for contingency employment in urban or complex terrain while confronting low- and mid-range threats that may display both conventional and asymmetric warfare capabilities. The SBCT is a self-contained organization that enhances strategic responsiveness by providing full spectrum versatility demanded by the National Military Strategy.

System Description
The current Stryker FoV consists of two variants, the Infantry Carrier Vehicle (ICV) and MGS. The ICV variant includes nine configurations on a common vehicle platform: (1) ICV, (2) Anti-Tank Guided Missile Vehicle (ATGM), (3) Reconnaissance Vehicle (RV), (4) Fire Support Vehicle (FSV), (5) Engineer Squad Vehicle (ESV), (6) Mortar Carrier Vehicle (MC), (7) Commander's Vehicle (CV), (8) Medical Evacuation Vehicle (MEV), and (9) Nuclear, Biological and Chemical Reconnaissance Vehicle (NBCRV).

Each of the 10 Stryker vehicle configurations is developed to meet individual threshold requirements specified in the Operational Requirements Document. Desired growth to meet objective requirements will be achieved through the pending S-MOD program. S-MOD is a pre-MDAP to provide incremental technology upgrades to the Stryker FoV that will improve situational awareness and network compatibility, enhance mobility, improve protection against chemical and kinetic energy threats, provide enhanced blast protection, improve infantry dismount capacity, improve weapon lethality, provide greater reliability and maintainability, and improve casualty evacuation and treatment.

Developmental Test and Evaluation Activity

- The MGS and NBCRV are in LRIP and fielding and expect to have a FRP decision in FY 2011.
- DT&E activity was focused on the phased reliability and survivability testing to correct performance, reliability, and survivability limitations for the MGS and NBCRV.
- The MGS and NBCRV test schedule is a challenge due to vehicle availability associated with change order retrofit, production line cut in, and trained operator schedules.

Developmental Test and Evaluation Assessment

- DT&E planning efforts continued to assist the Program Management Office in plans and schedule to conduct T&E necessary to correct or mitigate deficiencies identified regarding MGS and or NBCRV suitability and reliability; and early planning for the follow-on S-MOD program.
- The program is involved in MGS, NBCRV, and S-MOD T&E Working Integrated Product Teams to document MGS and NBCRV T&E results and required S-MOD T&E documentation. There are various documents for each of the three efforts. MGS and NBCRV are working on mitigating reliability and survivability shortfalls found in previous operational tests by revising the test plans. S-MOD is still working on its Test and Evaluation Strategy (TES), and it is expected 2nd quarter FY 2010.
- MGS and NBCRV have a realistic T&E strategy and approach to satisfy vehicle and system shortfalls to correct or mitigate performance reliability and survivability deficiencies.
- There is medium risk to support a successful operational test and eventually FRP decisions in FY 2011 relating to receiving and installing the planned modification kits, status of Stryker Reactive Armor Tiles (SRAT II) T&E and acceptance, and cold weather T&E. DT&E S-MOD activities are pending receipt of the Stryker Acquisition Strategy, revised S-MOD TES, and Technology Development Strategy.

Summary of FY 2009 Systems Engineering Activities

- **Systems Engineering Plan (SEP)** – The Stryker SEP was approved in March 2008. An update is planned to support the S-MOD MS B decision in late 2011. The SEP is comprehensive and includes systems engineering activities for the entire program, including MGS and NBCRV. There have been no approved waivers or deviations from the SEP.
- **Requirements** – Change 1 to the Stryker Operational Requirements Document was approved in November 2007. The program has eight Key Performance Parameters: Network Ready; Transportability; Infantry and Engineer Squad Configuration; MGS Bunker Busting; Force Protection; Survivability; Materiel Availability; and Energy Efficiency. Analysis on the C-130 aircraft transportability element shows that the MGS and the up-armored S-MOD vehicles will exceed the maximum C-130 payload. The user and materiel developers collaborated to rescind this requirement. The Stryker vehicles are still transportable on C-5 and C-17 aircraft.
- **Critical Technologies –** The S-MOD program is using extensive modeling and simulation, Army laboratories, and System Integration Labs (SILs), demonstration models and MGS, ICV, and MC vehicles to demonstrate S-MOD capabilities. The goal is to demonstrate a Technology Readiness Level 6 or greater by MS B.
- **Technical Reviews** – The S-MOD System Requirements Review was held in FY 2009. A System Functional Review was held to assess the S-MOD capabilities that could be pulled ahead for insertion into current vehicles. A follow-on System Functional Review 2 is planned in FY 2010 to further define, refine, and decompose requirements and trades prior to establishing the system functional baseline. A trade study decision tree is being used to continuously evaluate the

Size, Weight, Power, and Cost trades in system functionality to support an FY 2011 Preliminary Design Review.

- **Technical Issues and Risks –** The Program Manager (PM) developed corrective actions via materiel solutions or techniques, tactics and procedures to correct the 23 MGS deficiencies required prior to a FRP decision. The deficiencies (requirements and observations) were identified by the Army T&E Command, DOT&E, and and senior Army leadership based on Training and Doctrine Command prioritization. Corrective actions are implemented via engineering change orders. Validation testing of engineering change orders should be completed by 4th quarter FY 2010 or early FY 2011.
- **Reliability –** A December 2007 Acquisition Decision Memorandum extended LRIP for the NBCRV in order to improve reliability of the vehicle and to demonstrate improvements via a reliability growth test plan. The reliability growth test was planned for three phases, with an off-ramp at the end of the second phase if the criterion of 1,333 Mean Miles Between System Abort with 70 percent confidence is met. The second phase is complete and being scored. Sufficient reliability is an entrance criterion to Initial Operational Test and Evaluation Phase II. Reliability improvements to the MGS mission equipment package and vehicle continue. Testing of the mission equipment package and vehicle reliability, availability, maintainability will continue through FY 2010.
- **Integration** – To support integration activities and testing, PM Stryker and GDLS have established a Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance SIL and use other Government laboratories and SILs to support system integration. After SIL and software integration efforts and testing are completed, GDLS holds an Integration Readiness Checkpoint review to ensure integration is complete. A S-MOD Interface Design Review is scheduled in FY 2011.

Summary of FY 2009 Systems Engineering Assessments

- **Program Support Reviews (PSRs)** – A PSR was conducted in November 2007. The next PSR is scheduled for 2011 to support the S-MOD MS B decision. Two S-MOD Technical Information Meetings were held to assess the status of the program's systems engineering processes and tools. The program is implementing systems engineering discipline and rigor.
- **Systems Engineering Principles and Best Practices –** The Stryker program received a Top 5 DoD Program Award at the 2009 National Defense Industrial Association Systems Engineering Conference.
- **Program Health Metrics** – Initial Technical Performance Measures for the S-MOD effort have been developed. The measures are being refined, and measures on transportability, power margin, survivability, and fuel efficiency may be added to ensure all requirements are met. Technical Performance Measures not being met are considered a risk and are being included in the program Risk Management System.
- **Conclusion** – Eight of the 10 configurations are in FRP; the Mobile Gun System (MGS) and Nuclear, Biological and Chemical Reconnaissance Vehicles (NBCRV) are in LRIP. FRP decisions in 2011 for MGS and NBCRV are medium risk and dependent upon the successful correction and validation of the identified MGS deficiencies and a successful operational test for NBCRV.

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6.2 Assessments of Navy MDAPs

15 programs:

- Broad Area Maritime Surveillance (BAMS) Unmanned Aircraft System
- CH-53K Heavy Lift Replacement Helicopter
- Cooperative Engagement Capability (CEC)
- CVN 78 Ford Class Nuclear Aircraft Carrier
- DDG 1000 Zumwalt Class Destroyer
- E-2D Advanced Hawkeye (AHE)
- EA-18G "Growler"
- Expeditionary Fighting Vehicle (EFV)
- H-1 Upgrades (4BW/4BN)
  - U.S. Marine Corps Upgrade to AH-1W Attack and UH-1N Utility Helicopters
- Joint High Speed Vessel (JHSV)
- Littoral Combat Ship (LCS)
- P-8A Poseidon Multi-mission Maritime Aircraft
- Ship-to-Shore Connector (SSC)
- Standard Missile-6 (SM-6)
- SSN 774 Virginia Class Submarine

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Broad Area Maritime Surveillance (BAMS) Unmanned Aircraft System

Prime Contractor: Northrop Grumman Aerospace Systems

Executive Summary

BAMS is an unmanned aircraft system (UAS) that provides multiple sensor capability to the maritime theater of operations. The program is in the Engineering and Manufacturing Development (EMD) phase with a Preliminary Design Review (PDR) in January 2010. Milestone (MS) B was held April 2008, and MS C is planned for March 2013. The program is executing to cost and schedule.

Mission Description

The BAMS UAS provides persistent maritime intelligence, surveillance, and reconnaissance as a continuous source of information to help maintain the Common Operational and Tactical Picture in the maritime battle space. BAMS UAS will operate both independently and with other assets to provide a more effective and supportable persistent maritime surveillance capability than currently exists. Data collected by the BAMS UAS will be made available on the Global Information Grid (GIG) and will support a variety of intelligence activities and nodes.

System Description

The BAMS UAS will be a system of systems consisting of land-based unmanned aircraft (UA), interactive mission payloads, line-of-sight (LOS) and beyond LOS communications systems, a mission control system, and associated support equipment. The BAMS UAS will incorporate a networked communications architecture in alignment with the DoD GIG. The Distributed Common Ground/Surface System – Navy and Global Command and Control System – Maritime will be used to transport BAMS UA data and make it available to GIG subscribers. There are three system increments envisioned, with Increment 1 in development. Increment 2 will provide a more robust airborne communications relay package, and Increment 3 will provide robust signals intelligence capability.

Summary of FY 2009 Systems Engineering Activities

- **Systems Engineering Plan (SEP)** – The BAMS UAS SEP was approved in January 2009 following MS B. An update is planned in 2013 to support MS C.
  - The program has been executing to the SEP without waivers or deviations.
- **Requirements** – The Capability Development Document was approved May 2007.
  - The program has seven Key Performance Parameters (KPPs). KPPs include range and time on station, targeting, interoperability, and availability. All are on track to be demonstrated by Initial Operational Test and Evaluation.
  - Indications are the preliminary design will meet the KPPs.
- **Critical Technologies –** The Navy conducted the latest Technology Readiness Assessment (TRA) in support of MS B in April 2008. The TRA determined the program does not have any critical technology elements.

- **Technical Reviews** – Two systems engineering technical reviews were conducted in FY 2009. One technical review is scheduled for FY 2010.
  - **System Requirements Review –** The System Requirements Review was successfully conducted in January 2009 to establish the requirements baseline. As a result of the review, the program requirements, funding, and schedule are balanced.
  - **System Functional Review –** The System Functional Review was conducted in July 2009 to establish the functional baseline for the program entering the preliminary design phase.
- **Technical Issues and Risks –** Current issues include thermal management at low altitude, power generation, and weight. Trade studies and additional analysis are being conducted to address the issues. Risks being addressed include the due regard radar, software development assumptions, and critical software certification. Risk mitigation includes analysis and increased early testing.
- **Reliability –** BAMS UAS has an extensive Reliability, Maintainability/Prognostics and Health Management program to influence design for maximum System Operational Effectiveness through the systems engineering trade study process.
- **Systems Engineering Support of Life Cycle Management and Sustainability** – BAMS UAS has established an Integrated Logistics Support Integrated Product Team to address analysis and trade studies on life cycle management and sustainment alternatives to balance warfighter performance needs, expectations, and resources with life cycle management activities.
- **Software –** The software development effort takes advantage of the contractors' Level III certification to the Capability Maturity Model Integration. Prototyping of key functions began in May 2009, and integrated testing is scheduled to begin in FY 2010.
  - Initial total software lines of code are estimated at 5.8 million, with 4.7 million reused or off-the-shelf and 1.1 million new or modified.
- **Integration** – BAMS UAS has fully decomposed requirements to the system specifications, including interface control documents and system architectures.
- **Manufacturing** – The BAMS UAS aircraft is based on the Air Force's Global Hawk aircraft, and the Manufacturing Readiness Level is related to the maturity in that program. Any changes to the basic aircraft should not introduce new manufacturing processes or technologies.

Summary of FY 2009 Systems Engineering Assessments

- **Program Support Reviews (PSRs)** – No PSRs were held during FY 2009. The next scheduled PSR will be in support of MS C in FY 2013. Key systems engineering activities included the System Requirements Review, the System Functional Review, and multiple subsystem PDRs.
- **Systems Engineering Principles and Best Practices** – BAMS UAS places a high priority on executing to a robust systems engineering process. BAMS UAS uses DoD, Navy, and industry guidelines in its systems engineering activities. The program received a Top 5 DoD Program Award at the 2009 National Defense Industrial Association Systems Engineering Conference.
- **Program Health Metrics** – As of the System Functional Review in July 2009, the BAMS UAS program is meeting or exceeding 18 of 22 Technical Performance Measures (TPMs). The program is addressing the four non-compliant TPMs through a combination of trade studies and additional engineering.
- **Conclusion –** The BAMS UAS is scheduled for a MS C decision in FY 2013 and is mitigating the risk of critical software certification during EMD.

CH-53K Heavy Lift Replacement Helicopter

Prime Contractor: Sikorsky Aircraft Corporation

Executive Summary
The CH-53K Heavy Lift Replacement helicopter will replace the CH-53E helicopter to generate a robust U.S. Marine Corps heavy-lift capability. The program achieved Milestone (MS) B in December 2005 and is in the Engineering and Manufacturing Development phase. A Preliminary Design Review was conducted in September 2008, and the program is conducting subsystem Critical Design Reviews (CDRs) in planning for a system CDR in September 2010. The program is restructuring because of early schedule delays but is now on track.

Mission Description
The CH-53K will meet the Marine Air Ground Task Force vertical heavy-lift warfighting requirements beyond 2025. The CH-53K will be required to operate from prepared/unprepared landing areas, day or night, in adverse weather, on land and in maritime environments. The aircraft will internally transport passengers, litters, cargo, and vehicles, and includes provisions for weaponry. The aircraft will support the external lift of cargo on three independent external cargo hooks and is capable of externally lifting three times the weight of the CH-53E.

System Description
The aircraft is a build-new, evolutionary update of the CH-53 design. It is a dual-piloted, multi-engine helicopter, incorporating the latest vertical lift, survivability, reliability, maintainability, and avionics technologies. The CH-53K will be equipped with a seven-blade main rotor system and a four-blade canted tail rotor designed by Sikorsky Aircraft Corporation. Main engine power is supplied by three GE38-1B turboshaft engines. The airframe structure is designed for a service life of 10,000 flight hours.

Summary of FY 2009 Systems Engineering Activities
The program conducted two Integrating Design Reviews (IDRs) in 2009 to establish design closure for the CDR. The IDR is a process adopted by the program to identify and resolve any system-level issues and minimize risk prior to major technical reviews.

- **Systems Engineering Plan (SEP) –** A SEP was submitted to OSD prior to MS B approval but was returned for corrections due to policy changes. The SEP is currently being updated as part of a Program Support Review (PSR). There are no planned waivers or deviations.
- **Requirements** – The program has seven Key Performance Parameters (KPPs); all should be met within the restructured schedule. Key requirements include range and lift capability and three supportability related KPPs to drive focused improvements over the legacy aircraft in order to reduce operations and support costs. Positive steps have been taken by the program to prevent requirements growth. It has established a Capabilities Integrated Product Team that serves as a

configuration steering board to identify and resolve aircraft mission-related issues and program requirements.

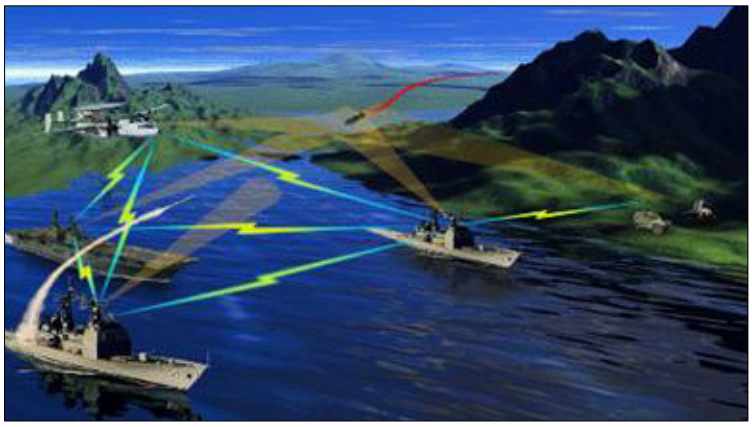
- **Critical Technologies –** The program has two critical technology elements remaining. The main gearbox and main rotor head were Technology Readiness Level (TRL) 4 at MS B and are tracking to TRL 7 for a technology maturation assessment in January 2010. Although not a critical technology element, the CH-53K is designed as a Fly-by-Wire (FBW) aircraft and carries inherent risk. FBW benefits include: stable handling qualities, increased survivability, improved maintainability and diagnostics, and weight savings of approximately 700 lbs.
- **Technical Reviews** – Early technical reviews were conducted behind schedule, but the reviews were event driven, comprehensive, and detailed, leading to a mature design. To validate system maturity, two IDRs were conducted in 2009. The IDRs have had a positive impact on technical review success and closure.
- **Technical Issues and Risks –** Aircraft weight is a risk to meeting performance requirements. The program has a comprehensive plan for weight growth, including a Weight Improvement Process.
- **Reliability –** The program is meeting Reliability and Availability parameters. Maintainability parameters are currently deficient in both Mean Time To Repair and Mean Corrective Maintenance Time Between Operational Mission Failures but are tracking to meet threshold parameters by MS C. An extensive Design for Maintainability program was introduced to ensure user and stakeholder input prior to final design.
- **Software –** The program's Software Development Plan is being followed through program, prime contractor, and subcontractor processes, metrics, and data. The most recent Software Readiness Review was comprehensive and reflected the integration of subcontractor data. Software lines of code estimates have increased as the design matures.
- **Manufacturing** – There is a strong focus on producibility; lean manufacturing; modularization; smart design guidelines for machined parts and tolerances; ergonomics; safety; foreign object debris prevention; assembly and installation mistake proofing; process capability, and up-to-date 3D solid models and graphic work instructions.

Summary of FY 2009 Systems Engineering Assessments

- **Program Support Reviews (PSRs)** – A PSR was conducted in September 2009 in anticipation of a breach in Acquisition Program Baseline schedule parameters. The major risk to the program is the availability of funding to execute to its restructured schedule.
- **Systems Engineering Principles and Best Practices –** The PSR identified three best practices:
  - The program's institution of interim IDRs to reduce risk prior to technical reviews is a best practice recommended for Service-wide adoption.
  - Establishment of the Capabilities Integrated Product Team that serves as a configuration steering board that identifies, clarifies, and resolves aircraft mission-related issues and program requirements to help prevent requirements creep.
  - Sikorsky's Design for Manufacturing and Assembly is an industry-wide best practice.
- **Program Health Metrics** – The program has developed a set of health metrics that will track Technical Performance Measures from the CDR throughout its life cycle.
- **Conclusion –** The program is staffed at a level to properly execute to a restructured schedule, technical processes are mature, the Government and contractor have jointly developed a comprehensive, realistic Integrated Master Schedule, and the program is on track for a successful system-level CDR.

Cooperative Engagement Capability (CEC)

Prime Contractor: Raytheon Joint Sensor Netting



Executive Summary
Cooperative Engagement Capability (CEC) is a sensor network with Integrated Fire Control capability that significantly improves battle force air and missile defense capabilities by coordinating measurement data from battle force air search sensors on CEC-equipped units into a single, real-time, composite track picture. Milestone III was held in 2002. The program is on schedule and within budget to support the E-2D program.

Mission Description
CEC distributes sensor data from each ship and aircraft, or cooperating unit (CU), to all other CUs in the battle force through a real-time, line of sight, high data rate sensor and engagement data distribution network. CEC significantly improves battle force defense in depth, including both local and area defense capabilities against current and future air and missile threats.

System Description
CEC consists of the Data Distribution System (DDS) and the Cooperative Engagement Processor (CEP), which is integrated with a host Combat System. The DDS encodes and distributes ownship sensor and engagement data and is a high-capacity, jam-resistant, directional system providing precision gridlocking and high throughput of data. The CEP is a high-capacity distributed processor that is able to convert sensor data from each CU to output data that can be utilized for real-time target tracking by all CUs. The data are passed to the ship's combat system; the ship can then cue its onboard sensors for fire control and target prosecution, or use the fire control quality data from other units through CEC to engage targets without using ownship sensors.

Summary of FY 2009 Systems Engineering Activities

- **Systems Engineering Plan (SEP)** – The program has a SEP and a Systems Engineering Integrated Product Team Charter. There are no approved waivers or deviations from the SEP. The objectives of the SEP are being met.
- **Requirements** – The Operational Requirements Document was validated in 2002.
  - The CEC program has six Key Performance Parameters (KPPs) in the areas of tracking performance, availability, performance in jamming, and interoperability. All six have been demonstrated successfully in shipboard variants, five of six for the airborne configuration. The final KPP for the airborne configuration, Interoperability, will be demonstrated in FY 2012 during the E-2D IOT&E.
- **Technical Reviews** – Two systems engineering technical reviews were conducted in FY 2009. No technical reviews are scheduled in FY 2010.

  - Critical Design Review (CDR): A hardware CDR was successfully conducted in February 2009 to establish the hardware product baseline configuration of the redesigned Signal Data Processor (SDP-S). The review was assessed as meeting all exit criteria. The CEC requirements are reasonable, funding is adequate, and the schedule is appropriately phased.
  - A Crypto Modification Software Preliminary Design Review/CDR was successfully conducted in April 2009 to establish the software product baseline configuration of the SDP-S. The review was assessed as meeting all exit criteria.
- **Technical Issues and Risks**
  - Risks being addressed include CEC Crypto Modification and integration into the SDP and resolution of AN/USG-3 suitability issues from FOT&E-2 and FOT&E-3.
- **Reliability –** The program has developed and implemented a reliability plan to support Low-Rate Initial Production (LRIP) Exit Criteria. The plan includes Highly Accelerated Life Test to identify design weaknesses. The Reliability Qualification testing will demonstrate a simulated E-2D operational environment. Reliability testing of the Engineering Development Model systems satisfies one of the four Exit Criteria from CEC Defense Acquisition Board review in FY 2009.
- **Systems Engineering Support of Life Cycle Management and Sustainability –** Production and obsolescence management are evaluated at semi-annual program reviews, addressing key materiel providers to determine product availability. The program has implemented a Pre-Planned Product Improvement (P^3I) that focused on reducing the size, cost, and weight by consolidating the core components of the SDP into a single unit. The SDP will become a common component for all CEC versions, improving sustainment.
- **Software –** Software development is on track.
- **Integration –** The P^3I Cooperative Engagement Transmission Processing Set brought CEC into compliance with the Navy's Open Architecture Computing Environment (OACE) Category 3 standards. The P3I SDP with the Sierra II chip (SDP-S) is designed to meet the form, fit, size, weight, and power requirements for a "one box fits all" sea, air, and ground mobile platform integration and is compliant with OACE standards. The CEC program continues to maximize use of its systems labs and land-based test network sites at Wallops Island, Virginia, and Naval Surface Warfare Center, Dahlgren, Virginia, by using real Combat/Weapon System interfaces and the CEP with simulated local sensors and simulated DDS provided through a CEP Wrap-Around Simulation Plant to test CEP software functionality.
- **Manufacturing –** CEC is in Full-Rate Production on shipboard variants and LRIP on the E-2D variants.

Summary of FY 2009 System Engineering Assessments

- **Program Support Reviews (PSRs)** – A PSR has not been conducted. DSE maintains continuous engagement and participates in and assesses technical reviews.
- **Systems Engineering Principles and Best Practices –** The CEC program has implemented DoD systems engineering principles in technical program planning and execution.
- **Critical Technologies** – The CEC program has nine critical technology elements only one of which is less than Technology Readiness Level 9.
- **Program Health Metrics** – The CEC program has an established set of Technical Performance Measures.
- **Conclusion –** The next major CEC milestone is Full-Rate Production for the Airborne USG-3B system in FY 2013. The only risk, the SDP-S Crypto certification, is evaluated as low.

CVN 78 Ford Class Nuclear Aircraft Carrier

Prime Contractor: Northrop Grumman Shipbuilding Newport News

Executive Summary

The CVN 78 program is in the Engineering and Manufacturing Development phase. Milestone (MS) B was held on April 23, 2004, and MS C is planned for 2018. The most significant risk to the CVN 78 program lies within the Electromagnetic Aircraft Launch System (EMALS) program involving schedule and technical risk. Various other risks with mitigation plans are being tracked for Advanced Arresting Gear, Combat Systems/Air Traffic Control integration with Dual Band Radar, and other concurrently developing systems. All programs and integration efforts remain on schedule to support CVN 78 construction with subsystem deliveries meeting Required In Yard Dates. On-time delivery of CVN 78 is essential to meet the congressionally mandated CVN force levels of 11 ships.

Mission Description

The future aircraft carrier class of ships is known as the CVN 78 multipurpose aircraft carrier. The CVN 78 Class, starting with hull number CVN 78, will be the numerical replacement for USS ENTERPRISE (CVN 65), and USS NIMITZ (CVN 68) class aircraft carriers as they reach the end of their service lives. Aircraft carriers and their battle groups are major pillars in the projection of Naval Sea Power. The primary weapon system for the CVN 78 Class is the embarked Carrier Air Wing (CVW); the ship will be the sea base for U.S. Naval Tactical Air Power.

System Description

The CVN 78 Class will be a large-deck, nuclear-powered aircraft carrier that maintains the core capabilities of U.S. Naval Aviation, improves affordability of the carrier force, and incorporates flexibility in design that will accommodate future systems and technologies after construction and throughout its service life. The CVN 78 Class of ships represents a significant advancement in technology and warfighting capability over the CVN 68 Class.

Developmental Test and Evaluation Activity

- OSD approved the CVN 78 Test and Evaluation Master Plan (TEMP) 1610 Revision B July 1, 2007. Revision C is planned for FY 2012 approval, and TEMP Working Level meetings are providing the updated information. The purpose of the update is to support a Defense Acquisition Board Program Review scheduled for late FY 2011.
- PMS 378, along with Navy Test and Evaluation (T&E) leadership, have committed to using the new Defense Acquisition Guidebook four-part TEMP format in conjunction with the ongoing TEMP update to incorporate the concept of Integrated Testing.
- Test Schedule: Component and systems integration T&E DT-B1 phase was conducted April 2007–September 2009; the report is in the approval cycle.

Developmental Test and Evaluation Assessment

- Adequate T&E for CVN 78 depends upon several types of T&E that are not directly under the control of PMS 378. While this strategy is cost and schedule efficient, it does increase the risk of adverse impact due to changes in the other test programs. This strategy also demands significant oversight and management by PMS 378, and complicates oversight by OSD. Examples include:
  - The T&E strategy for CVN 78 leverages Participating Acquisition Resource Manager (PARM) testing of individual systems to be installed in CVN 78.
  - Combat Systems T&E leverages test events conducted on the Self-Defense Test Ship under the Capstone Air Warfare Ship Self-Defense Enterprise TEMP (TEMP 1714).
  - Probability of Raid Annihilation (Pra) assessment will be conducted using the Navy Pra Testbed, a federation of high-fidelity models and simulations (M&S), verified and validated using data from CVN 78 and Self-Defense Test Ship flight tests.
  - PEO Carriers plans to use land-based distributive test events (System Engineering Events) sponsored by NAVSEA05H3 for the first time to mitigate ship integration and interoperability risks at the time of delivery.
- DT&E in FY 2009 focused on identifying potential design, construction, and integration problems. The DT&E started with M&S and is gradually shifting to testing actual systems. PMS 378 used test data from the systems to verify and validate the models used during M&S.
- Separate, parallel test events were conducted on the Warfare Systems, EMALS, Service Life Weight and Stability Allowances (a Key Performance Parameter (KPP)), Plasma Arc Waste Destruction System, Advanced Arresting Gear, Advanced Weapons Elevators, Underway Replenishment, Sortie Generation Rate (a KPP), Net-Ready KPP, and an Information Assurance Accreditation.
- The EMALS test program included robust High Cycle Testing and Highly Accelerated Life Testing to identify failure modes and mitigate them in the design to improve system reliability. As an example, testing revealed moisture intrusion in the linear induction motor.
- PMA 251 as the EMALS PARM will use the test data to improve the production EMALS design to eliminate the moisture intrusion. Accordingly, projected risk to the construction schedule is low.

Summary of FY 2009 Systems Engineering Activities

- **Systems Engineering Plan (SEP)** – The CVN 78 SEP was approved on April 10, 2007, to support a Defense Acquisition Board Program Review in 2008. An update is planned in 2018 to support MS C in 2018. There are no approved waivers or deviations from the SEP. The objectives of the SEP are being met.
- **Requirements** – The Operational Requirements Document (ORD), Change 2, was approved on June 22, 2007. The ship baseline for the CVN 78 Class is designed to support the ORD KPPs.
- **Critical Technologies** – The CVN 78 program has 13 critical technology elements related to KPPs. These include an increased Sortie Generation Rate, Net-Ready, Reduced Manning, Ship Service Electrical Generating Capacity, Force Protection, Service Life Weight and Stability Allowances. All Technology Readiness Levels (TRLs) are expected to be TRL 6 and higher by September 2010.
- **Technical Issues and Risks –** Technical risks associated with EMALS development continue to be closely managed and mitigated. Low-risk long-lead item procurements have been initiated to maintain the ship production schedule and material in yard dates. System development and demonstration of the single catapult EMALS at the Naval Air Warfare Center (NAWC), Lakehurst, New Jersey, continue to reduce risks associated with integration, production, and

reliability. Integrated performance of the entire four-catapult shipboard system is being simulated and evaluated at NAWC, to mitigate full system shipboard integration risks.

- **Integration** – 70+ Government-furnished equipment systems present shipboard integration challenges.

Summary of FY 2009 Systems Engineering Assessments

- **Defense Support Team (DST) Review** – On July 23, 2008, USD(AT&L) directed a DST to assess the development of the EMALS and its ability to support the CVN 78. The DST reported its findings and recommendations in February 2009 and recommended that the Navy continue with the development and integration of EMALS for CVN 78 and future carriers. The DST identified eight findings with actionable recommendations the Navy should implement to reduce technical and schedule risks. The Navy is implementing seven of the eight recommendations.
- **Program Health Metrics** – The CVN 78 program is on track for meeting its Technical Performance Measures.
- **Conclusion –** The CVN 78 program is in the Engineering and Manufacturing Development phase. MS B was held on April 23, 2004, and MS C is planned for 2018. The most significant schedule and technical risks to the CVN 78 program currently lie within the EMALS and Advanced Arresting Gear programs. The Navy has mitigation plans in place, and the programs remain on schedule to support CVN 78 construction with subsystem deliveries meeting Required In Yard Dates. On-time delivery of CVN 78 is essential to meet the congressionally mandated CVN force levels of 11 ships.

DDG 1000 Zumwalt Class Destroyer

Prime Contractor: General Dynamics Bath Iron Works, Northrop Grumman Shipbuilding (NGSB), Raytheon, BAE Systems

Executive Summary

DDG 1000 will be an optimally crewed, multi-mission surface combatant designed to fulfill volume firepower and precision strike requirements. The program is in the Engineering and Manufacturing Development phase. Milestone (MS) B was held in November 2005 and MS C is planned for 2015.

Mission Description

The DDG 1000 program's mission is to provide the foundation for the next generation of U.S. Navy surface combatants. This multi-mission surface combatant will serve as a versatile asset in the context of "Sea Power 21." Armed with an array of Sea Strike weapons, DDG 1000 will provide the Joint Force Commander with precision strike and volume fires. Designed with sustainable payload, multispectral stealth and optimal manning, DDG 1000 will take the fight to the enemy with unprecedented striking power, sustainability, survivability, and information dominance.

System Description

Armed with an array of weapons, DDG 1000 will provide offensive, distributed, and precision firepower at long ranges in support of forces ashore. To ensure effective operations in the littoral, DDG 1000 will incorporate signature reduction, active and passive self-defense systems, and enhanced survivability features.

Summary of FY 2009 Systems Engineering Activities

- **Construction Memorandums of Agreement** – In April 2009, the Secretary of Defense announced at a press conference regarding the FY 2010 President's Budget a decision to build all three DDG 1000 class destroyers at Bath Iron Works, Inc. (BIW). The rationale for the decision was to allow the Navy to more efficiently build all three ships at one shipyard and to ensure a smooth transition to restarting the DDG 51 program at NGSB in Mississippi. The plan, as announced by the Secretary, is dependent on the ability to award contracts for the remaining two DDG 1000 class ships to BIW. The Navy started DDG 1000 Ship Fabrication in February 2009. In April 2009, Assistant Secretary of the Navy (Research, Development and Acquisition), BIW, and NGSB signed Memorandums of Agreement (MOAs) addressing the allocation of ship construction workload for DDG 1000 and DDG 51 Class ships. The MOAs allocate construction responsibility for FY 2009 and prior DDG 1000 Class ships to BIW and will award selected DDG 51 Class ships between BIW and NGSB. BIW will have construction responsibility for all three DDG 1000 Class ships, including the design, integration, testing, and delivery. NGSB will retain responsibility for design, engineering, and fabrication of the composite superstructure and

composite hangar, and fabrication of aft Perimeter Vertical Launch System for all three DDG 1000 ships.

- **Systems Engineering Plan (SEP)** – The DD(X) SEP was initially approved in March 2005 to support MS B. An update was approved in May 2007. An update is planned in 2015 to support MS C in 2005.
  - There are no approved waivers or deviations from the SEP.
  - The objectives of the SEP are being met.
- **Requirements** – The Joint Requirements Oversight Council approved the Operational Requirements Document on January 23, 2006.
  - The DDG 1000 program has 12 Key Performance Parameters (KPPs), which are related to critical technologies in major areas such as warfare systems, optimal crew size, and radar cross section. All of the KPPs are on track for being demonstrated by Operational Evaluation in September 2014.
- **Critical Technologies** – The transformational technologies aboard DDG 1000 include an integrated power system (IPS) with an electric drive; an Advanced Gun System with the high rate of fire and precision to reach almost eight times farther, and command more than 110 times the area of the current 5-inch gun system; the new Dual Band Radar consisting of the Multi-Function Radar SPY-3 and Volume Search Radar; optimal manning through advanced system automation, stealth through reduced acoustic, magnetic, infrared, and radar cross-section signatures; and enhanced survivability through automated damage control and fire suppression systems. Their Technology Readiness Levels (TRLs) range from 5 to 7. All are expected to be TRL 6+ by ship installation. The last Technology Readiness Assessment was conducted in February 2009.
- **Technical Issues and Risks**
  - Risks being addressed include software development and integration, certification of the DDG 1000 hull form, and IPS integration and test. Plans to resolve risks are on track and are expected to be fully mitigated by 2012.
- **Software**
  - Software Releases (SR) 1-4 have been executed on cost and schedule. SR 5 and 6 are on schedule to support ship activation and delivery. Software development and integration risk described previously due to size and complexity of effort will be mitigated by close monitoring of monthly metrics by the Program Manager and quarterly metrics submission to OSD. This will be ongoing through SR 6 scheduled for August 2012.
- **Integration**
  - IPS Integration and Test due to complexity of effort and use of new or adapted technology will be mitigated by purchase of long-lead material, delivery of Engineering Control System Software, completion of land-based test site installation, and completion of full power run testing.

Summary of FY 2009 Systems Engineering Assessments

- **Program Support Reviews (PSRs)** – An initial PSR was completed in February 2005 to support MS B in November 2005. A PSR will be conducted to support MS C in 2015.
- **Program Health Metrics** – The DDG 1000 program is on track for meeting its Technical Performance Measures.
- **Conclusion** – The DDG 1000 program is on track and low risk for meeting its next milestone.

E-2D Advanced Hawkeye (AHE)

Prime Contractor: Northrop Grumman

Executive Summary
The E-2D Advanced Hawkeye (AHE) System Development and Demonstration phase began in FY 2003 and will be completed in FY 2012. The work effort required during this phase is 95 percent complete. The E-2D held its Milestone (MS) C decision in June 2009 and was approved to enter into Low-Rate Initial Production (LRIP) for Lots 1 and 2.

Mission Description
The E-2D AHE is an all-weather, twin-engine, carrier-based, airborne command, control, and surveillance aircraft designed to extend task force defense perimeters. The AHE mission is to provide advance threat warning of approaching enemy surface units and aircraft; to vector interceptors or strike aircraft to attack; and to provide real-time area surveillance, intercept, search and rescue, communications relay, and strike/air traffic control. Key AHE objectives include improved battle space target detection and situational awareness, especially in the littorals, and support of Theater Air Missile Defense operations, particularly execution of Naval Integrated Fire Control-Counter Air for the Carrier Strike Group Commander.

System Description
The E-2D AHE includes the AN/APY-9 RADAR system; electronically scanned Identification, Friend or Foe system; modernized tactical cockpit; new Intercommunication System; generator and cooling upgrades to support all capabilities; and investments to reduce total ownership cost. In addition, the E-2D will comply with the Chief of Naval Operations' system safety mandates and Communications, Navigation, Surveillance/Air Traffic Management requirements.

Developmental Test and Evaluation Activity
The E-2D AHE program MS C Test and Evaluation Master Plan was approved in April 2009. The program is currently in the third of four developmental test phases with Initial Operational Test and Evaluation (IOT&E) scheduled for FY 2012.

Developmental Test and Evaluation Assessment
- The current third phase of developmental testing focuses on verification of the weapon system specification. The scope of the third phase includes production functionality with the Cooperative Engagement Capability (CEC), a system developed separately from E-2D AHE. The third phase is planned to be completed by October 2010 to support the LRIP 3 and 4 production decision.
- Overall, system flight test data collection is ahead of schedule, but the Air Vehicle subsystem functionality testing is behind in data point collection due to an engine mount design issue. The program is in the process of resolving the issue and will update the air vehicle test plan to meet the data point collection shortfall.

- The Director, Operational Test and Evaluation acknowledged in the MS C TEMP approval letter that "three suitability critical operational issues (COIs) may not be resolved during Initial Operational Test and Evaluation (IOT&E)" and that "any COIs not resolved during IOT&E will be required as part of formal Follow-on Operational Test and Evaluation." The training and maintainability COIs will not be resolved during IOT&E because documentation will not be complete in time to support IOT&E. The logistics supportability COI will not be resolved during IOT&E due to integrated logistics support not fully established.
- As of December 2009, the flight test program is approximately 60 percent complete and is on track for meeting most of the Key Performance Parameter (KPP) objectives/thresholds. During the first Operational Assessment, radar performance issues were discovered including loss of overland radar detection of airborne targets. Fixes are under way and planned for subsequent test. Also of concern is meeting the radar system reliability Critical Technical Parameter objective, which has not been met primarily due to transmitter and processor subsystem Line Replaceable Modules and radar system restarts experienced on most flights. The program is working to resolve the transmitter and process subsystem problems and radar restart stability issues through failure corrective actions. In addition, the Reliability and Maintainability Review Board is in the process of analyzing the reliability data to determine the risk in meeting the radar reliability growth curve and reliability requirements for IOT&E.
- The E-2D program is dependent upon the CEC hardware and software scheduled for delivery late in the E-2D program. This presents a risk that the CEC will not be available to support effective developmental testing prior to IOT&E. The program is monitoring this risk as well as mitigating risks of meeting radar performance and reliability objectives.

Summary of FY 2009 Systems Engineering Activities

- The configuration is stable. The program is on track to meet schedule requirements.
- **Systems Engineering Plan (SEP)** – The E-2D SEP was approved on January 26, 2009, in support of the June 2009 MS C decision. It provided excellent documentation of the program's plan to execute the systems engineering activities during the Production and Deployment phase. There are no waivers or deviations from the SEP. The program should update and submit a revised SEP in advance of the Full-Rate Production (FRP) decision.
- **Requirements** – The Capability Development Document was signed in March 2009. The E-2D program provides a significant advancement in capability. The radar represents a two-generational advancement in capability. The requirements were well defined and understood before design was initiated. The program is making progress toward achieving designated KPPs addressing net-ready, force protection, survivability, sustainment, radar availability, and radar detection range requirements; however, the radar warrants careful management to ensure it meets its reliability requirements.
- **Technical Reviews –** This program completed a review process similar to the one for a critical Nunn-McCurdy breach in May 2009. AT&L directed the program director to review the cost growth in the program. OSD conducted a detailed root cause analysis and assessment. It found that the root causes of the E-2D AHE program unit cost growth were an underestimation of the cost of the radar at MS B; multiple production quantity profile changes since setting the program cost baseline at MS B; increased contractor overhead rates primarily due to pension liability costs; and added capabilities since the MS B Acquisition Program Baseline.
  - At the conclusion of the Nunn-McCurdy review, AT&L approved the E-2D AHE program's entry into Production and Deployment, specifically LRIP for Lots 1 and 2. In addition, the

Program Manager was authorized to contract for LRIP Lot 3 long-lead procurement items prior to authorization to award a fully funded contract for FY 2011 LRIP Lot 3.

- The E-2D program was issued a new, re-baselined Production Acquisition Program Baseline in July 2009 as a result of the Nunn-McCurdy certification process. The production delivery schedule was rebaselined and fully funded. Currently there are no known production funding issues. The program is closely managing funds to complete the System Development and Demonstration phase within the over target baseline profile. Any required redesign efforts may require additional development funds.

- **Technical Issues and Risks** – Issues being worked include System Development and Demonstration cost containment, open software discrepancy reports, and developmental flight test progress to verify system performance. Plans to resolve these issues include proactive management of program risks and opportunities, and software fixes into the baseline software so that they may be verified during flight test. Risks being addressed include insufficient radar reliability, software maturity, and test point completion rate to verify system performance. The Program Office actively manages software fixes and releases to the baseline program to support the flight test program.
- **Reliability** – E-2D weapon system reliability has been consistently above objective. The current radar reliability is assessed at less than 20 percent of requirement, leading to a high risk that the radar will not meet its Mean Time Between Failure (MTBF) requirement. Given current flight test and reliability growth plans, it could be reasonably expected that the actual radar MTBF achieved will be significantly lower than the requirement without continued investment in reliability growth. The program has implemented FRACAS (Failure, Reporting, Analysis, and Corrective Action System) and other reliability growth techniques, which must be continued. The consequences of not meeting the MTBF requirement would be higher Operations and Support costs, lower system Operational Availability, and lower Mission Reliability.
- **Software** – DSE reviewed the E-2D software development effort in April–May 2009. The E-2D program has completed development of 1.25 million equivalent source lines of code and is currently fixing defects found during developmental test. DSE assessed and confirmed that the program's plans are on track for resolving discrepancies and improving the maturity of their software. The majority of the software discrepancies are in the radar and the modernization tactical cockpit. The E-2D program relies on the CEC program and is waiting for delivery of the final hardware and software for that program, which will occur late in the flight test program, representing a software risk.

Summary of FY 2009 Systems Engineering Assessments

- **Critical Technologies –** The Navy performed a Technology Readiness Assessment (TRA) in support of the MS C decision and subsequent entry into LRIP in March 2009. The TRA identified five critical technology elements (CTEs); all five CTEs were rated at a Technology Readiness Level (TRL) 7 or higher. Normally, TRL 7 is considered an appropriate minimum maturity level at MS C.
- **Systems Engineering Principles and Best Practices –** DSE reviews the status of software discrepancy resolution, flight test progress, Earned Value Management System metrics, and system reliability on a quarterly basis. These areas are progressing to plan.
- **Conclusion –** During the Nunn-McCurdy review, the E-2D AHE program was assessed as medium technical risk. The next major milestone is a FRP decision scheduled for FY 2013.

EA-18G "Growler"

Prime Contractor: Boeing

Executive Summary

The EA-18G will replace the EA-6B as the primary tactical electronic warfare aircraft designed to provide day/night lethal and non-lethal electronic support in the suppression of enemy air defenses. The EA-18G completed developmental test in 2008 and Initial Operational Test and Evaluation (IOT&E) in 2009. It was rated effective and suitable by the Commander, Operational Test and Evaluation Force (COMOPTEVFOR), and effective but not suitable by the Director, Operational Test and Evaluation (DOT&E). Eight enhancing characteristics were identified, but seven major deficiencies were reported. The program identified five corrections and two partial corrections to these deficiencies. Testing has been conducted to verify the corrections. COMOPTEVFOR will release a report to provide the assessment results. USD(AT&L) approved the program for Full-Rate Production in November 2009.

Mission Description

The EA-18G program is replacing the Navy's current fleet of EA-6Bs, providing a capability to detect, identify, locate, and suppress hostile emitters. EA-18G will provide day/night lethal and non-lethal electronic support in the suppression of enemy air defenses beginning in 2010. Capabilities include suppression and degradation of enemy defense systems by airborne electronic jamming and/or employment of the High-Speed Anti-Radiation Missile (HARM) series of weapons and other hard kill weapons.

System Description

The EA-18G is the fourth variant of the F/A-18 family of aircraft and will provide enhanced connectivity to national, theater, and strike assets, and organic, accurate emitter targeting for employment of onboard suppression weapons such as the HARM and the AIM-120C. The EA-18G is based on an F/A-18F airframe with an integrated Airborne Electronic Attack (AEA) system, which consists of ALQ-99 Tactical Jamming System (TJS) pods, an AN/ALQ-218 Receiver, a Communication Countermeasures Set, and a Multi-Mission Advanced Tactical Terminal.

Total procurement quantity for the EA-18G is planned for 88 aircraft. The EA-6B's Improved Capability III AEA suite was adapted for incorporation on the EA-18G, and additional modifications to the EA-18G include a new communications countermeasures set, electronics interface unit, and enhancements designed to improve aircraft communications reception while onboard jamming is active.

Developmental Test and Evaluation Activity

- Developmental tests were completed in 2008, and the EA-18G completed IOT&E during 2009 with an effective and suitable from COMOPTEVFOR, and an effective but not suitable rating

from DOT&E. The program identified five corrections and two partial corrections to the seven existing deficiencies. Testing to verify correction of deficiencies was conducted, and COMOPTEVFOR's report is being processed. The Test and Evaluation Master Plan (TEMP) was updated based on the Full-Rate Production decision in November 2009.

Developmental Test and Evaluation Assessment

- Developmental test (DT) plans were approved and consistent with the TEMP. Follow-on test and evaluation (FOT&E) (both developmental and operational) were planned and conducted in close coordination among the EA-18G contractor, DT, and OT organizations.
- Operational testing was recently completed to verify corrections to deficiencies reported during IOT&E and previous deficiencies identified during DT&E. The next EA-18G software upgrade is scheduled for a 4th quarter 2010 release to the fleet. Software updates/upgrades will be tested and delivered on a 2-year cycle, concurrent with F/A-18E/F software. For planning and scheduling, EA-18G software testing is established, coordinated, and tested under the H6 System Configuration Set TEMP.
- The F/A-18E/F and EA-18G test programs are conducted under the Integrated Test concept and provided excellent EA-18G test results during the System Development and Demonstration phase of the program.
- ALQ-99 TJS pod integration complexities have affected EA-18G reliability. While ALQ-99 TJS pod reliability has been poor, particularly for non-warfighting units in the test community, integrating a legacy jamming pod onto a digital airframe has proven challenging. Periodic threat library updates will continue to improve performance, but persistent limitations to test continue:
  - Range limitations prevent testing at maximum signal density.
  - Not all threat systems or simulators are available for use in testing.
  - Federal Communications Commission frequency restrictions prevent testing through the entire operating range.
  - A lack of instrumented sea-based threat systems at sea prevents system testing in the open water and littoral environment.
  - The Services are engaged and working the range and threat limitation issues affecting test.

Summary of FY 2009 Systems Engineering Activities

- **Systems Engineering Plan (SEP)** – The EA-18G SEP was approved in May 2007 to support the Low-Rate Initial Production (LRIP) phase. There are no approved waivers or deviations from the SEP. The objectives of the SEP are being met.
- **Requirements** – The Capability Production Document was validated in April 2007.
  - The EA-18G program has 10 Key Performance Parameters (KPPs), which may be grouped into the general areas of radar and receiver effectiveness, net-centric military capability, operational suitability, and reliability. All but one were demonstrated in IOT&E. The remaining KPP was not demonstrable in an OT environment but received a satisfactory test result in DT. The Joint Requirements Oversight Council approved the revision of that KPP due to the inability to adequately test for accurate results in the OT environment.
- **Critical Technologies** – There are no critical technology elements.
- **Technical Reviews** – There were no technical reviews held in FY 2009.
- **Technical Issues and Risks** – None; USD(AT&L) approved the program to enter Full-Rate Production in November 2009.

- **Reliability** – Post-IOT&E: The system met the reliability threshold for Mean Flight Hours Between Operational Mission Failure.
- **Systems Engineering Support of Life Cycle Management and Sustainability** – DSE made recommendations, and program management has begun implementing improvements to enhance future supportability and sustainability.
- **Software** – The program successfully passed IOT&E and USD(AT&L) approved entry into Full-Rate Production in November 2009. Future maintenance releases are in progress.
- **Integration** – The program is in Full-Rate Production.
- **Manufacturing** – The manufacturing processes are mature. The program is in Full-Rate Production.

Summary of FY 2009 Systems Engineering Assessments

- **Assessment of Operational Test Readiness (AOTR)** – DSE performed an AOTR in August/September 2008 focusing on the EA-18G program's technical and materiel readiness to proceed from DT into IOT&E. The assessment indicated the program had multiple moderate-level risks entering IOT&E, and DSE rated the overall risk for IOT&E as moderate.
  - Positive observations included that the AEA system met TEMP thresholds, in some cases exceeding required performance. There was significant improvement over existing AEA capability in the following: survivability due to increased situational awareness; targeting capability with Active Electronically Scanned Array (AESA) radar and Link-16 datalink; airframe reliability and maintainability based on Super Hornet; stores carriage with three TJS Pods, two HARM missiles, and two Advanced Medium-Range Air-to-Air Missiles (AMRAAMs); enhanced jamming effectiveness; and electronic surveillance with ALQ-218 detection capability.
  - Key findings included problems with the legacy ALQ-99 tactical jamming pod and its reliability and availability; challenges with software lockup, mission planning, Communication Countermeasures Set emitter library, Built-in Test false alarm rate, Interference Cancellation System (INCANS) communications noise cancellation system, inadequate threat warning indications, and human factors.
  - The EA-18G program acted on the risks and recommendations. The program delayed the start of IOT&E by 6 weeks to release another software block to implement fixes.
  - Result: The program completed IOT&E and received ratings of effective and suitable from the Navy COMOPTEVFOR. In the Beyond-LRIP report, DOT&E rated the program effective and survivable but not suitable due to excessive Built-in Test failures that resulted in excessive maintenance.
- **Conclusion –** The program is low risk and was approved by USD(AT&L) for Full-Rate Production in November 2009.

Expeditionary Fighting Vehicle (EFV)

Prime Contractor: General Dynamics Amphibious Systems

Executive Summary
The Expeditionary Fighting Vehicle (EFV) program is in the System Development and Demonstration phase. Milestone (MS) B was held in December 2000 and MS C is planned for December 2011. Seven prototype vehicles are being fabricated at the Joint Services Manufacturing Center in Lima, Ohio. Prototype vehicles are scheduled to start developmental testing/reliability growth testing in late FY 2010 and will support the validation of the Design for Reliability modeling results and verify that the Reliability Key Performance Parameter (KPP) can be achieved at Initial Operational Test and Evaluation.

Mission Description
The EFV will be the U.S. Marine Corps's (USMC) primary means of tactical mobility for the Marine Rifle Squad during the conduct of amphibious operations and subsequent ground combat operations ashore. The EFV is a replacement for the current AAV7A1 Amphibious Assault Vehicle and is the keystone to the USMC Expeditionary Maneuver Warfare and Ship-to-Objective Maneuver concepts. The EFV will conduct the signature mission of the USMC, Expeditionary Maneuver Warfare from Seabases by initiating amphibious operations from 20-25 miles over the horizon and seamlessly transporting Marines to inland objectives.

System Description
The EFV is a family of a high-water speed armored amphibious personnel vehicles that are fully tracked and Nuclear, Biological, and Chemical protected. The vehicles are capable of delivering the ground combat element of USMC assault forces (17 combat equipped Marines) from amphibious shipping located over the horizon to inland objectives. The EFV has a personnel variant and a command and control variant capable of both land and water mobility.

Summary of FY 2009 Systems Engineering Activities
- **Systems Engineering Plan (SEP) –** The SEP was updated in December 2008. An update is planned to support MS C in December 2011. There have been no approved waivers or deviations from the SEP. The program has planned and is completing activities to accomplish SEP objectives.
- **Requirements –** The Capability Production Document was validated in April 2006. The capabilities outlined in the document are reasonable. The program's KPPs include water speed, land mobility speed, force protection, firepower, troop capacity, Mean Time Between Operational Mission Failure, and net ready. An open architecture design supports transition to meet the net-ready KPP with future upgrades. The Program Manager Advanced Amphibious Assault (AAA) is closely managing system weight to ensure the EFV can maintain appropriate land and water speeds to meet KPPs.
- **Critical Technologies –** An EFV Technology Readiness Assessment was completed in May 2007 and revalidated in October 2008. The critical technology elements were determined to be at Technology Readiness Level 7.

- **Technical Reviews** – One systems engineering technical review was conducted in FY 2009. No technical reviews are scheduled for FY 2010.
  - **Critical Design Review (CDR) –** A system-level CDR was successfully conducted in December 2008. Ninety-eight of 99 component and subsystem design reviews were completed. After testing design fixes, the final subsystem review on the exhaust system was closed out in June 2009. The product baseline has been established and is under configuration management.
- **Technical Issues and Risks –** Weight is a watch item for management and all subsystem Integrated Product Teams. The program has had independent system weight assessments and has supported initiatives to cut weight. The system design includes weight margin to allow future system growth.
- **Reliability –** The EFV program has a KPP reliability requirement of 43.5 hours Mean Time Between Operational Mission Failure and is currently on track to achieve this requirement. Five Knowledge Points are planned from FY 2009 through FY 2013 to assess if the EFV program is on track to meet the KPP.
- **Systems Engineering Support of Life Cycle Management and Sustainability** – Detailed Supportability Assessments have been conducted on all 27 subsystems. Efforts are ongoing to validate/verify Interactive Electronic Technical Manual tasks prior to the 2011 scheduled Operational Assessment 2 and to reduce engine repair life cycle costs.
- **Software –** EFV software development is addressing more than 30,000 requirements. Software builds adding more system functionality are released to coincide with a program or test event. The EFV reuses fielded versions of the following tactical software: Command and Control Personal Computer, Advanced Field Artillery Tactical Data System, Intelligence Analysis System, and the Tactical Combat Operations System.
- **Integration** – EFV has 102 Interface Control Documents that document thousands of interfaces. More than 80,000 interface requirements have been allocated to the 27 subsystems and are managed in an allocation database.
- **Manufacturing** – The program is holding monthly production review meetings with General Dynamics Amphibious Systems, applicable suppliers/subcontractors, and other stakeholders to correct any prototype production problems or issues and to ensure the program is ready for Low-Rate Initial Production.

Summary of FY 2009 Systems Engineering Assessments

- **Program Support Reviews (PSRs)** – An initial PSR was conducted in May 2006 to support Pre-MS C. The PSR recommended several systems engineering and testing actions that Program Manager AAA initiated. The next PSR will be held in 2011 to assess readiness for MS C.
- **Systems Engineering Principles and Best Practices** – The Program Manager AAA and General Dynamics Amphibious Systems are conducting a robust Design for Reliability Program. As a best practice fault tree analysis, cost-benefit analysis of biggest contributors to mission reliability, design of failure modes analysis, and the Crow methodology for design action reporting and tracking were used in developing a reliability growth curve and reliability test program.
- **Program Health Metrics** – The EFV program is on track to meet its 25 system-level Technical Performance Measures. The Program Manager AAA has put emphasis on monitoring and projecting progress in meeting the total weight margin and reliability Technical Performance Measures in order to satisfy KPPs.
- **Conclusion** – The EFV program has designed a vehicle utilizing a robust Design for Reliability Program. Prototype vehicles are being fabricated for an Operational Assessment scheduled in 2011. MS C is planned for December 2011.

H-1 Upgrades (4BW/4BN)
U.S. Marine Corps Upgrade to AH-1W Attack and UH-1N Utility Helicopters

Prime Contractor: Bell Helicopter

Executive Summary
The H-1 Upgrades program incorporates state-of-the-art improvements, including increased range, payload, speed, combat and crash survivability, and improved lethality into the existing fleet of AH-1Ws and UH-1Ns that converts them to 226 AH-1Zs and 123 UH-1Ys, respectively. The UH-1Y has demonstrated these capabilities by successfully completing developmental test and evaluation (DT&E) leading to Initial Operational Test and Evaluation (IOT&E), Initial Operational Capability (IOC), deploying at sea, and completing the first phase of Follow-on Operational Test and Evaluation (FOT&E). The AH-1Z is currently being evaluated by the integrated test (IT) team in preparation for the final phase of IOT&E. The UH-1Y is in Full-Rate Production. The Full-Rate Production decision for the AH-1Z is expected in 1st quarter FY 2011.

Mission Description
AH-1Z provides rotary wing close air support, anti-armor, armed escort, armed/visual reconnaissance, and provides coordination and terminal guidance for supporting arms to include close air support, artillery, and naval gunfire under day/night and adverse weather conditions. UH-1Y provides control of command elements, armed escort for assault support operations, and security of forward and rear area forces.

System Description
UH-1 Upgrades will provide a standard configuration throughout the fleet, airframes with a 10,000 flight hour service life, new and completely integrated avionics and glass cockpits, a highly maneuverable and reliable four-bladed rotor system with composite blades, and an upgraded drive train and landing gear, all common to both aircraft. Developmental test and evaluation is verifying the upgraded aircraft will have increased range, payload, speed, combat survivability, crash survivability, and improved sensors.

Developmental Test and Evaluation Activity

- Documented in the latest Test and Evaluation Master Plan (TEMP), UH-1Y is post Milestone C, having completed IOT&E in May 2008 and proceeding to DT&E of enhancements leading to FOT&E.
- AH-1Z is post MS II and verifying in a second inter-phase test period of developmental and integrated testing, DT/IT-IIIC, October 2009–February 2010, corrections of deficiencies relating to the AH-1Z weapons system during the May 2008 IOT&E and validating readiness for IOT&E Phase III, March–July 2010.

Developmental Test and Evaluation Assessment

- Test events have been planned in detail in advance of execution and have leveraged all available resources efficiently. This has allowed early risk reduction efforts to be completed on early deliveries, enhanced integrated test, and provided for early feedback to the Program Manager for corrective actions. Developmental test plans include operational test addendums that provide for seamless conduct of integrated test.
- Interphase developmental test provided data that improved the weapons release envelope significantly. Risk reduction T&E of a pre-production Tactical Sight System (TSS) provided an end-to-end evaluation of the weapon system and identified numerous items that were corrected or improved prior to delivery of production units for the next phase of DT&E. All testing not exclusively operational test has been conducted as integrated test. Two developmental test and one operational test squadron have integrated operations to the extent that nearly any event can be completed at any location with the available asset.
- Risk reduction testing in particular has directly improved the performance and capabilities of the TSS, significantly improving the performance of the weapon system as a whole. Integrated test in support of UH-1Y software and sensor improvements allowed a smooth transition into FOT&E on schedule and with low risk supporting the second deployment.
- The overarching test schedule for all test squadrons maintains a detailed plan for all significant events for at least a year in advance. All assets required are tracked and allocated to the highest priority events. Detailed planning and tracking has allowed smooth transitions to secondary plans when required and timely action by the Program Office to concentrate on items or actions that appear to be falling behind plan. Daily risk management and asset management has minimized negative impacts of challenges and allowed maximum utilization of early successes.

Joint High Speed Vessel (JHSV)

Prime Contractor: Austal USA

Executive Summary
The Joint High Speed Vessel (JHSV) program is a Navy-led acquisition to construct high-speed, shallow-draft ships capable of intra-theater transport of joint forces personnel and cargo. JHSV will be a non-combatant vessel, built to commercial ship standards, that operates in permissive environments. The program entered the Engineering and Manufacturing Development phase and received Defense Acquisition Board authority to initiate construction in December 2009. The program completed Milestone (MS) B in November 2008, and MS C is planned for FY 2013. The Navy awarded a detailed design and construction contract in November 2008 and approved start of construction in December 2009.

Mission Description
The JHSV will provide high-speed, shallow-draft transport for intra-theater transport of medium payloads of personnel and cargo for joint forces, to bridge the gap between low-speed sealift and high-speed airlift for combat-ready personnel, equipment, and supplies over operational distances. It will provide access to littoral offload points that include austere, minor, and degraded ports. When the threat environment requires, JHSV will operate under the protection of Sea Shield or other Combatant Commander's assets; it can operate in low threat/benign environments independently. JHSV will self-deploy from the Continental United States or another theater to an advance base or to an operational site. It will operate within the Global Information Grid (GIG) architecture; command and control elements onboard will communicate with other sea base elements or Joint Forces within the Joint Operating Area by use of FORCEnet.

System Description
JHSV will be a modified version of an existing commercial vessel (non-developmental). While performing a variety of lift and support missions, JHSV will be a non-combatant vessel that operates in permissive environments. The Navy is initially building 10 ships: 5 for the Army and 5 for the Navy. A second buy of 8 ships for the Navy may have configuration changes not yet identified. It will not require development of new materials, systems, subsystems, or processes, or integration of new and complex combat systems, making it a low-risk acquisition program. JHSV will have an aluminum catamaran hull with water-jet propulsion. It incorporates military-unique features such as light armament, aviation, C4I (command, control, communications, computers, and intelligence), damage control, and firefighting. It has a threshold payload of 600 Short Tons (ST) and can carry up to 312 troops. The Army may crew its ships with soldiers; the Navy will use civilian mariners under Military Sealift Command, which also will provide life cycle management. Although no policy changes have been made, the Army is evaluating whether to use Military Sealift Command for maintenance support in terms of cost, performance, and operational risk. A different approach to manning could affect full Army compliance with the December 18, 2009, Acquisition Decision Memorandum (ADM) to develop a common support strategy for life cycle management.

Developmental Test and Evaluation Activity

- The Test and Evaluation Master Plan (TEMP) was approved August 2008.
- Test Schedule – To date, the program has conducted engineering tests and trade-off experiments.

Developmental Test and Evaluation Assessment

- The program will update the TEMP during summer 2010 to incorporate changes in the Navy and Army Concept of Operations, as directed by the December 18, 2009, ADM.
- Prior to construction, the program is assessing requirements through computational and analytical assessments of drawings, and through model testing. Upon delivery, many requirements will be verified during Production Acceptance Test and Evaluation.
- Detail Design Analysis was completed in FY 2009. The event was an assessment of the detailed design by subject matter experts, who evaluated the likelihood of JHSV meeting its Critical Technical Parameters and other selected program objectives including:
  - Testability of design and operational requirements
  - Potential Test and Evaluation risks and mitigation recommendations
  - Recommendations in support of the Final Critical Design Review (CDR) and Production Readiness Review (PRR)
- No high-risk items were identified. Moderate risk items identified included:
  - Net Ready/C4I Related Critical Technical Parameters: Design did not reserve weight and power for future C4I system installations.
  - Survivability (American Bureau of Shipping Certification): Analysis indicated areas of buckling and yielding in hull bulkheads and side shell. Structural modifications were necessary to enable traveling at 35 knots in sea state 3.
  - Medical Facilities Systems: Several doorways and passageways are not wide enough for four personnel to carry a patient in a stokes litter to the medical space.
  - Chemical and Biological Contamination Survivability: The JHSV design will not have three separate adjacent compartments for decontamination as recommended in the Military Sealift Command Damage Control Manual.
- OSD/DDT&E is a member of the JHSV Test and Evaluation Working Integrated Product Team and is providing guidance during the TEMP update.
- As JHSV will not involve any new technologies or components, developmental test and evaluation will largely focus on the integration of the systems into the ship design.
- Particular safety emphasis should be directed toward the air quality in the mission deck while running military vehicle engines during developmental test and evaluation. No forced air ventilation system is planned for the mission deck. OSD/DDT&E supports program decision to perform a computational fluid dynamics study to determine tactics, techniques, and procedures to avoid hazardous buildup of vehicle exhaust.

Summary of FY 2009 Systems Engineering Activities

- **Systems Engineering Plan (SEP) –** The program submitted a SEP for approval in October 2009. An OSD team reviewed the SEP and approved the document. No waivers or deviations from the SEP are needed. The program approach is low risk and streamlined based on experience with leased vessels, commercial designs, and affordability goals.
- **Requirements –** The Capability Development Document (CDD) has been validated.
  - The CDD was approved February 8, 2007. JHSV has eight Key Performance Parameters (KPPs), primarily centered on meeting speed-distance-payload requirements of 600 ST for 1,200 nm at an average speed of 35 kts. The design supports all KPPs for demonstrating threshold goals by the end of FY 2013.

  - The CDD did not address reliability, but the program has taken measures to comply with Reliability/Availability/Maintainability (RAM) OSD requirements.
  - The Assistant Secretary of the Navy (Research Development and Acquisition) held a Configuration Steering Board October 13, 2009, to revalidate the design baseline.
- **Critical Technologies –** JHSV has no critical technology elements.
- **Technical Reviews –** There were two Navy-defined CDRs. The Navy restricted OSD representatives from attending early technical reviews, limiting attendees to selected personnel. The PRR was open to OSD. The program will hold monthly reviews with the contractor initially and then quarterly; annual Defense Acquisition Board program reviews are planned.
  - Requirements, funding, and schedule are balanced; although still early, the Capital Budget Pilot Plan appears to have provided stability in planning.
  - Funding is adequate and appropriately phased.
  - The Program Manager declined last-minute Army requests for additional ship space, more weight, and other modifications because the modifications would have counted against payload and performance factors.
- **Technical Issues and Risks**
  - Issue: Can the contractor train and retain a workforce to meet deliveries? Mitigation: The contractor has a well-organized plan for teaming with the state and establishing a 2-to-6-week training program in a new facility being built.
  - Risk: The most demanding Technical Performance Measure is 600 ST payload delivered 1,200 nm at 35 kts in up to sea state 3. Mitigation: The Navy is firmly holding limits to add-ons and mission growth.
  - Risk: The contractor must deliver two ships per year, at a projected rate of 2 years per vessel. Mitigation: The contractor created a modern, automated module manufacturing facility and is gearing up for production.
- **Reliability –** The program has self-imposed materiel reliability targets of 0.67, operational availability of 0.74, and materiel availability of 0.72. Design and support approaches are on track to meet these requirements. (CDD preceded the OSD RAM requirement.)
- **Systems Engineering Support of Life Cycle Management and Sustainability –** The program will use the Military Sealift Command's proven structure for JHSV life cycle management and sustainability. Soldiers will operate Army-owned JHSVs. Army life cycle personnel use a Service-specific sustainment strategy in lieu of the joint strategy.
- **Software –** No special software was developed solely for JHSV.
- **Integration –** There are no integration issues.
- **Manufacturing –** The program has negotiated a production contract and warranties; the Manufacturing Readiness Level is estimated at 8–9.

Summary of FY 2009 Systems Engineering Assessments

- **Program Support Review (PSRs) –** DSE conducted an initial PSR June through November 2008 to support MS B and entry into the System Development and Demonstration phase. The program was on track in terms of joint requirements (no open issues), high degree of Service commonality, and adequate staffing. Key findings: JHSV lacked a reliability requirement; the program allowed insufficient time to respond to feedback from testing if fixes were required in the design or product line.
- **Conclusion –** The program received MS B approval on November 12, 2008, and is in the System Demonstration and Development phase. JHSV was given approval to start construction on December 18, 2009. Because JHSV is based on a commercial design and will use a highly automated production facility, the program is low risk.

Littoral Combat Ship (LCS)

Lockheed Martin USS Freedom

General Dynamics USS Independence

Prime Contractors: Lockheed Martin (LCS 1, 3), General Dynamics (LCS 2, 4)

Executive Summary

Littoral Combat Ship (LCS) is intended to fill littoral capability gaps in Mine Warfare (MIW), Surface Warfare (SUW) and Anti-Submarine Warfare (ASW) identified in the Littoral Combat Ship Capability Development Document (CDD). The program now involves two competing multi-mission hulls (seaframes) from Lockheed Martin and General Dynamics, with a down-select planned for spring 2010. The LCS program incorporates activities of two Program Managers: PMS 501 is responsible for development of the seaframes and overall LCS management; PMS 420 is responsible for development of the MPs. LCS completed Milestone (MS) A-prime in December 2008 and plans a MS B in May–June 2010.

Mission Description

LCS provides small "focused mission ships" to prosecute littoral warfare (mine countermeasures (MCM), ASW, or SUW). LCS's high-speed, shallow-draft off-board systems; core combat capability; mission bay storage; and flight deck resources could support other missions, including Enhanced Maritime Interception Operations, logistics, homeland defense, or intelligence, surveillance, and reconnaissance.

System Description

LCS comprises core systems combined with embarked modular mission capability packages (MPs). A core system is a functional capability permanently installed in LCS for all configurations; it provides self-defense, navigation, C4I (command, control, communications, computers, and intelligence), and other requirements common to all mission areas. MPs are functional groupings of systems/modules that integrate with the seaframe to provide the means for executing a particular mission as MCM, SUW, or ASW.

Seaframes couple to MPs, each tailored for one specific mission. MPs are based on increments of added capabilities spiraled into various modules as they mature and are tested for effectiveness and suitability. Technology refreshment ensures MPs keep pace with challenging threats. LCS can trade MPs (mission modules and crew) pierside in a friendly port to meet changing threats. Seaframes

leverage automation, "smart systems," and human systems integration principles in engineering, damage control, combat systems, and ship control to reduce manning. Systems are tied into an extensive Local Area Network to support seaframe and core crew operations. MP upgrades and modular components with manned and unmanned systems ensure LCS retains an edge in technology currency and effectiveness. On the first four ships, blue/gold core and MP crews will be rotated every 4 months to permit rest and training. The remaining ships will have a rotating multiple-crew concept. Logistics support will be forward deployed to minimize on-board loads, to leverage off-board maintenance capabilities, and to extend resources for other tasking. After 18 months of deployment, LCS will return to the Continental United States for maintenance.

LCS core systems provide the capability to detect, identify, track, and protect against anti-ship cruise missiles, threat aircraft, and small boats. Seaframe self-defense capabilities include: 57mm gun, Rolling Airframe Missile (RAM) or SeaRAM, .50 cal machine guns, and Decoy Launching System Mk 53 (NULKA). In addition, MPs may bring 30mm guns, a Non-Line-of-Sight missile launcher, Hellfire missiles, and various ASW weaponry.

Developmental Test and Evaluation Activity

- The Test and Evaluation Master Plan (TEMP) was approved December 19, 2008. An update is in progress to reflect a revised Acquisition Strategy.
- The Test Schedule is changing due to recent revision of Acquisition Strategy and FY 2010 down-select to single seaframe. Original plans called for a 14-phase Technical Evaluation (TECHEVAL) on the two seaframes, incorporating three different mission packages (MCM, SUW, and ASW) at different times and on different seaframes. Each TECHEVAL phase was to be followed by Initial Operational Test and Evaluation. A similar strategy is expected after down-select.

Developmental Test and Evaluation Assessment

- Operational contingencies resulted in early deployment of LCS-1. Developmental test and evaluation events will be planned for the periods after return from deployment and subsequent crew stand-down and maintenance availabilities.
- LCS air warfare capabilities will require assessment and resolution of critical operational issues in connection with the Capstone Enterprise Air Warfare TEMP. The results of this testing will be used in conjunction with Self-Defense Test Ship testing and Probability of Raid Annihilation Testbeds to evaluate LCS air defense performance. The plans for the LCS Self-Defense Test Ship and Probability of Raid Annihilation Testbed test and evaluation were established in FY 2009.
- Ship underway time is needed to evaluate and train for MP execution. Early deployment before developmental testing and operational testing could require extended shipyard availability to ensure readiness.
- Commander, Operational Test and Evaluation Force, is conducting a Quick Reaction Assessment for the Chief of Naval Operations regarding post-delivery training and engineering testing on LCS 1 to ensure readiness.
- Launch, Recovery, and Handling systems have not been tested for all manned and unmanned surface and subsurface craft.
- OSD/DDT&E is a member of the LCS Test and Evaluation Working Integrated Product Team and will assist the Program Manager in planning and executing developmental test and evaluation that complies with DoD policy and guidance. The TEMP will be updated following the MS B approval to reflect any changes needed to remain consistent with the selected design.

Summary of FY 2009 Systems Engineering Activities

- **Systems Engineering Plan (SEP)** – The LCS program provided a draft SEP for review in April 2009, before the Acquisition Strategy was changed. That update was revised and is nearing final adjudication.
  - Another update is planned following the MS B approval to reflect any changes needed to remain consistent with the selected design.
  - There were no program waivers of DoDI 5000.02 systems engineering-related requirements.
- **Requirements** – The LCS CDD for flight 0+ was validated June 17, 2008.
  - Early testing suggests both seaframes may achieve Key Performance Parameters (KPPs), but neither has had opportunity to work with all MPs to assess Focused Mission execution. MPs need several planned incremental upgrades to reach KPPs.
  - The LCS program has 10 KPPs, primarily involving speed, range at transit, mission package payload, draft, and crewing. All are on track for demonstration by FY 2013 when the last of the MPs completes its planned upgrades.
  - **Critical Technologies** – The program has no critical technologies for seaframes or MPs.
- **Technical Reviews** – None in FY 2009.
- **Technical Issues and Risks**
  - Based upon Acceptance Trials data, the Navy added internal and external buoyancy tanks prior to deployment to ensure LCS-1 would meet stability requirements in a damaged condition.
  - LCS-1 had two post-delivery shipyard availabilities to correct design and construction deficiencies; a third 30-day shipyard availability for continuing maintenance began in mid-December. Weight had to be removed from the superstructure to improve survivability. Hull encroachments into MP spaces need correction.
  - LCS-2 will initiate post-delivery tests and trials following delivery in January; deficiencies are to be determined.
  - Funding and schedule were unrealistic, given final implementation of Naval Vessel Rules in the 2005–2006 timeframe after contractor design and cost responses. The Government-accepted commercial designs were not adequate for combatants; subsequent contractor recovery efforts resulted in delays, cost overruns, deficiencies, and errors trying to adjust designs and minimize schedule for both ships.
- **Reliability**
  - Systems Engineering Reliability, Availability and Maintainability (RAM) Enhancements: Contractors were provided with RAM goals and must demonstrate achievement of requirements throughout design, test, and construction to show availability.
  - CDD requirement for Materiel Availability is 0.64 threshold, 0.712 objective. Operational availability is 0.85. Systems engineering and Reliability Growth will be reevaluated following MS B approval.
- **Systems Engineering Support of Life Cycle Management and Sustainability** – Seaframe sustainment is to be finalized following selection of a single seaframe; for MPs, the Navy will use a contractor and West Coast facilities for management, storage, and support.
- **Software** – Builds have been completed. Although seaframes are highly automated to support minimal crewing, few software issues have emerged; however, seaframes have not completed developmental test and operational test.

- **Integration** – The program has major integration challenges between seaframes and MPs. To address this issue, the program established an Integrated Product Team to provide interface specifications and examine construction details to ensure smooth interfaces; the team has identified numerous deficiencies and verified corrections within each seaframe.
- **Manufacturing** – Manufacturing Readiness Level 9 applies to seaframes. The Non-Line-of-Sight missile is completing development and test as part of an Army program and is the least mature component, with the exception of Navy's proposed new ASW MP.

Summary of FY 2009 Systems Engineering Assessments

- **Program Support Reviews (PSRs)** – The most recent PSR took place in 2007. The program has since matured; a new PSR is planned for February–April 2010 in preparation for MS B in May or June 2010.
- **Conclusion** – The program completed a Milestone (MS) A-prime December 18, 2008, and has two seaframes in post-delivery tests and trials and two more in construction. A MS B is planned for summer 2010. The program is medium risk for potential cost increases and lacks the benefit of a timely test and evaluation program with all mission packages due to early deployment commitments.

P-8A Poseidon Multi-mission Maritime Aircraft

Prime Contractor: Boeing Integrated Defense Systems

Executive Summary

The P-8A Poseidon Multi-mission Maritime Aircraft is in the System Development and Demonstration phase. Milestone (MS) B was held in May 2004. MS C is scheduled for May 2010. The program is fabricating test aircraft to prove out airworthiness and mission system functions. Integrated flight and ground testing is ongoing.

Mission Description

The P-8A is the next generation Navy Maritime Patrol and Reconnaissance Aircraft intended to replace the aging P-3C, Orion. The P-8A will provide anti-submarine warfare cueing-to-killing, anti-surface warfare capability, and armed maritime intelligence, surveillance, and reconnaissance. The P-8A supports elements of the Joint Undersea Superiority Initial Capabilities Document and Mine Warfare capabilities needed to provide "assured access" in accordance with Joint and Navy concepts of operations and Sea Power 21.

System Description

The P-8A is a militarized derivative of the commercial Boeing 737-800 aircraft. The P-8A supports loading, carriage, and employment of anti-ship missiles, air-to-surface weapons, torpedoes, naval mines, sonobuoys, and other expendables. Future plans for P-8A improvements include adding upgrades to command, control, communications and computers; improvements to meet the Net-Ready Key Performance Parameter (KPP); and adding more lethal precision weapons.

Summary of FY 2009 Systems Engineering Activities

- **Systems Engineering Plan (SEP)** – The P-8A SEP was approved in August 2005 to support entry into the System Development and Demonstration phase. The SEP is being updated for the May 2010 MS C.
  - There have been no approved SEP waivers or deviations.
  - The program has planned and is completing activities to accomplish SEP objectives.
- **Requirements**
  - A Capability Production Document was approved in June 2009. The KPPs of mission endurance, mission stores loadout, on-station altitude, survivability, force protection, sustainment, and net-ready are reasonable. A Capabilities Development Document for future P-8A improvements is being staffed.
  - The Maritime Surveillance Aircraft Program Office (PMA-290) is keeping a close watch on actions taken to meet the Mission Radius/Endurance KPP. The PMA-290 is supporting weight reduction initiatives to ensure the system meets the KPP.
- **Critical Technologies** – The P-8A program acquisition strategy includes using proven technologies. Developing technologies when ready will be added as improvements to the P-8A. The Electronic Surveillance Measures Digital Receiver and Hydro-Carbon Sensor are Critical

Technology Elements projected to be at Technology Readiness Level 7 for the May 2010 MS Decision Review.

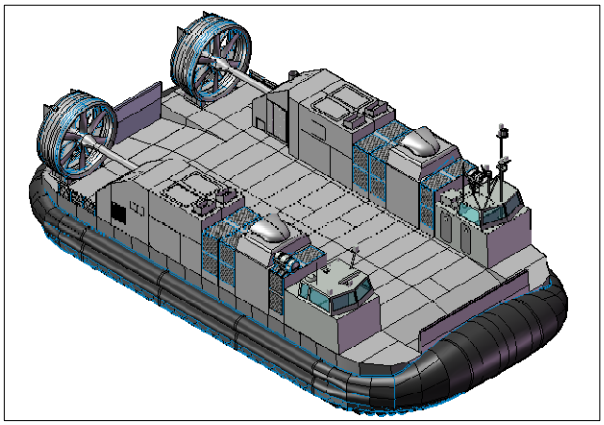
- **Technical Reviews** – Three systems engineering technical reviews were conducted in FY 2009. Four technical reviews are scheduled for FY 2010.
  - The Naval Air Systems Command held a T-1 Test Aircraft Test Readiness Review in May 2009 and First Flight Readiness Review in August 2009. The reviews identified the completion of Test Work Descriptions, the completion of Structural and Fatigue Analysis, and flight envelope development as actions needed to support first flight. With these actions resolved, the Navy completed first flight on October 15, 2009. Integrated flight testing of the T-1, T-2, and T-3 Aircraft will continue at Seattle, Washington, and the Naval Air Station Patuxent River, Maryland, through 2011.
  - Numerous key subcontractor and vendor Production Readiness Reviews (PRRs) were held during 2009. A PRR of Boeing Integrated Defense Systems was held in September 2009. An Executive-Level PRR is scheduled for January 2010.
- **Technical Issues and Risks**
  - The International Association of Machinists and Aerospace Workers strike against Boeing was settled in November 2008. The strike affected work on test aircraft production. The program made up lost time by using available schedule margin and extended shifts on critical work activities.
  - Boeing Integrated Defense Systems identified a 7-month delay to complete static testing. The start of fatigue testing also was delayed. The program was able to adjust test schedules so that testing will still be completed in the planned timeframe.
- **Reliability** – The P-8A program has a reliability requirement of 11.7 Mean Flight Hours Between Operational Mission Failure and is on track to achieve the requirement.
- **Systems Engineering Support of Life Cycle Management and Sustainability** – The program is taking advantage of the P-8A's commercial aircraft derivation and will use the commercial supply chain to support common parts replacement and reduce logistics support costs.
- **Software** – P-8A has 2 million lines of software code to be developed and tested. The program is using the Software Development Laboratory, the Weapon Systems Integration Laboratory, and the Mission Systems Integration Laboratory for development and validation of software.
- **Integration** – A P-8A Integration Readiness Review was held in April 2008. The review identified actions needed to support system integration.
- **Manufacturing** – The program plans to use a Boeing Commercial Aircraft assembly line for Full-Rate Production. Using this well-equipped facility will reduce production costs for facilities and tooling.

Summary of FY 2009 Systems Engineering Assessments

- **Program Support Reviews (PSRs)** – An initial PSR was conducted in April 2004 to support MS B and entry into the System Development and Demonstration phase. The next P-8A PSR is scheduled for January 2010 in support of the May 2010 MS Decision Review.
- **Systems Engineering Principles and Best Practices** – The program has developed an Integrated Verification Plan to ensure all Performance Based Systems Specification requirements are met. Test and Evaluation Reference Numbers are used to consolidate, track, and plan the test and demonstration activities and to identify the resources required to verify requirements.
- **Program Health Metrics** – The P-8A program is on track for meeting all 16 system-level Technical Performance Measures.
- **Conclusion –** The P-8A program has utilized low-risk technologies in order to develop a replacement for the aging P-3C aircraft. MS C is planned for May 2010.

Ship-to-Shore Connector (SSC)

Prime Contractor: None.



Executive Summary

Ship-to-Shore Connector (SSC) is the replacement for the current Landing Craft, Air Cushion (LCAC), which will be retiring beginning in 2015. SSC retains the same footprint as LCAC for embarkation aboard amphibious ships but will have major components redesigned for improved reliability, added payload, additional range, easier maintainability, and greater automation. The program received Milestone (MS) A approval on May 21, 2009, and is in the Technology Development phase. A Preliminary Design Review is planned for 3rd quarter FY 2010, followed by MS B in September 2010. Detailed Design and Construction award is projected for about July 2011. The SSC Initial Operational Capability is 4th quarter FY 2019.

Mission Description

Provide high-speed transport for 74 Short Tons of troops, equipment, and supplies from ships over-the-horizon to forces ashore during forcible entry missions. SSC must operate over unimproved beaches and through surf zones, mud, and ice, providing overland transport in diverse coastal environments. In addition, SSC will support domestic and international noncombatant and nonmilitary operations, such as humanitarian aid.

System Description

SSC will be an Air Cushion Vehicle (ACV) similar to the current LCAC. Maritime access from task force shipping has challenges; only an ACV can transit carrying a heavy combat payload, such as a tank with mine-sweeping plow. SSC targets advances in cargo capacity, performance, automation, reliability, and maintainability to support ship-to-shore transport of joint forces across the full range of military operations for 2015 and beyond. SSC is prototype testing selected components on LCAC Service Life Extension Program (SLEP) test vehicles (early engineering) and will conduct research and development (R&D) testing with the first SSC to evaluate use of composites, simplified propulsion and gear boxes, automation, and improved skirt design among other changes. Speed will be approximately 35 kts and have a mission radius of 86 nm needed to support a Marine Expeditionary Brigade from at least 25 nm. No increments to SSC are planned.

Summary of FY 2009 Systems Engineering Activities

- **Systems Engineering Plan (SEP)** – The SSC SEP was initially approved January 27, 2009, to support MS A. An update is planned following MS B and contract award.
  - There are no waivers or deviations from the SEP.
  - Objectives of the SEP are being met.

- **Requirements** – SSC's primary Key Performance Parameter (KPP) is to transport 74 Short Tons from a seabase 25 nm to shore (mission radius of 86 nm without refueling) in sea state 3. All KPPs are on track for demonstration by FY 2018.
- **Critical Technologies** – There are no critical technology elements. Technology Readiness Level is estimated to be 5 or 6, subject to contractor selection and designs.
- **Technical Reviews** – Two Navy-specified reviews were held in FY 2009. Program plans a DoD-defined Preliminary Design Review before MS B to formally establish a baseline.
  - Navy identified a $77M shortfall in Research, Development, Test and Evaluation funding between the Service Cost Position and the Navy's funded program. Navy will address this shortfall in POM (Program Objective Memorandum) 12. Requirements, funding, and schedule will then be balanced.
- **Technical Issues and Risks** – Issues include software development and integration and cost estimates to support software and component testing. To mitigate the issues, the program is reevaluating software requirements and continues to seek realistic cost data prior to issuing a request for proposals for a Detailed Design and Construction contractor.
- **Reliability** – The program will have a materiel availability of 0.55 and operational availability of 0.85. SSC will use the Design Reference Mission for development of reliability, availability, and maintainability characteristics. LCAC SLEP will provide a baseline for trade studies and metrics.
- **Systems Engineering Support of Life Cycle Management and Sustainability** – SSC is in early development of a product support strategy for life cycle management and sustainment.
- **Software** – The program plans to port LCAC SLEP software, upgrade software components, and add new software; scope and resources are possible risks areas being examined.
- **Integration** – SSC design revises the LCAC power train and includes composites in structure; hardware and software changes include improved situational awareness with an integrated tactical display, workload distribution among the crew, enhanced C4N (command, control, communications, computers, and navigation), and increased automation.
- **Manufacturing** – Although the program is using state-of-the-practice technologies, finding the right materials suitable for the mission profile (i.e., composite ramp strong enough for a tank) without breaking cost limitations is a challenge. SSC is developing Technical Performance Parameters for MS B and a Detailed Design and Construction solicitation based upon LCAC experience, technology development studies, and prototyping.

Summary of FY 2009 Systems Engineering Assessments

- **Program Support Review (PSR)** – A PSR was completed March 2009 for entry into the Technology Development phase. The program was found technically well qualified, having worked with LCACs for 30 years. The certification requirements approach is sound. With only limited contractor feedback, costs were estimated for purposes of the PSR. Schedule was a concern; the R&D craft will not provide results until after delivery of the first group of production craft.
- **Conclusion** – The program received MS A approval on May 21, 2009, and is in the Technology Development phase. The program is low risk.

Standard Missile-6 (SM-6)

Prime Contractor: Raytheon Missile Systems

Executive Summary
Standard Missile-6 (SM-6) is an integration of the SM-2 propulsion and ordnance with the Advanced Medium Range Air-to-Air Missile (AMRAAM) active seeker and the Aegis Weapon System. SM-6 completed Milestone C review in July 2009 and is now in Low-Rate Initial Production, Lot 1.

Mission Description
SM-6 is designed to provide ship self-defense, fleet area defense, and theater air defense for sea and littoral forces. SM-6 is a surface-to-air supersonic missile, launched from AEGIS Cruisers and Destroyers, capable of successfully engaging manned and unmanned, fixed, or rotary wing aircraft, and land attack or Anti-Ship Cruise Missiles in a fleet area defense role and over hostile territory. SM-6 may be employed in concert with the developing Joint Theater Air and Missile Defense Family of Systems to provide continuous protection to forward deployed maneuver forces as well as theater rear assets.

System Description
The SM-6 program is an evolutionary, capabilities-based acquisition program that will use spiral development to produce an initial Block I capability, with follow-on blocks to pace emerging threat systems as required. It combines the tested legacy of SM-2 propulsion and ordnance with the AMRAAM active seeker. In addition to an extended range, the SM-6 Block I will have active missile seeker homing for improved flight responsiveness, guidance, subclutter visibility, and countermeasures resistance over present SM-2 missiles, and it will be Engage-on-Remote intercept capable.

Developmental Test and Evaluation Activity

- The Test and Evaluation Master Plan (TEMP) was approved July 28, 2009.
- Developmental test and evaluation events completed in FY 2009 included Design and Performance Verification, Weapon System Integration, Airframe Flight Performance, and Missile Engagement Performance.
- TECHEVAL flight tests at Pacific Missile Range Facility (PMRF) Barking Sands, Hawaii, are planned for 2010.
- Initial Operational Test and Evaluation (IOT&E) test flights are planned for late 2010.
- Follow-On Operational Test and Evaluation (FOT&E) test flights are dependent upon fielding of AEGIS Advanced Capability 12 and 14 in conjunction with Navy Integrated Fire Control–Counter Air, and development of the Multi-Stage Supersonic Target.

Developmental Test and Evaluation Assessment

- Summary: SM-6 flight tests during FY 2009 were technical in nature and did not include at-sea end-to-end missions against threat-representative targets. All flights planned for FY 2009 achieved all primary test objectives. One Control Test Vehicle (CTV) failed to launch due to a legacy hardware problem that was subsequently corrected. The corrected CTV launched and achieved all primary test objectives but eventually lost control due to a failure in the steering control section. Root cause of the failure was identified and closed by the Failure Review Board (FRB) in May 2009.
- At-sea end-to-end flight tests against threat representative targets are scheduled for the 3rd quarter 2010.
- Design and Performance Verification was performed at the Raytheon Missile Systems facility in Tucson, Arizona, on component and round level assets. The test item passed shipboard vibration testing. Near Miss Shock and SPY-1 Electromagnetic Environment test results are pending completion of inspections and analysis.
- Weapon System Integration included integration testing between the SM-6 missile and its canister; the AEGIS Weapon System (AWS) was conducted at the Combat Systems Engineering Development Site in Moorestown, New Jersey. The AWS Baseline 7.1R interface testing verified successful SM-6 operation when fired from legacy ship systems as an SM-2 Block IV. The test was a risk reduction event for the upcoming FY 2010 at-sea test firings.
- Airframe Flight Performance consisted of a CTV flight test conducted at White Sands Missile Range, New Mexico. The first CTV failed to launch due to a power supply circuit battery startup fault. Raytheon replicated the fault and successfully tested the mitigation. A second mission (CTV-1A) achieved all primary test objectives. The CTV-1A missile lost control at approximately 95 seconds of flight due to a failure in the steering control section. Root cause of the failure was identified and closed by the FRB in May 2009. The Program Office also updated the SM-6 models and simulations using data from the test.
- Missile Engagement Performance consisted of a Guidance Test Vehicle (GTV) flight test conducted at White Sands Missile Range, New Mexico. A developmental SM-6 Block I missile performed a successful intercept in FY 2009 as part of the Advanced Air Directed Intercept experiment conducted by the Office of Naval Research.
- The Aegis Weapon System is not yet capable of conducting over the horizon (OTH) active intercepts. The program will demonstrate OTH intercepts in FOT&E with Aegis Advanced Capability baselines 12 and 14, in conjunction with Naval Integrated Fire Control – Counter Air.
- SM-6 will require an FOT&E flight test after development of the Multi-Stage Supersonic Target.

Summary of FY 2009 Systems Engineering Activities

- **Systems Engineering Plan (SEP)** – The SM-6 SEP was approved in June 2009.
  - There are no approved waivers or deviations from the SEP.
  - This iteration of the SEP was developed in preparation for MS C and includes the technical planning as the program transitions to the Production and Deployment acquisition phase.
- **Requirements** – The SM-6 Capability Production Document was approved in December 2008.
  - The SM-6 program has five Key Performance Parameters dealing with mission success, range, interoperability, availability, and target characteristics, which are on track for being demonstrated in 2010 during Developmental and Operational Testing.
- **Technical Reviews** – One systems engineering technical review was conducted in FY 2009. No technical reviews are scheduled for FY 2010.

  - A Production Readiness Review was completed by the Program Office in December 2008 to establish the Low-Rate Initial Production (LRIP) baseline. This event-driven review focused on Proof of Manufacturing plans and progress. SM-6 was assessed as having demonstrated Engineering Readiness Level (EMRL) 3, a required System Development and Demonstration (SDD) phase exit criterion.
- **Technical Issues and Risks** – Issues the Program Office is working include demonstration of the full capability of SM-6. Plans to resolve this issue are to be presented at the FY 2010 Defense Acquisition Board.
  - Risks being addressed include SM-6 entry into LRIP without reliability having been demonstrated and the lack of an integrated risk management program. Plans to resolve them are on track and include the development of an SM-6 reliability growth program covering both storage and flight and the assessment of program risk areas to ensure mitigation efforts are pursued.
- **Reliability** – The SM-6 program has developed a reliability growth program and is in the process of funding a reliability assessment and growth effort.
- **Systems Engineering Support of Life Cycle Management and Sustainability** – SM-6 life cycle management and sustainability will build on the current SM-2 management process with existing infrastructure including test equipment, handling equipment, loading procedures, documentation, and operational and maintenance training courses that are in place. SM-6 will introduce no additional training infrastructure or personnel requirements. The development of a Portable Built-in-Tester will improve operational availability and ease future software upgrades.
- **Software** – Software development is within budget and schedule. All required software functionality is in the baseline. The team is continuing to improve the software both in accuracy and performance.
- **Integration** – The SM-6 program has a Systems Integration Integrated Product Team to address integration issues with the Aegis Weapon System and the Vertical Launching System.
- **Manufacturing** – The SM-6 program has demonstrated EMRL 3, a required SDD phase exit criterion.

Summary of FY 2009 Systems Engineering Assessments

- **Program Support Reviews (PSRs)** – An initial PSR was completed in 2004 to support MS B and entry into the SDD phase. The PSR in FY 2009 supported MS C and indicated that the program had low technical risk for entry into Production and Deployment.
  - Positive observations were that production readiness met MS B exit criteria; Integration and Flight Tests have demonstrated technical maturity; and the Management/Contractor Team is in place to support successful LRIP transition.
  - Key findings were that SM-6 development is ahead of Aegis Modernization Advanced Capability Build for FY 2012 and NIFC-CA (Naval Integrated Fire Control–Counter Air); the test program has too few shots to ensure compliance with the flight reliability requirement at an acceptable confidence level; the launch availability requirement was not defined in the Missile Performance Specification; reliability assessment to date is mostly handbook prediction based (MIL-STD-217F) and may not reflect actual field performance; and risk management appears to be contractor based with limited interface by Program Office personnel.
  - Major PSR recommendations included developing, in LRIP, an SM-6 reliability growth program covering both storage and flight; identifying all required capabilities and associated

tests; and identifying post-IOT&E tests required to assess all SM-6 requirements and include them in the MS C TEMP. The SM-6 program has taken action to address these recommendations.

- **Systems Engineering Principles and Best Practices –** The SM-6 Engineering Value Management program was judged "first rate" by the Defense Contract Management Agency, while the lack of an integrated SM-6 Risk Management Program was assessed as needing greater Program Office oversight during the last PSR.
- **Critical Technologies –** The SM-6 program has critical technology elements (CTEs) related to the missile's guidance section. The Technology Readiness Level of each of the seven CTEs was assessed to be at least 7 during a Technology Readiness Assessment completed in May 2009.
- **Program Health Metrics –** The SM-6 program has 24 Critical Technical Parameters (CTPs), several of which cannot be demonstrated until at-sea testing with an Aegis Combat System, capable of fully supporting all SM-6 capabilities, is conducted beginning in March 2010. The program is on track to meet all of its CTPs.
- **Conclusion –** As evaluated during the MS C PSR, the SM-6 program was assessed as low technical risk. The next major milestone is a Full-Rate Production decision scheduled for FY 2011.

SSN 774 Virginia Class Submarine

Prime Contractor: General Dynamics Electric Boat

Executive Summary
The SSN 774 Virginia class submarine program is bringing forward a critical national security asset designed to flexibly address the unique multi-mission requirements of the post-Cold War era. The program is in the Production and Deployment phase. It completed Milestone (MS) II (Low-Rate Initial Production) in June 1995 and IIB in June 2008. MS III (Full-Rate Production decision) is planned for 3rd quarter FY 2010. The Virginia class submarine completed Initial Operational Test and Evaluation (IOT&E) in March 2008, and DOT&E's report was signed November 12, 2009. The Virginia class program continues to execute all planned events and is ready to proceed into Full-Rate Production.

Mission Description
The Virginia (SSN 774) class submarine is a multi-mission nuclear-powered submarine, fully integrated with the joint task forces. The primary mission areas are Battle Group Operations; Covert Strike Warfare; Naval Special Warfare; Covert Mine Warfare; Anti-Submarine Warfare (ASW); Anti-Surface Warfare; and Intelligence, Surveillance and Reconnaissance, Indication and Warning, and Electronic Warfare. Capable of performing traditional submarine missions, dominating the littoral battle space, and adapting to future requirements, the Virginia class submarine will satisfy its assigned roles well into the 21st century.

System Description
The Virginia class submarine is the replacement for the aging fleet of Los Angeles class submarines. The Virginia class is capable of targeting, controlling, and launching Mk 48 Advanced Capability torpedoes, Tomahawk cruise missiles, and future mines. The program has sonar capability similar to the Seawolf submarine class with improvements to the electronic support suite and combat control systems. In addition, it has a new design propulsion plant incorporating proven components from previous submarine classes. The Virginia class uses a modular design and significant commercial off-the-shelf (COTS) computer technologies and hardware that allow for rapid and cost-effective technology refresh cycles.

Developmental Test and Evaluation Activity

- Test and Evaluation Master Plan (TEMP) status – Revision F approved November 2009.
- The program completed portions of Follow-on Test and Evaluation (FOT&E) events for Arctic Operations (October 2009) and Dry Deck Shelter Special Operational Forces (December 2009).
- Virginia class performance is dependent on the performance of separately managed subsystems that are integrated into Virginia's Non-Propulsion Electronics Systems (NPES). Programs under OSD/DDT&E and/or DOT&E oversight with testing in 2009: AN/BQQ-10 Sonar System Acoustic Rapid COTS Insertion (A-RCI); TB-34 Next-Generation Fat Line Replacement Towed Array; and AN/BYG-1 Combat Control System.

Developmental Test and Evaluation Assessment

- Revision F of the Virginia Class TEMP adequately addresses current performance requirements and includes appropriate planning details for the upcoming FOT&E through October 2010 (SSN 777 NPES Modernization OT-IIIB). Testing of the Virginia class is at the platform level. The separately managed subsystems are tested under their specific TEMPs and are now under OSD/DDT&E oversight. These subprograms use a cyclic modernization/upgrade approach with the goal of increasing performance with each increment until the required performance is met. OSD/DDT&E and DOT&E have requested that the Navy finalize their SSN 777 Developmental Test Plan, which will address all subsystem upgrade program testing to support Virginia class critical technical parameters. As part of the recent TEMP approval, OSD/DDT&E and DOT&E requested that the Navy provide a detailed plan for developing and approving an adequate SSK (conventional submarine) threat surrogate/test event, which will assess the ASW mission against the SSK threat in the littorals, within 180 days of their pending Full-Rate Production decision.
- The Navy continues to execute all planned events. Platform availability has had an impact on the schedule and accomplishment of all planned tests. Delayed items are appropriately rescheduled, assessed, and tracked.
- Although the Virginia class was found operationally suitable and the reliability critical operational issue was satisfactorily resolved, NPES subsystem reliability issues have been a problem on the Virginia class program as well as in-service platforms. Reliability problems include materiel issues and insufficient time to assess the reliability with substantial confidence. Based on the requirements imposed by the July 2008 USD(AT&L) Reliability, Availability, and Maintainability policy memo, the Program Office is developing a reliability growth program for the Virginia class Block III unique changes, with details due to DT&E.
- The planned Developmental Test Plan will be a key to managing the test risk as the program completes all scheduled FOT&E events and during the NPES testing.

Summary of FY 2009 Systems Engineering Activities

- **Systems Engineering Plan (SEP)** – No SEP exists for Virginia (not previously required). A 2009 Program Support Review recommended a SEP for Block III and IV builds.
- **Requirements** – All Key Performance Parameters (KPPs) have been met. The Virginia program has 18 KPPs, primarily involving speed, depth, radiated noise, non-acoustic quieting, payload, torpedo launch rate, and net ready.
- **Technical Reviews** – None. However, robust technical reviews and developmental and operational test and evaluation programs are anticipated for Block III.
- **Technical Issues and Risks** – Issues include Special Hull Treatment and self-noise issues. Plans to resolve the issues are on track.

- **Reliability** – The Virginia Block I and II builds were developed prior to the requirement for a reliability growth program, which was imposed by the July 2008 USD(AT&L) Reliability, Availability, and Maintainability policy memo. The reliability growth program will be required as the program advances from MS III, and DSE is currently working with the program to develop a reliability growth program for the Block III-unique changes.
- **Systems Engineering Support of Life Cycle Management and Sustainability** – The new SEP will address life cycle management and sustainability. DSE is closely engaged in this area.
- **Software** – The Virginia class NPES contains the major software-related work for the program. NPES is a collection of programs that are managed outside the Program Management Office (PMO) and are delivered as Government-furnished equipment (GFE) to the primary submarine builder. The program has limited insight into how the GFE software development work is managed; however, the approach has proved successful.
- **Integration** – The program relies on GFE from more than 20 Participating Acquisition Resource Managers. Integration has been successfully controlled, but the program is endeavoring to insert more discipline into the process.
- **Manufacturing** – Quality problems continue in the shipyards, specifically Northrop Grumman Newport News, Virginia. The program reports that it is currently working to resolve an issue with welding inspection and manufacturing problems in the torpedo room.

Summary of FY 2009 Systems Engineering Assessments

- **Program Support Reviews (PSRs)** – DSE conducted a PSR in 2009 for the upcoming MS III Full-Rate Production decision. The PSR team concluded that the Virginia program is ready to proceed to MS III. PSR recommendations included the following:
  - PMO continue ongoing efforts to mitigate Special Hull Treatment and spherical array sonar self-noise deficiencies.
  - PMO develop a program SEP going forward (Blocks III and IV) for OSD approval within 120 days of the Defense Acquisition Board.
  - Program Manager require periodic reporting from its Participating Acquisition Resource Managers.
  - PMO initiate a reliability growth program to include NPES and main machinery subsystem components, and document the program in the Virginia SEP. Measure the initial Mean Time Between Failures for all critical subsystems.
  - Update the TIGER model (or equivalent) to ensure long-term logistics support.
  - PEO Subs implement a coordinated software metric tracking program for NPES.
- **Systems Engineering Principles and Best Practices** – Although it lacks a SEP, the Virginia program demonstrates strong systems engineering principles.
  - Use of Participating Acquisition Resource Managers allows PEO Subs to provide the platform, and the entire submarine force, with state-of-the-art systems.
  - Insertion of technology allows for a continual upgrade of warfighting capabilities.
  - The program maintains close integration with two shipyards, made possible by strong program management.
- **Program Health Metrics** – Technical Performance Measures have been met.
- **Conclusion** – The program is scheduled for Milestone III (Full-Rate Production decision) in the 3rd quarter FY 2010. The program is low technical risk; however, it is working toward closer integration of supporting systems, such as sonar and imaging systems, as well as solving several manufacturing problems (e.g., manufacturing quality, special hull treatment).

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6.3 Assessments of Air Force MDAPs

13 programs:

- Advanced Extremely High Frequency (AEHF) Satellite
- Battle Command Support-Fixed (BCS-F)
- C-5M Super Galaxy
  - Consists of two programs: C-5 Reliability Enhancement and Re-engining Program (RERP) and C-5 Avionics Modernization Program (AMP)
- C-5 Reliability Enhancement and Re-engining Program (RERP)
- C-130 Avionics Modernization Program (AMP)
- Combat Information Transport System (CITS)
- Global Hawk (RQ-4B) Unmanned Aircraft System
- HC/MC-130 Recapitalization (Recap)
- Integrated Strategic Planning and Analysis Network (ISPAN) Block 1
- Joint Cargo Aircraft (JCA)
- Mission Planning System (MPS) Increment IV
- MQ-9A Reaper Unmanned Aircraft System
- Wideband Global SATCOM (WGS)

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Advanced Extremely High Frequency (AEHF) Satellite

Prime Contractor: Lockheed Martin Space Systems and Northrop Grumman Space Technology

Executive Summary

Advanced Extremely High Frequency (AEHF) is a joint Service satellite communications system that provides global, survivable, secure, protected, and jam-resistant communications for high-priority military ground, sea, and air assets. The program is post Milestone (MS) B. The AEHF satellite communication system program continues to have three satellites in system-level integration and test.

Mission Description

The system consists of four satellites in Geosynchronous Earth Orbit and is designed to 10 times the capacity of the 1990s-era Milstar Block II satellites. It will provide continuous 24-hour Extremely High Frequency Extended Data Rate coverage between 65 degrees north and 65 degrees south latitude. AEHF allows the National Security Council and Combatant Commanders to control their tactical and strategic forces at all levels of conflict through general nuclear war and supports the attainment of information superiority.

System Description

The AEHF operational system consists of three segments: the Space Segment, the Mission Control Segment (MCS), and the Terminal (or User) Segment. The Space Segment includes an integrated constellation of Milstar and AEHF satellites to provide worldwide coverage. The MCS replaces the Milstar ground control system and controls both Milstar and AEHF satellites on orbit, monitors satellite health, and provides communication system planning and monitoring. The MCS consists of the Mission Operations Element, Mission Planning Element, Test and Training Simulation Element, and Operations Support and Sustainment Element. The Terminal Segment includes ground-fixed, ground-mobile, man-portable, transportable, airborne, submarine, and shipborne configurations.

Developmental Test and Evaluation Activity

- AEHF completed a significant risk reduction test (i.e., single Satellite Development Test).
- AEHF command and control (C2) system was used to successfully fly an operational Milstar satellite and demonstrated the ability to "fallback" Milstar to its currently operational C2 system.
- AEHF has developed an adequate developmental test (DT) strategy (i.e., the Program Manager conducted additional thermal vacuum testing on Space Vehicle (SV) 1 to complement other inter-segment tests and confirm correction of all technical issues identified in FY 2008).
- Government developmental software testing has identified major problems with software maturity, particularly in the Mission Planning Element. The Program Manager plans for a comprehensive test of the software in FY 2010.
- Work continues on investigating the root cause of the Security Processor (SEC) halts/stops, but a definitive root cause does not appear likely. The Government is evaluating a possible work-around.
- The Nuller Reflector finished thermal cycle testing in October 2009; results were nominal. The Program Manager, Chair of the Closure Failure Review Board, directed a "use-as-is" decision in December 2009. The decision will not limit the operational requirements document or degrade

performance. To assess potential reach-across issues, gimbal dish antenna and crosslink antenna coupon thermal testing is under way and expected to conclude in March 2010. Coupon samples from the crosslink reflector have developed small cracks after thermal cycling. Because the cracks degrade the surface reflectivity, mitigation is needed. A proposed solution, which adds heater strips to the reflector to regulate its temperature, is being reviewed to identify the impact to other systems.

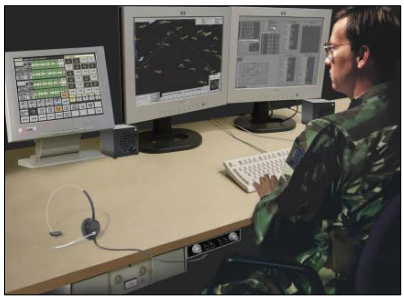
- Terminal Boards – SV-1 solar array repairs and testing were completed in August 2009. SV-2 repair and test are scheduled to start in December 2009. SV-3 solar array was dispositioned "use-as-is."
- AEHF submitted a revised draft Test and Evaluation Master Plan (TEMP) that incorporates substantial program changes and additional pre-launch DT&E/Operational Test and Evaluation (OT&E) opportunities since the approved TEMP in FY 2001. OSD/DDT&E expects to receive the Component-approved TEMP for OSD approval by the end of 2nd quarter CY 2010.
- Test Schedule: SV-1 hardware issues moved launch out to 4th quarter FY 2010, with a cascading effect on the launches of SV-2 and SV-3. The launch delay caused a schedule threshold breach for Initial Operational Capability (IOC).

Developmental Test and Evaluation Assessment

- T&E planning is adequate; however, the Air Force is analyzing an alternative strategy for AEHF anti-jam testing to support IOT&E. The new IOC date for SV-1 through SV-3 is dependent on resolution of the satellite hardware issues. IOC is met with two AEHF satellites operating at Extended Data Rate with Milstar backward compatibility. In August 2009, OSD recommended approval of an Acquisition Strategy adding SVs 4, 5, and 6 to the AEHF constellation because of the cancellation of the Transformational Satellite (TSAT) program. TSAT cancellation was not a factor in SV-4. The AEHF program must ensure an obsolescence plan is prepared to characterize the amount of system change due to Form-Fit-Function replacement of SV components that are no longer manufactured. AEHF is implementing a repair process that will eliminate the need for use of terminal boards. The TEMP in Component staffing needs to plan for adequate regression testing and Follow-on Test and Evaluation (both DT&E and OT&E) of those Form-Fit-Function changes; the system changes due to the addition of SVs 4, 5, and 6, interoperability testing with all available terminal variants; and the addition of more robust T&E early in the test cycle. The program added testing earlier in the test cycle for each SV based on lessons learned from prior T&E.
- AEHF has closed out all but one Acquisition Decision Memorandum action since August 2009 with the exception of the updated Acquisition Program Baseline (APB), signed by the Milestone Decision Authority. The program is updating cost and schedule parameters in the APB, and a draft copy is at HQ AF awaiting signature. OSD recommended approval of the Acquisition Strategy for SVs 4, 5, and 6 in August 2009.
- AEHF SV-1 completed the added thermal vacuum testing in July 2009 with no significant issues. Test data review of S-band self-compatibility test during SV-1 Final Integration System Test (FIST) was completed November 7, 2009. As a result of the data review and subsequent analysis, it was determined that a free radiation test will not be required. SV-2 remove and replace of multiple satellite boxes is complete, and acoustic testing completed in August 2009. FIST is scheduled to start January 2010. SV-3 Baseline Integration System Test began in September 2009 and completed testing in December 2009 with no significant issues. SV-3 completed side-by-side testing of the payload module and propulsion core; system-level spacecraft buildup is ongoing.
- AEHF is in the new Earned Value baseline and is executing ahead of the over target baseline. This performance positioned the program to investigate the possibility of a June 2010 launch, 3 months ahead of the current baseline schedule, September 2010. The program is assessing Deficiency Reporting data post-testing completion.

Battle Command Support-Fixed (BCS-F)

Prime Contractor: Thales-Raytheon



Executive Summary
The Battle Command Support-Fixed (BCS-F) is a tactical air sovereignty battle management command and control (C2) system that correlates data received from air, land, and sea elements into a common tactical picture. The BCS-F program began as a Rapid Acquisition Prototype System shortly after September 11, 2001. It is considered a mature legacy system that is undergoing incremental changes to provide new capabilities and enhancements. Key FY 2009 systems engineering activities included a Critical Design Review in November 2009.

Mission Description
BCS-F provides the North American Aerospace Defense Command (NORAD) air defense sectors, as well as the Hawaii and Alaska regional air operation centers, with common commercial off-the-shelf (COTS) hardware based on an open architecture software configuration. It enhances NORAD and Pacific Command (PACOM) commanders with a viable, interoperable, open architecture C2 and air battle management node capability to execute and support the mission of Air Sovereignty and Air Defense. Air defense operators employ BCS-F to provide enhanced surveillance, identification, and control of North American airspace; warning and assessment of aerospace attack; and control of air defense assets. Forces use the BCS-F to (1) monitor airborne activity in support of air sovereignty and air defense missions 24 hours per day, 365 days per year; (2) provide effective and integrated battle management of resources during peacetime, transition to war, attack, and post-attack periods; and (3) process, integrate, display, and distribute data from sensors, data links, and other C2 agencies to provide situational awareness and support air sovereignty operations.

System Description
The BCS-F Increment 1 program began under Electronic Systems Center contract F19628-03-C-0045 in April 2003. In 2004, Increment 2 replaced the processing and display portion of the legacy AN/FYQ-93 and its associated ancillary systems support equipment when it was fielded to six locations throughout the United States and Canada, and it provides a point of departure for the Increment 3 system. The BCS-F locations include five operational Air Operation Center/Air Defense Sectors and one support facility, all of which will be upgraded to the new Increment 3 architecture. Increment 3 will not change the management of air sovereignty or the management of the air defense battle. It will provide the operator with a new air defense operating system and faster processors with new capabilities and enhancements to the Increment 2 system.

Summary of FY 2009 Systems Engineering Activities
- **Systems Engineering Plan (SEP)** – BCS-F developed no SEP because the requirement for a SEP did not occur until after the program was a mature legacy system.
- **Requirements** – BCS-F developed no Capability Development Document or Capability Production Document as BCS-F was considered a mature legacy system that is undergoing incremental changes to provide new capabilities and enhancements. BCS-F has an interoperability Key Performance Parameter (KPP), which it is meeting.
- **Critical Technologies** – BCS-F does not have any critical technology elements.

- **Technical Reviews** – No systems engineering technical reviews were conducted in FY 2009. No technical reviews are scheduled for FY 2010.
- **Technical Issues and Risks** – The May 2009 Program Support Review (PSR) issues include inadequate contractor-Government interface/communication, information assurance, number of test events, and requirements management process. Plans to resolve the issues are on track.
- **Reliability** – The May 2009 PSR found no system reliability issues.
- **Systems Engineering Support of Life Cycle Management and Sustainability** – During sustainment, life cycle upgrades to COTS technology will be through COTS products.
- **Software** – The prime contractor was directed to remove BCS-M (Mobile) specific code from the software. There is approximately a $20M shortage in software development funding due to the removal of BCS-M participation in common software development. The May 2009 PSR recommended Program Management Office (PMO) ensure funding is transferred from BCS-M to BCS-F in order to fully fund the software development.
- **Integration** – BCS-F was able to achieve fundamental mission capability shortly after September 11, 2001, but the warfighter was dissatisfied with the current system capacity due to a lack of direct user participation in the system development process. Unmet user expectations are being resolved by evaluating user/operator performance expectations and including users/operators in Integrated Product Team and Working Group meetings.
- **Manufacturing** – The May 2009 PSR found that there were manufacturing issues despite a Prime Contractor Capability Maturity Model Integration (CMMI) Level 5 rating and a large number of CAT I and II Deficiency Reports for a CMMI Level 5 contracted program.

Summary of FY 2009 Systems Engineering Assessments

- **Program Support Reviews (PSRs)** – The May 2009 PSR discussed findings and provided actionable recommendations to The Deputy Assistant Secretary of Defense for Command, Control, Communications, Intelligence, Surveillance and Reconnaissance and Information Technology Acquisition (DASD/C3ISR & IT Acquisition), who requested this review.
- **Positive Observations** – Key Findings included the following: BCS-F achieved mission capability shortly after September 11, 2001. It is currently meeting the interoperability KPP. BCS-F and Three-Dimensional Expeditionary Long Range Radar (3DELRR) efficiently captured Battle Command System-Mobile (BCS-M) PMO resources. Following termination of BCS-M, personnel moved to 3DELRR and BCS-F PMOs.
- **Issues** – Increment 3 Initial Operational Capability is based on Configuration Control Board approval of Release 3.1 software, anticipated to occur at the Threshold date of February 2010; the schedule for software Release 3.2 is aggressive. The PMO is managing eight open risks from a January 2009, risk review. There is a lack of evidence of current key documentation, including the Government Acquisition Strategy Report, Systems Engineering Plan (perhaps because BCS-F is a mature system being sustained and upgraded), Capability Manufacturing Plan, Risk Management Plan, System Threat Assessment Report, and Information Support Plan; and the contractor Safety Analysis Report, System Design Plan, and Systems Engineering Management Plan.
- **Systems Engineering Principles and Best Practices**
  - The development of the Integrated Air Defense System for defending the National Capital Region from air threats was a rapid prototyping effort.
  - Involvement of Canada took advantage of previously developed best practices in NORAD.
- **Program Health Metrics** – Software development estimates planning is documented in the contractor's Technical Performance Measurement Plan.
- **Conclusion** – BCS-F has completed all milestones. It is a mature legacy system.

C-5M Super Galaxy

Prime Contractor: Lockheed Martin Aeronautics Company

Executive Summary
The C-5M program was approved for Milestone (MS) C in March 2008 and is in the Production and Deployment phase. Developmental testing was completed on Block 3.4 flight software in January 2009 and updated in July 2009. DSE completed a C-5 Fleet Software review in December 2008 and Assessment of Operational Test Readiness in August 2009. The C-5M program started Qualification Operational Test and Evaluation (QOT&E) in October 2009 and is scheduled to complete in early 2010.

Mission Description
The mission of the C-5 weapon system is to provide strategic delivery of outsized/oversized cargo and passengers primarily via air-land operations. C-5 missions include strategic airlift, aerial refueling (receiver), and emergency aeromedical evacuation. The aircraft must perform these missions throughout the worldwide air traffic control environment in all weather.

System Description
The C-5 is the largest strategic airlift platform in the DoD inventory. Manufactured by Lockheed Martin, it is a long-range, high-speed, high-altitude, swept-wing jet engine-powered airplane, designed for use as a heavy logistic transport. C-5M incorporates two programs: C-5 Reliability Enhancement and Re-engining Program (RERP) and C-5 Avionics Modernization Program (AMP).

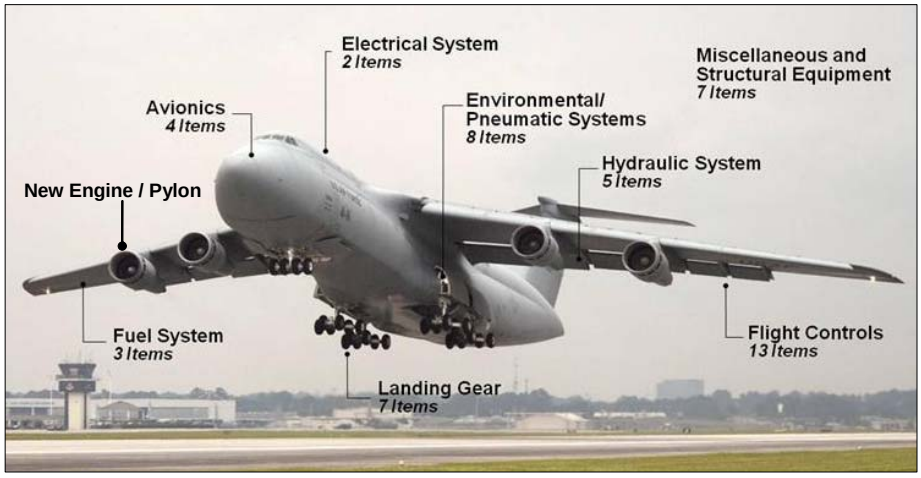
Summary of FY 2009 Systems Engineering Activities
- **Systems Engineering Plan (SEP)** – The C-5M RERP SEP was initially approved in July 2008 to support In-Process Review (IPR) Defense Acquisition Board (DAB) in December 2008. The DAB directed the update of the C-5 Fleet SEP, which was approved May 2009. An update of the Fleet SEP is planned in April 2010 to support Full-Rate Production DAB.
  - There are no approved waivers or deviations from the SEP.
  - The objectives of the SEP are being met. The program has established most of the major systems engineering management structures and processes outlined in the SEP.
- **Requirements** – The C-5 RERP Capabilities Production Document (CPD) was validated in March 2008. The C-5 RERP program has five Key Performance Parameters (KPPs). The parameters relate to reliability, aerodynamic performance, and environmental compliance. All of the KPPs are on track for being demonstrated by February 2010. QOT&E conducted October 2009 to January 2010 will evaluate the KPPs. The program requirements are stable and reasonable.
- **Critical Technologies** – The C-5M program does not have any critical technology elements.
- **Technical Reviews** – One systems engineering technical review was conducted in FY 2009. No technical reviews are scheduled for FY 2010.

  - C-5 Fleet Software Review – The software review was successfully conducted in December 2008 to review the status of C-5 AMP and RERP software baselines. The review indicated that the AMP and RERP software baselines were split exposing technical and cost risk to the program to maintain two baselines. The program has instituted recommendations provided by the review, and improvements are on track.
- **Technical Issues and Risks** – Issues the program is working include the funding impacts resulting from RMD 800, resolution of three technical issues, and test program planning with limited aircraft resources. Plans to resolve the technical issues are on track.
- **Reliability** – QOT&E is under way to evaluate progress in achieving the key reliability requirements. There is no reliability growth program on the current System Development and Demonstration contract. The SEP indicates fleet reliability will be monitored via the Aging Fleet Integrity and Reliability Management database. Seventy reliability enhancements were incorporated in the RERP program to address the systems with the highest failure rates or that contributed greatest to repair times.
- **Systems Engineering Support of Life Cycle Management and Sustainability** – The program will use interim contractor support through mid-2012 as organic service support is built up for RERP.
- **Software** – C-5 fleet software review in December 2008 found that at the point of the MS C decision, the AMP and RERP software baselines were split. The review identified three fleet software risks related to software insight, baseline management, and manpower. The improvements the program has made are on track to resolve the risk areas.
- **Integration** – As software block change updates are developed and installed, the Software Integrated Product Team and Integrated Test Team work to resolve discrepancies prior to fielding the new block of software.
- **Manufacturing** – The program used Low-Rate Initial Production assets to adjust manufacturing processes and planning. The program is on track to achieve Manufacturing Readiness Level 9 at the Full-Rate Production decision.

Summary of FY 2009 Systems Engineering Assessments

- **Program Support Reviews (PSRs)** – The C-5 RERP Assessment of Operational Test Readiness (AOTR) was conducted in August 2009 to assess program readiness to enter QOT&E. The AOTR in FY 2009 indicated that the program showed moderate to high risk of having a successful dedicated QOT&E due to technical issues identified in developmental test and evaluation (DT&E).
  - Positive observations included that the program followed a strong integrated test and evaluation management process.
  - Key findings included mitigations for a high number of discrepancy reports; the DT&E was not yet completed on some systems, making the dedicated OT&E moderate to high risk.
  - Major recommendations included the following: Define path to develop, test, and verify deferred capabilities; and develop fixes for identified deficiencies prior to the IPR DAB. The C-5M program has taken action to address these recommendations.
- **Systems Engineering Principles and Best Practices** – The C-5M program has implemented DoD systems engineering principles in technical program planning and execution.
- **Program Health Metrics** – Dedicated QOT&E is under way to evaluate technical performance measures.
- **Conclusion** – The program has a moderate risk rating pending the results of QOT&E, resolution of technical issues that could affect reliability, funding, and follow-on testing. The next major milestone is the Full-Rate Production decision.

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



Prime Contractor: Lockheed Martin Aeronautics Company

Executive Summary
The C-5 Reliability Enhancement and Re-engining Program (RERP) program builds upon the C-5 Avionics Modernization Program (AMP) with additional C-5 Reliability Enhancement and Re-engining the C-5Bs with new commercial engines. The program is currently in Qualification Operational Test and Evaluation (QOT&E), which is equivalent to Initial Operational Test and Evaluation. Upon completion of QOT&E and Beyond Low-Rate Initial Production (BLRIP) report, C-5Bs will undergo the C-5 RERP modifications.

Mission Description
The C-5 is one of only two military organic strategic airlift aircraft that contributes to the rapid global delivery capability of the Global Mobility Concept of Operations. The C-5's main contributions are its range, unmatched outsized/oversized cargo capacity, and integrated passenger carrying capability. The C-5 RERP program improves C-5 reliability while upgrading the engines.

System Description
C-5 RERP continues the modernization of the AMP-modified C-5s by incorporating the following features: integrates General Electric (GE) CF6-80C2-L1F engines (military designation F138-GE-100) with new nacelles, thrust reversers, and pylons onto the existing C-5 airframe; implements 50 reliability enhancement upgrades and other airframe structure and propulsion improvements; and records parameters for Military Flight Operations Quality Assurance.

Developmental Test and Evaluation Activity
- Developmental testing completed in the 4th quarter FY 2009 to support the C-5 RERP QOT&E, which started in 1st quarter FY 2010. The program maintains an active T&E Integrating Integrated Product Team.
- As directed by the Milestone C Acquisition Decision Memorandum (March 25, 2008), the Air Force constructed an overall C-5 Roadmap and Fleet Test and Evaluation Master Plan (TEMP) to better coordinate and plan across the separate C-5 upgrade programs. The C-5 RERP TEMP is being updated to build from the Fleet TEMP, which OSD approved in September 2009.

Developmental Test and Evaluation Assessment

- The program is currently planning additional developmental test and evaluation to resolve deficiencies discovered during QOT&E.
- The system is on track to meet all five Key Performance Parameters (KPPs). Developmental testing supported the C-5 RERP Assessment of Operational Test Readiness (AOTR) conducted in August 2009 to assess program readiness to enter QOT&E. The AOTR indicated that the program was high risk of not having a successful dedicated QOT&E due to technical issues identified during developmental test and evaluation. The AOTR identified the following:
  - Positive observations included the program had implemented a strong integrated test and evaluation management process.
  - Key finding: The program had a high number of mitigation/work-around plans for entry into QOT&E with issues discovered during developmental test. These factors combined with incomplete DT&E on some systems make the dedicated QOT&E high risk.
  - Issues identified:
    - In-flight use of the thrust reversers, Built-in Test system, auto throttle, and the Environmental Control System did not meet requirements. Work-arounds have been established to mitigate the risks, but the underlying issues remain and will have to be retested when fixes are in place.
    - Significant other deficiencies need to be corrected and verified.
    - Block 3.4 Operational Flight Program software did not fix all the outstanding issues prior to the start of QOT&E.
    - Real-world suitability may be affected by new civil navigation requirements, which changed after the associated C-5 RERP KPP was written and tested.
  - Major AOTR recommendations:
    - Define path to develop, test, and verify deferred capabilities and fixes for identified deficiencies prior to QOT&E start.
    - Scope and resource now for Follow-on Operational Test and Evaluation activities.
      - Impose robust, integrated verification of technical issues and implement deferred capabilities.
      - Prioritize the correction of identified deficiencies from developmental test and QOT&E.
- At OSD's request, the Air Force constructed an overall C-5 Roadmap and Fleet TEMP to better coordinate and plan across individual programs. The C-5 RERP TEMP is being updated to build from the Fleet TEMP. The program has completed planned developmental testing, but the system needs more testing to ensure that issues found during developmental test are resolved. The program maintains an active T&E Integrating Integrated Product Team, which it leverages effectively.

C-130 Avionics Modernization Program (AMP)

C-130 AMP Cockpit Layout

Prime Contractor: Boeing

Executive Summary
The C-130 Avionics Modernization Program (AMP) upgrades the cockpit layout, navigation, real-time information, night-vision, and avionics-sustainment systems and corrects deficiencies in the legacy C-130 fleet. The C-130 AMP is in the Engineering and Manufacturing Development phase. There were no key systems engineering activities in FY 2009, and the program completed most of the formal developmental test and evaluation activities in FY 2009. However, due to Air Force budget shortfalls, the Milestone (MS) C date was postponed until March 2010.

Mission Description
Units equipped with the C-130 perform the tactical airlift combat delivery mission.

System Description
The C-130 AMP addresses avionics sustainability and capability enhancements (in particular Communication/Navigation/Surveillance and Air Traffic Management (CNS/ATM)), using existing glass-cockpit technology. The C-130 AMP was originally intended for the entire C-130 fleet. However, recapitalization decisions and a Nunn-McCurdy breach in FY 2007 de-scoped the program from more than 500 aircraft to the current 221 aircraft in three different mission design series (MDS): C-130 H2, H2.5, and H3. C-130 AMP Phase II is a separate pre-Major Defense Acquisition Program planned to update the cockpits of the remaining C-130 MDS aircraft that were not scheduled for recapitalization. At the Department's direction, AMP funding issues are being addressed by the Air Force.

Developmental Test and Evaluation Activity
The C-130 AMP completed developmental test in December 2009 and is proceeding to Initial Operational Test and Evaluation (IOT&E) scheduled for FY 2011. The Test and Evaluation Master Plan (TEMP) was approved in February 2008.

Developmental Test and Evaluation Assessment

- The C-130 AMP program has a mature and stable test organization and structure. The program is executing test points in accordance with the TEMP and Detailed Test Plans, and conducts weekly teleconferences to update the T&E Working Integrated Product Team members. Developmental testing was completed in December 2009.
- Developmental testing to date indicates that the C-130 AMP has met or is on track to attain all six of its Key Performance Parameters (KPPs). Similarly, the aircraft has verified or is on track to meet all five of its Key System Attributes. A final software build will add improved navigation capabilities in the summer of 2010.
- Although the Director, Operational Test and Evaluation (DOT&E) has required four production-representative aircraft for IOT&E, the program has current authorization for only the three developmental test aircraft, which will be brought up to production specifications, plus two additional modification kits. The program was working with DOT&E to receive approval to execute IOT&E with the three existing aircraft.

Summary of FY 2009 Systems Engineering Activities

- **Systems Engineering Plan (SEP)** – The SEP was approved September 12, 2008, to support a MS C decision. An update is planned by the System Program Office to reflect current engineering processes, requirements, and test status/plans.
  - There are no approved waivers or deviations from the SEP.
  - The objectives of the SEP are being met.
- **Requirements** – The Capability Production Document was approved in FY 2008 to support the MS C but required an update late in 2008 to correct the reliability parameter.
  - The program has six KPPs: CNS/ATM and Navigation-Safety compliance, Baseline Cockpit Layout, Net-Ready, Force Protection, Materiel Availability, and Integrated Defensive System Situational Awareness (Survivability). The test program shows that the program has the capability to meet the requirements subject to the risks noted above.
  - The program requirements are stable and reasonable.
  - One Configuration Steering Board was conducted in FY 2009.
- **Critical Technologies** – The program does not have any critical technology elements. The Air Force reviewed and approved a Technology Readiness Assessment in September 2008. All AMP components are currently assessed at a Technology Readiness Level 9.
- **Technical Reviews –** No systems engineering reviews were conducted in FY 2009. A Functional Configuration Audit is scheduled for completion in FY 2010.
- **Technical Issues and Risks –** Issues the program is working include the late delivery and integration of an integrated maintenance information system and delays in data needed for a component of the defensive system. Mitigation plans are on track.
  - Risks the program is addressing include mission processor throughput, technical publications delivery schedule, and limited tactical mission testing. Plans to resolve them are on track and include infrastructure design changes and optimization of the mission processer architecture, reduction in cycle time for publications, and increased air drop testing.
- **Reliability –** The program has the capability to meet the reliability objectives after the Joint Reliability and Maintainability Evaluation Team improved the reliability growth efforts by identifying and fixing an incorrect requirement, and standardizing scoring across developmental and operational test events. However, the program needs to aggressively commit to correcting any remaining deficiencies to further reduce AMP reliability risk.

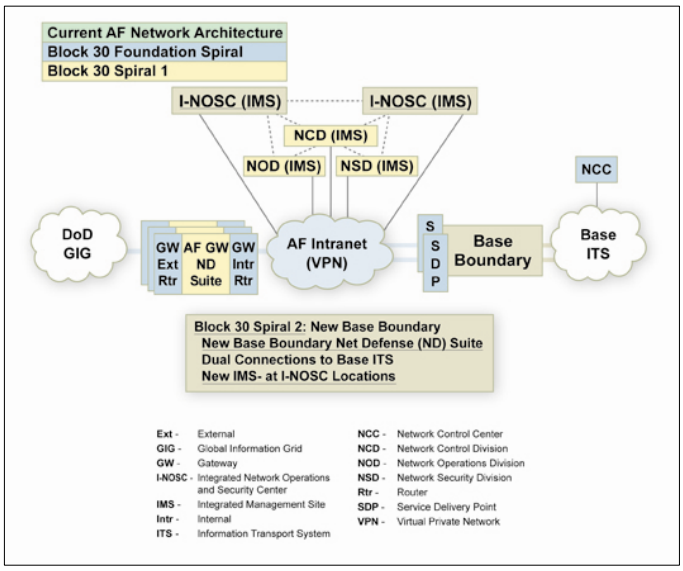
- **Systems Engineering Support of Life Cycle Management and Sustainability** – Implementation of sustainment metrics relies heavily on the electronic maintenance management and debrief system, which may not be mature enough for operational testing due to the late delivery of the software. The depot source of repair and logistics plans have been finalized, but software sustainment will be challenging.
- **Software** – The pre-production software had a large number of discrepancies related to AMP functionality and utility. However, most onboard discrepancies were fixed in later versions of the software.
- **Integration** – The avionics has open-architecture features, but the program will need to be vigilant for diminishing manufacturing sources and growth capability on key components. The AMP program does not address the aging issues and high ownership costs of the basic "green" C-130 aircraft.
- **Manufacturing** – The Production Readiness Review (PRR) conducted in March 2008 found no major risks for the production phase. However, the potential for expanded production at Air Logistics Centers was not assessed at the PRR. Exit criteria for LRIP include an independent manufacturing risk assessment and proof of kit installs at industry locations and Air Logistics Centers.

Summary of FY 2009 Systems Engineering Assessments

- **Program Support Reviews (PSRs)** – A PSR was conducted in August–October 2008 to support MS C.
  - Positive findings included completion of production configuration functionality, and identifying and correcting the incorrect reliability parameter noted above.
  - Key findings were noted in reliability, software, sustainment, and resource areas. In addition, the LRIP plan with multiple vendors and Air Logistics Centers was deemed excessively complex and schedule-challenged, and it would cost more than a simpler sole-source award to the AMP contractor.
  - Major PSR recommendations were to address the mission processor limitations and increase program management attention in the findings areas noted above.
- **Systems Engineering Principles and Best Practices –** Despite the delays and funding issues, the developmental test program completed the AMP test points largely on the planned burn-down schedules with no high-priority deficiencies noted.
- **Program Health Metrics** – The program receives reports of technical performance measures (TPMs) during periodic contractor reviews in the areas of avionics, software, system performance, and reliability. Except for the maintenance management system noted above, TPMs are tracking to plan.
- **Conclusion** – The C-130 AMP program is low technical risk with MS C planned for March 2010.

Combat Information Transport System (CITS) / Second Generation Wireless Local Area Network (2GWLAN)

Prime Contractor: General Dynamics



Executive Summary
The Air Force Second-Generation Wireless Local Area Network (2GWLAN) program is the Combat Information Transport System (CITS) Program Management Office's standard solution to provide wireless information transport capability to Air Force sites worldwide.

Mission Description
CITS will enable integrated network management of the Global Information Grid–Air Force (GIG-AF) by the Integrated-Network Operation Security Centers. It provides wireless connectivity that enables the F-22 maintenance concept and will consolidate telecom management at the Integrated-Network Operation Security Centers. It lays ground work for flexible new technology (i.e., Voice over Internet Protocol). The program will provide standardized classified and unclassified wireless services to designated core buildings at 97 Air Force sites.

System Description
The CITS program fields base-wide communication infrastructure and standardized network defense tools, network management tools, and transport required to remotely operate the Air Force network. These capabilities are critical to the Air Force Network Operations Commander's ability to centrally defend, operate, and manage the Air Force component of the Defense Information Infrastructure.

Summary of FY 2009 Systems Engineering Activities
- The DoD Inspector General conducted a performance audit of the 2GWLAN program from November 2007 to June 2008. In its draft report, the Inspector General recommended that the Assistant Secretary of Defense for Networks and Information Integration (ASD(NII)) review the program, with an emphasis on 2GWLAN.
- **Requirements** – Requirements, derived from the 1998 Operational Requirements Document, are to provide: information technology infrastructure for fixed Air Force bases worldwide; information Transport System including wireless systems for fixed bases worldwide; and Enterprise-level Network Management/Network Defense for the GIG-AF.
- **Technical Issues and Risks** – The 2008/2009 Program Support Review identified six significant program risks:
  - Specific goals are unlikely to be met after funds are exhausted.
    - Driver: Lack of acquisition management rigor.
    - Recommendations: Restructure and staff CITS to comply with DoD 5000; apply appropriate ASD(NII) oversight mechanisms.
  - 2GWLAN has residual information assurance deficiencies from 1GEN legacy.

    - Driver: Expansion contract was not in sync with 2GWLAN installations.
    - Recommendation: Synchronize high-security mitigations for legacy with 2GWLAN roll-out.
  - End-to-end AF network performance is insufficient.
    - Driver: Systems engineering is deficient.
    - Recommendation: The program should adopt prototyping methods using systems engineering principles.
  - Infrastructure/Air Force Network Operations staffing is insufficient to manage the network.
    - Driver: Air Force staffing reductions, and other consolidation efforts.
    - Recommendation: Conduct staffing analysis and synchronize manpower and CITS functionality migration with Integrated-Network Operation Security Centers maturity (mitigate premature staff reductions).
  - The overall performance of the 2GWLAN is insufficient to meet the needs of the user.
    - Driver: Lack of risk reduction and systems engineering.
    - Recommendation: Identify alternative materiel and non-materiel solutions and fund risk reduction to improve overall performance.
  - GIG interoperability is at risk.
    - Driver: Lack of robust architecture.
    - Recommendation: Embark on rigorous architecture development.
- **Reliability** – Finding from 2008 Program Support Review: The program has no capability to measure reliability performance (a Key Performance Parameter).
- **Software** – The program uses commercial off-the-shelf (COTS) software.
- **Integration** – COTS software is integrated by contractors.

Summary of FY 2009 Systems Engineering Assessments

- **Program Support Reviews (PSRs)** – DSE performed a PSR in response to the recommendations in the DoD Inspector General's report, and with the concurrence of Deputy Under Secretary of Defense for Acquisition and Technology/Systems and Software Engineering. In response to the review, the Air Force agreed to restructure the CITS/2GWLAN program. The restructure plans responded to all significant CITS/2GWLAN PSR recommendations:
  - Restructure and staff CITS to comply with DoD 5000. Synchronize high-security mitigations for legacy with the 2GWLAN roll-out.
  - Adopt prototyping methods using systems engineering principles.
  - Conduct staffing analysis and synchronize manpower and CITS functionality migration with Integrated Network Operations Security Center maturity (mitigate premature staff reductions).
  - Identify alternative materiel and non-materiel solutions and fund risk reduction to improve overall performance.
  - Embark on rigorous architecture development (as-is and to-be), considering updated capabilities needs and operational concepts.
  - Develop migration plan and structure CITS efforts to achieve an objective baseline. Structure CITS efforts and staff CITS to achieve above; apply appropriate ASD(NII) oversight.
  - Support technology exploration and risk reduction activities; account for tech refresh and sustainability.
  - Perform risk reduction and systems engineering improvement to ensure end-to-end CITS network performance and continuity of operations.
  - For 2GWLAN wireless connectivity, examine alternatives and synchronize maximum mitigations for legacy with the 2GWLAN roll-out.
- **Conclusion –** CITS has restructured its effort into two discrete ACAT IAC MAIS efforts that allow management of cost, performance, and schedule.

Global Hawk (RQ-4B) Unmanned Aircraft System

Prime Contractor: Northrop Grumman

Executive Summary
The Global Hawk unmanned aircraft system (UAS) provides multiple sensor capability to the theater of operations. The program is simultaneously in the Engineering and Manufacturing Development, Production and Deployment, and Operations and Support phases. The system has completed 63 percent of its procurement during Low-Rate Initial Production and still has approximately 40 percent of its testing to complete before the start of operational test. The program continues to experience numerous schedule delays to completing operational test and entering Full-Rate Production.

Mission Description
The Global Hawk RQ-4B is a high-altitude, long-endurance UAS and integrated sensor system used to provide intelligence, surveillance, and reconnaissance capability to combatant commands. The system provides high-resolution, high-quality, digital imagery of tactical targets and other critical areas of interest in near real time. Aircraft imagery is typically down-linked to the Ground System (GS), but it can be down-linked directly to ground forces.

System Description
The RQ-4 system is composed of GS and five configurations (blocks) of aircraft. The program stemmed from a successful Advanced Concept Technology Demonstration (ACTD) developed by the Defense Advanced Research Programs Agency in 2002. There are four basic Block configurations incorporating various improvements:

- Block 10, original design supporting operations today
- Block 20, basic Block 10 functionality with Enhanced Integrated Sensor Suite (EISS)
- Block 30, Block 20 capability with the addition of signals intelligence gathering using the Airborne Signals Intelligence Payload (ASIP)
- Block 40, new configuration which replaces both the EISS sensors and the ASIP packages with the Multi-Platform Radar Technology Insertion Program sensor package.
- Modified Block 20, to support a May 2009 Joint Urgent Operational Need with the Battlefield Airborne Communications Node payload

Summary of FY 2009 Systems Engineering Activities

- **Systems Engineering Plan (SEP)** – The Global Hawk SEP was initially approved July 7, 2007, but the majority of the information has not been updated since its submission September 2005. Between the submission and approval, the program experienced a Nunn-McCurdy breach, which restructured the program. There are no planned updates. There are no approved waivers or deviations from the SEP. Numerous program meetings have verified that the objectives of the SEP are not being met, and the document is not being actively maintained. This will be addressed in the next Defense Acquisition Board (DAB) In-Progress Review (IPR).

- **Requirements** – The Capability Development Document was validated in May 2005. The Global Hawk program has five Key Performance Parameters (KPPs) to include endurance, world-wide operations, dynamic control, net-ready, and battle space awareness. The program reports that it is on track to demonstrate the KPPs by 2012 during Initial Operational Test and Evaluation, but this has not been independently assessed. Program requirements have continually grown to incorporate new warfighter needs resulting in the multi-block procurement strategy.
- **Critical Technologies** – The Global Hawk program has critical technologies related to its various sensor package capabilities. The Technology Readiness Levels of these critical technologies have not been assessed. As part of the Section 2366B post-Preliminary Design Review MS B certification, a Technology Readiness Assessment is required.
- **Technical Reviews** – No program-identified systems engineering technical reviews were conducted in FY 2009, and none are planned for FY 2010.
- **Technical Issues and Risks** – Issues include system reliability, test scheduling, and conducting an end-to-end system capability demonstration. Reviews have not demonstrated satisfactory plans to resolve these issues. Action meetings with OSD staff and plans to resolve these issues have been directed as part of the FY 2009 DAB IPRs and Acquisition Decision Memorandums.
- **Reliability** – The program has a reliability mission requirement of 85 percent Effective Time on Station over a single 30-day deployment. The program has not collected appropriate data to determine if this requirement is achievable. Measurements of Mean Time Between Critical Failures are showing a predicted capability of only one-tenth of the required 100 hours. DSE has hosted meetings with the Program Office in an attempt to develop a reliability growth plan. No funding has been allocated to support reliability improvement, and there is a high probability of failing operational test.
- **Systems Engineering Support of Life Cycle Management and Sustainability** – Insufficient investment in life cycle management and sustainability is evidenced by poor system availability. The current plans are reactive in nature and not a systemic sustainability optimization and comprehensive life cycle approach.
- **Software** – The program has not collected adequate software development metrics. The program has developed more than 3.4 million lines of code, but the program does not have a plan for sustainment, test fixes, and future upgrade development efforts, cost, schedule, or staffing.
- **Integration** – The sensor packages are being developed as separate programs from the aircraft program. The necessary planning to ensure system-level capability has not occurred. The program does not have fully defined DoD Architecture Framework views and has not performed adequate evaluation of the system.
- **Manufacturing** – The program does not have any significant manufacturing efforts.

Summary of FY 2009 Systems Engineering Assessments

- **Program Support Reviews (PSRs)** – There were no assessments of the program in FY 2009.
- **Systems Engineering Principles and Best Practices** – In transitioning from an ACTD to an ACAT-ID program, systems engineering disciplines and processes were underfunded and underscoped. The early success and desire for quick fielding were a disincentive to following best practices and sound processes. The lack of these processes has contributed significantly to a 30-month delay in the program since 2006.
- **Program Health Metrics** – The program is not managed with Technical Performance Measures.
- **Conclusion** – Despite continuous engagement, the program has a high-risk rating pending the determination of actual system capability, resolution of reliability concerns, competing priorities of simultaneous block builds, unit cost growth, and schedule delays to completing operational test and entering Full-Rate Production.

HC/MC-130 Recapitalization (Recap)

Prime Contractor: Lockheed Martin Aeronautics Company

Executive Summary: The HC/MC-130 Recap program will replace the existing fleet of old HC-130 and MC-130 aircraft. The Recap is a pre-MDAP program entering at Milestone (MS) C in January 2010. Mitigation plans are in place to address schedule and technical risks.

Mission Description

The Recap is an extended-range, combat rescue version of the C-130J transport aircraft. The HC primary mission is to provide air refueling for rescue helicopters. The MC aircraft are used by U.S. Special Operations Command (USSOCOM) for air refueling of special operations forces (SOF) vehicles as well as for the insertion and recovery of special mission teams.

System Description

The HC/MC-130 Recap program will replace a mixed assortment of 37 aged HC-130 and 37 MC-130 aircraft. The core configuration of the HC/MC-130 Recap uses the U.S. Marine Corps KC-130J as the baseline design with several modifications to support the mission. USSOCOM will fund the integration of additional special operations-unique capabilities in several increments for the MC configuration under a separate Major Force Program-11, Acquisition Category (ACAT) III program. The Air Force plans to provide future block upgrades by leveraging the C-130J Block 7-9 programs.

Summary of FY 09 Systems Engineering Activities

- **Systems Engineering Plan** – The MS C Systems Engineering Plan (SEP) is dated July 24, 2009. The program will provide a waiver for the use of Hexavalent Chrome in finishes on the airframe and other major components. The objectives of the SEP are being met.
- **Requirements** – A Capability Production Document for the core configuration is dated May 18, 2009, and was approved by the Joint Requirements Oversight Council on August 13, 2009. The program has five Key Performance Parameters (KPPs): simultaneous air refueling (two Combat Search and Rescue or SOF rotary wing receivers, also must refuel on M/CV-22), Net-Ready, Survivability (infra-red signature and threat warning), Force Protection, and Materiel Availability. Preliminary analysis shows the program has the capability to meet the KPP requirements, although there is a long-term risk of achieving the Availability KPP without a viable reliability growth program. The major requirements are stable and reasonable. The Air Force conducted a Configuration Steering Board in August 2009. Topics included program strategy, configuration, schedule, funding, and quantities.
- **Critical Technologies** – The Air Force completed a Technology Readiness Assessment in October 2009. The assessment identified one critical technology, the electro-optical infrared (EO/IR) sensor, and assessed the sensor at Technology Readiness Level 7.
- **Technical Reviews** – Three systems engineering reviews were conducted in FY 2009. One independent review of the HC-130 Fleet was conducted in FY 2009. One review is scheduled for completion in FY 2010.
  - The program conducted a core-configuration Preliminary Design Review in November 2008.

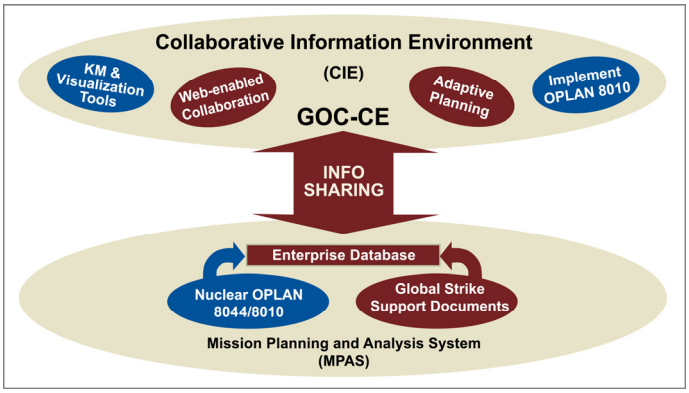
  - The program conducted a Critical Design Review in May 2009. The program will work with the contractor to update Configuration Management to be consistent with Department of Defense Instruction (DoDI) 5000.02.
  - In June 2009, at the request of the USD(AT&L), DSE personnel with support from AT&L staff conducted a review of the existing HC-130 fleet. The results showed that it is aged, is expensive to operate, is minimally capable, and should be replaced.
  - The program conducted a tailored Production Readiness Review in July 2009, which showed moderate risks in this area.
- **Technical Issues and Risks** – In 2009 the Recap program, with OSD oversight, addressed numerous acquisition planning, funding, technical documentation, and management issues of which many have been satisfactorily addressed prior to the MS C date. Risks being addressed are in schedule, integration, test, production, and logistics areas. Plans to resolve them are on track.
- **Reliability** – The program has the capability to meet the availability and reliability objectives and plans a reliability growth program.
- **Systems Engineering Support of Life Cycle Management and Sustainability** – Because a non-developmental acquisition approach was assumed, there were missed opportunities to further reduce sustainment and production costs in the Recap design.
- **Software** – The platform software is low technical risk; however, the maintenance support Data Transfer and Diagnostics System (DTADS) software is reliant on the C-130J program for development. The DTADS continues to trend behind schedule, which in turn may have an impact on the Recap test schedule.
- **Integration** – The Air Force Program Office assumed the performance risk for Recap. The USSOCOM's ACAT III program plans to integrate a complex, undefined capability increment starting in 2010. Many of the C-130J avionics components are proprietary with the overall design lacking desired open-systems architecture features.
- **Manufacturing** – The Production Readiness Review noted moderate risks for production. The exit criterion for Low-Rate Initial Production requires a Manufacturing Readiness Level of 9.

Summary of FY 2009 Systems Engineering Assessments

- **Program Support Reviews** – DSE completed a Program Support Review in September 2009 to assess technical planning and management of the program prior to MS C and entry into the Production and Deployment phase.
  - Positive findings showed the System Program Office (SPO) was aggressively executing toward a 2012 initial operational capability and using an inline modification strategy for the core design.
  - Key findings showed a medium risk schedule for Initial Operational Capability, and shortfalls in logistics and production planning. The technical risk for the modifications is low, but the SPO needs to more fully address the integration and test risk.
  - Major recommendations for the SPO included performing assessments on the industrial base's ability to support an increased production rate and reducing ownership costs, fixes of technical documents, and increased management attention on schedule and staffing vacancies.
- **Systems Engineering Principles and Best Practices** – The "inline" strategy of integrating the design of the HC modifications with the KC-130J prior to assembly on the production line significantly reduced unit costs.
- **Program Health Metrics** – Technical Performance Parameters are listed in the Test and Evaluation Master Plan and will be tracked during contractor and Government test, with evaluation starting in FY 2011.
- **Conclusion** – The HC/MC-130 Recap program is low technical risk but medium schedule risk. The MS C is planned in 2nd quarter FY 2010.

Integrated Strategic Planning and Analysis Network (ISPAN)

Prime Contractor: Lockheed Martin



Executive Summary

The Integrated Strategic Planning and Analysis Network (ISPAN) Block 1 program is in the Production and Deployment phase. Block 1 is being fielded. Block 1 Milestone (MS) C was held in January 2009 with Initial Operational Capability awarded in January 2009 and Full Operational Capability scheduled for July 2010. Increment 2 is in the Technology Development phase and had a pre-MS B Preliminary Design Review in November 2009. Increment 2 MS B is scheduled for March 2010.

Mission Description

ISPAN is modernizing the existing nuclear planning process and system that are primarily designed to plan and analyze Strategic Nuclear Forces (SNF) and to assist with planning, analysis, and employment of Non-SNF.

System Description

ISPAN will support the evolving U.S. Strategic Command mission to establish and provide full-spectrum global strike, integrated missile defense, space, information operations, and C4ISR (command, control, communications, computers, intelligence, surveillance, and reconnaissance) capabilities to meet deterrent and decisive national security objectives. It will interoperate with other DoD planning systems.

Summary of FY 2009 Systems Engineering Activities

- Key FY 2009 systems engineering activities for Increment 2 included the Materiel Development Decision in September 2009 and a pre-MS B Preliminary Design Review in November 2009.
- **Systems Engineering Plan (SEP)** – The ISPAN SEP was last coordinated with OSD Systems Engineering in August 2008 to support a Block 1 MS C decision. There are no approved waivers or deviations from the SEP. The objectives of the SEP are being met.
- **Requirements** – The Block 1 Capability Production Document was approved by the Joint Requirements Oversight Council in January 2009. Increment 2 capabilities are defined in the ISPAN Initial Capabilities Document approved in April 2009. As of October 2009, the resulting Increment 2 Capability Development Document (CDD) is in the Joint Capabilities Integration and Development System (JCIDS) approval process. The CDD will address the remainder of the ISPAN modernization to be achieved in Increments 2, 3, 4, and 5.
  - The Block 1 program has eight Key Performance Parameters (KPPs). All Block 1 KPPs, as defined within the CDD, were complete at Initial Operational Capability, January 2009.
- **Critical Technologies** – There are no new critical technology elements in Increment 2 and no Critical Program Information will be used within any increment of ISPAN. ISPAN uses commercial off-the-shelf (COTS) hardware and both COTS and Government off-the-shelf software as defined in DoD Directive 5200.39, Security, Intelligence, and Counterintelligence Support to Acquisition Program Protection, September 10, 1997.
- **Technical Reviews** – DSE did not participate in Increment 2 technical reviews in FY 2009.

- **Technical Issues and Risks** – Priority Increment 2 risks relate to technical areas and schedule.
  - Technical risks being addressed include information assurance (IA) vulnerabilities and cross-domain information exchange. Risk reduction efforts include using established IA vulnerability processes to patch all software, using a computer network defense security provider to supply active defense at all locations, following DoD IA Certification and Accreditation Process (DoDI 8500.2) to certify and accredit all networks and systems. For cross-domain information exchange, risk reduction includes using Unified Cross Domain Management Office references for guards.
  - Schedule risks include short increments adding to schedule pressure and Operational Test Agency (OTA) support to frequent deliveries. For schedule pressure, risk reduction efforts include advocating for and obtaining U.S. Air Force, Electronic Systems Center (ESC) Air Force, and OSD support for a streamlined documentation process; implementing Quarterly Program Reviews to speed the decision process; and developing a plan to extend Increments to adapt to traditional approach. For OTA support, risk reduction efforts include frequent interaction with OTA and their support based on Risk Assessment Level of Testing assessment. ISPAN Increment 2 is under consideration to become a pilot program for a new acquisition process that streamlines Information Technology (IT) developments. If implemented, the new IT acquisition process will add risk to the program's schedule.
- **Reliability** – Reliability is a key driver in formulating the system. System reliability and availability requirements drive the selection of COTS and the structure of the software architecture.
- **Systems Engineering Support of Life Cycle Management and Sustainability** – During sustainment, life cycle upgrades to COTS technology will be through COTS products.
- **Software** – Quantitative Software Management independent analysis determined Block 1 software schedule; productivity and project efforts are normal as compared to industry averages.
- **Integration** – The contractor and the System Program Office (SPO) work together to develop an integration strategy for new tools based on the tool's maturity and the status of the ISPAN architecture. The SPO has established relationships with other SPOs to ensure changes do not negatively affect the ISPAN environment.

Summary of FY 2009 Systems Engineering Assessments

- **Program Support Reviews (PSRs)** – A PSR was conducted in May 2008 to support Block 1 MS C decision. The PSR determined that the program had made significant progress following Block 1 rebaselining and program was on track to meet the new MS C decision date.
  - Positive observations included early integration of Functional Managers/users into development and testing, contractor developmental tool usage and Air Force Operational Test and Evaluation Center (AFOTEC) onsite support.
  - Key findings included requirements development did not adhere to a strict process and personnel shortages related to remote location.
  - Major recommendations: ESC and AFOTEC make ISPAN a priority, fill critical SPO positions, and maintain appropriate support; maintain derived requirements definition and changes to the Allocated Baseline in the Requirements Traceability Matrix (RTM); continue to follow the RTM change process in the SEP, including Program Manager approve changes with the concurrence of the Functional Manager and include links to requirements in JCIDS documents. The program has taken action to address the recommendations.
- **Systems Engineering Principles and Best Practices** – Use of on-site test team recommended for ISPAN and similar systems with rapid capability production tempo and numerous OT events.
- **Conclusion** – Block 1 Full Operational Capability is scheduled for July 2010. Increment 2 is in the Technology Development phase with MS B scheduled for March 2010. The program is low risk based on analysis of PSR results and success in fielding Block 1.

Joint Cargo Aircraft (JCA)

Prime Contractor: L-3 Integrated Systems

Executive Description
The Joint Cargo Aircraft (JCA) program is a non-developmental fixed-wing cargo aircraft procured by the Air Force for time-sensitive support of forward-deployed Army units. The JCA program is in Low-Rate Initial Production (LRIP) after Milestone (MS) C was held in May 2007. In April 2009, DoD Resource Management Decision 802 changed the direction of the program by reducing the production quantity from 78 to 38 aircraft, and transferring both the Army mission and program management to the Air Force. Mitigation plans are in place to address technical and schedule risks.

Mission Description
The JCA provides intra-theater airlift and on-demand transport of time-sensitive mission-critical cargo and personnel to forward-deployed units.

System Description
The JCA is a multifunctional fixed-wing cargo aircraft. L-3 is modifying the industrial baseline Italian C-27J design to incorporate defensive systems, GPS-capable avionics, and other components needed to meet the specific JCA mission requirements. No specific block upgrades are planned.

Summary of FY 09 Systems Engineering Activities

- **Systems Engineering Plan (SEP)** – The SEP was approved in February 2008, for LRIP. The Air Force Program Office will submit an update to support the Full-Rate Production (FRP) decision in FY 2011. There are no approved waivers or deviations from the SEP. The objectives of the SEP are being met.
- **Requirements** – The Joint Requirements Oversight Council approved the JCA Capability Development Document, in lieu of a Capability Production Document, in May 2007. The program has six Key Performance Parameters (KPPs): Net Ready, Self-Deployment, Enhanced Takeoff and Landing Performance, Transloadability (required cargo loads), Survivability, and Force Protection. The JCA is expected to meet all KPP requirements, but there may be some non-KPP shortfalls. The program requirements are stable and reasonable. No Configuration Steering Board was conducted in calendar year 2009.
- **Critical Technologies** – The program does not have any critical technology elements. A technology readiness assessment was conducted in 2007 to support the MS C decision.
- **Technical Reviews** – One systems engineering review was conducted in FY 2009. Two are scheduled for FY 2010.
  - Four Incremental System Verification Reviews were conducted in FY 2009. They will be completed in FY 2010 and will determine if the system has met its technical requirements by focusing on system specification compliance.
- **Technical Issues and Risks** – Issues the program is working include funding and planning impacts resulting from Resource Management Decision 802 and the need for a fourth LRIP lot

buy. Additional issues include test program delays due to strained resources for training and aircraft availability. Plans to resolve the issues are on track.
  - Risks being addressed include further delays to the test schedule and lack of a defined long-term sustainment plan. Plans to resolve risks are on track and include increased management attention on training, sustainment analyses, and deficiency-fix activities.
- **Reliability** – The program has an adequate reliability, availability, and maintainability plan. The contract includes incentives for the contractor to maintain availability of the aircraft during the applicable period of the interim support contract; however, as a result of the non-developmental item (NDI) acquisition approach, there are no plans to adjust the JCA design to further reduce ownership costs.
- **Systems Engineering Support of Life Cycle Management and Sustainability** – The program plans to use Contractor Logistics Support through at least FY 2012. The final sustainment approach is currently unknown until a Business Case Analysis (BCA), Depot Source of Repair, and Core Logistics Analysis are completed in FY 2010.
- **Software** – The NDI/firm-fixed priced contract approach limited the Government insight into the JCA software development; however, the Government does have oversight of the software configuration process. The contractor reports no major software issues but continues to provide updates to correct performance anomalies discovered during the test program.
- **Integration** – The avionics architecture design is similar to early versions of the C-130J, which is currently undergoing several block upgrades to correct deficiencies. Although the JCA has a flexible digital bus architecture, many of the components, such as the Flight Management System, are limited in growth capacity and lack open-architecture features.
- **Manufacturing** – The program conducted an initial Production Readiness Review (PRR) in December 2007 to assess the contractor manufacturing readiness. A final PRR is planned prior to FRP. The program established an Engineering Manufacturing Readiness Level (EMRL) of 4 out of 5 for LRIP exit criteria. Current EMRL level is 3 out of 5.

Summary of FY 2009 Systems Engineering Assessments
- **Program Support Reviews (PSRs)** – A PSR was conducted in March 2007 for program initiation at MS C, and another in September 2008 for the January 2009 Interim Program Review (IPR). A follow-on PSR is planned to support a January 2010 IPR.
  - Positive findings included the delivery of the first JCA on schedule.
  - Key findings included the potential for a production gap during LRIP, minimal staffing, late-to-need BCA, avionics architecture limits, and inadequate KPP verification plan.
  - Major recommendations include the following: Update the Acquisition Strategy for a fourth LRIP lot, update the SEP, increase staffing, synchronize timing of BCA with the Department's FY 2012 funding decisions, definitize technology insertion, and clarify verification plans for the KPPs. The Program Office is addressing these recommendations.
- **Systems Engineering Principles and Best Practices** – JCA developed workable plans with multiple agencies including the Federal Aviation Administration to reduce the schedule risk for certification of the aircraft and decouple these activities from the JCA critical path.
- **Program Health Metrics** – The program receives reports of technical performance measures during contractor reviews in the areas of schedule, software anomalies, system performance, and reliability. Except for a schedule variance in the test and training program, the measures are tracking to plan.
- **Conclusion** – The JCA program is low technical risk; however, the lack of a long-term sustainment plan results in uncertain ownership costs, and the Department needs to resolve the issues and risks spawned from the transfer of the Army mission and program management to the Air Force. The FRP decision is planned in the 2nd quarter FY 2011.

Mission Planning System (MPS) Increment IV

Prime Contractor: BAE Systems and Tybrin Corporation

Executive Summary
The Mission Planning System (MPS) provides the framework, information, automated tools, and decision aids needed to rapidly plan aviation missions. The program is in the Engineering and Manufacturing Development phase. Milestone (MS) B was awarded April 15, 2008. MS C is delayed until March 2011.

Mission Description
MPS functions in joint and coalition environments. It supports the needs of the warfighter (mission planner or other system user) for planning aviation missions and operates in a network-centric environment for collaborative, synchronized, and optimized planning. Mission planning is the development of a detailed flight plan based on threats, targets, terrain, weather, aircraft performance capability, and configuration. It is an essential task that must be performed prior to any fixed-wing or rotary-wing aircraft sortie.

System Description
MPS is a family of software-based developments designed to meet the Air Force requirement for an automated mission planning system. MPS replaces Air Force legacy mission planning systems and shares common framework architecture with the Navy. MPS Increment III was granted permission to proceed with Full Deployment, September 2009.

Summary of FY 2009 Systems Engineering Activities

- **Systems Engineering Plan (SEP)** – The MPS Increment IV SEP was approved in April 2007 to support the MS B Information Technology Acquisition Board review. There are no approved waivers or deviations from the SEP. The objectives of the SEP are being met.
- **Requirements** – The Joint Requirements Oversight Council approved the Capabilities Development Document in March 2006. The program has five Key Performance Parameters (KPPs). MPS maintains a traceability matrix that maps KPPs to functionalities. All KPPs are on track for being demonstrated at operational testing. Top-level requirements are stable. Requirement processes, derived requirements, and traceability tools are well defined for Increment IV and provide stable, traceable, and integrated requirements management.
- **Technical Reviews** – The MPS Increment IV Preliminary Design Review was conducted in May 2009 to establish the Framework 1.4 baseline. No significant design gaps were identified. Service-chaired Incremental Design Reviews were conducted in June and October 2009. The technical reviews are scheduled for FY 2010.
- **Technical Issues and Risks** – Issues include developing Windows XP and Vista implementations, large number of Deficiency Reports, increasing code size, and competition from fielded legacy solutions. Plans to resolve these issues are on track and include architecture development teams, Deficiency Report management efforts, removing duplicate security functions, and decoupling of FalconView digital mapping system.

  - Air Force is moving to Vista operating system while the Navy continues to use Windows XP; the program needs to develop software to work within both operating system environments.
  - The Software Integration Review Board meets weekly to manage Deficiency Reports and demonstrates fixes to the enterprise at biweekly meetings.
  - Risks being addressed include schedule, cost, and performance. Plans to reduce risk are in place and include combining releases 3.2 and 3.3 to reduce cost and schedule, delivering engineering releases for stakeholder early look of the software developments.
  - MPS is scheduled to replace the Portable Flight Planning Software and UNIX-based Mission Planning System systems. The Service's commitment to continue to fund a new development while legacy systems are available may result in future funding reductions to MPS.
- **Reliability** – The program has a reliability requirement of a minimum 8 hours per day, 5 days per week to continuous use for 5 days. The program is currently on track to achieve this requirement.
- **Software** – Effective source lines of code, consisting of new and modified logical source lines of code and excluding comment and blank lines, are as follows: Framework 1.3 (reconstructed) – 290,000 (290K), Framework 1.4 (PM baseline plan) 135K, TASM 1 (PM baseline plan) – 159K and TASM 1a (PM baseline plan) 162K.
- **Integration** – MPS established a Systems Engineering Integration and Test facility.

Summary of FY 2009 Systems Engineering Assessments

- **Program Support Reviews** – DSE led a Program Support Review between May 4, 2009, and June 23, 2009, to assess the program's ability to meet the December 2009 Acquisition Program Baseline threshold date for Increment IV MS C decision. A follow-on review is planned for 2011 in support of MS C decision.
  - Positive observations included that the program has well-defined process improvement processes in place, the contractor management team is highly experienced, and the program's Mission Planning Central portal provides knowledge sharing.
  - Key findings included that the program would most likely breach the MS C Acquisition Program Baseline threshold date by more than 1 year, resulting in a critical change notification submission in accordance with 10 U.S.C. 144A, Major Automated Information System Programs.
  - Major recommendations include: Consider transferring overall system integration responsibility and authority to the Systems Engineering, Integration, and Test facility to provide visibility into all system components; support an acquisition strategy calling for a 5-year base contract with five 1-year options to promote contractor stability; and consider implementing a Deficiency Report sunset strategy by which Deficiency Reports older than 5 years are retired.
- **Systems Engineering Principles and Best Practices** – Government obtained data rights to virtually all of the source code, which prevents an intellectual property conflict among the contractor and government participants. Architecture management, methods, and tools used are best practices and are enablers for this broadly distributed program.
- **Program Health Metrics** – Mission Planning Environment Contractors are maintaining metrics in accordance with their internal company processes.
- **Conclusion** – MPS Milestone C is planned for February 2011. The program is high risk based on competition from fielded legacy systems and Service's commitment to fund.

MQ-9A Reaper Unmanned Aircraft System

Prime Contractor: General Atomics Aeronautical Systems Incorporated

Executive Summary

MQ-9 Reaper is a remotely piloted unmanned aircraft system that provides multiple sensor and weapons capability. The program is in the Engineering and Manufacturing Development (EMD) phase. The program has transitioned from an ACAT II to an ACAT ID program with a Milestone (MS) C planned for 3rd quarter FY 2010.

Mission Description

MQ-9 Reaper will provide the persistent ability to hold time-sensitive targets at risk while performing reconnaissance as a secondary role. Immediate automated processing of target data will derive actionable precision-guided munitions quality coordinates. A modular architecture permits tailored mission flexibility where the aircraft acts as the "truck" to employ specialized weapons or sensor payloads.

System Description

The system consists of a Remote Piloted Aircraft, equipped sensors, weapons, communications systems, a ground control station, and the communications support equipment and personnel required to operate, maintain, and sustain the aircraft. Urgent warfighter need has necessitated the acceleration of deployment via a Block 1 configuration with a limited set of Capability Production Document (CPD) capabilities. Block 1 is now deployed; full Increment 1 is expected in FY 2012. An approved Increment 2 Capability Development Document (CDD) further defines the system capabilities.

Summary of FY 2009 Systems Engineering Activities

- The airframe is considered a Government off-the-shelf (GOTS) product, and there has been limited opportunity to instill rigorous systems engineering principles into the development program. The program originated as a concept development and subsequently became an ACAT II, then special interest, and finally an ACAT ID program. The Increment 1 capabilities have been broken into two configurations, Block 1 and Block 5, which allowed accelerated fielding of certain capabilities that could be achieved immediately while completing development of the remaining capabilities to be integrated as they matured. Key FY 2009 systems engineering activities included an Increment 1 Block 5 System Requirements Review (SRR) and establishment of a functional baseline.
- **Systems Engineering Plan (SEP)** – A draft SEP is in progress to support a MS C decision in spring 2010. There are no planned waivers or deviations.
- **Requirements** – Increment 1 has an approved CPD, Increment 2 has an approved CDD, but is unfunded at this time.
  - There are three Key Performance Parameters (KPPs): Net-Ready, Hunter, and Killer. The Killer KPP has been demonstrated in operational test. The Net-Ready and Hunter KPPs are planned to be demonstrated in future operational test to allow the system time to mature.
  - The program conducts routine requirements analysis and prioritization planning, although not endorsed officially by a Configuration Steering Board. The high number of new requirements and urgent needs has forced the delay of some baseline capability development. The

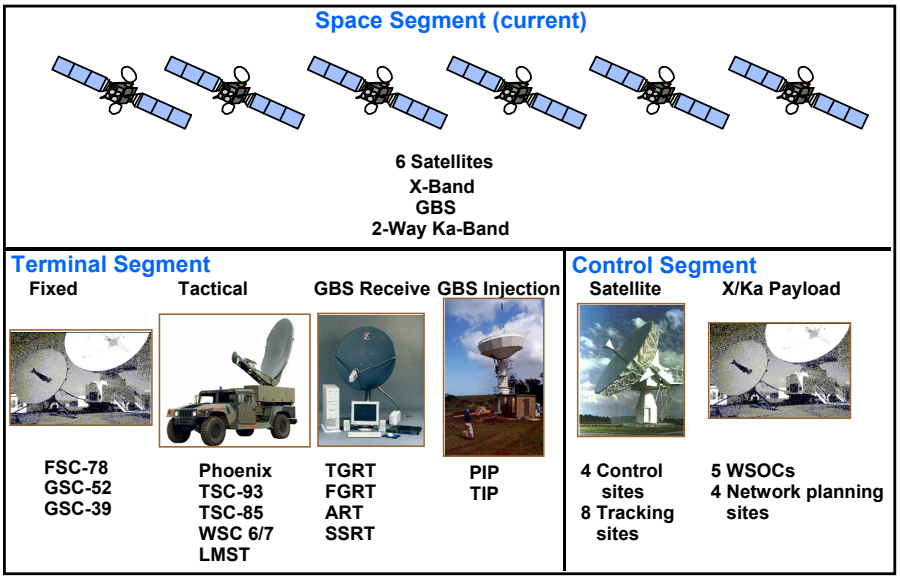
program will request the deferment of 13 threshold requirements until Increment 2 to stay within budget and schedule. These added requirements were not included in the CPD.

- **Critical Technologies** – The program did not perform an initial Technology Readiness Assessment (TRA) and has not identified any critical technologies at this time. A TRA will be performed in CY 2010 to support MS C.
- **Technical Reviews** – The program held an SRR for the Block 5 capability additions. Preliminary and Critical Design Reviews are planned in 2010. The SRR combined aspects of a requirements and functional review. Following completion of the review action items, the program will establish an Increment 1 Functional Baseline. Program lacks a robust set of Technical Performance Metrics.
- **Technical Issues and Risks** – Issues include Ground Control Station Advanced Cockpit improvements and integration, air vehicle structural improvements, and engine air worthiness certification. Planned retirement of risks is scheduled to meet full-rate production timelines. The contractor has initiated a new risk management process to address shortfalls.
- **Reliability** – The contactor developed an initial Reliability Improvement Plan and will deliver it to the Government for consideration; the plan requires enhancement. Since the program was built on a GOTS platform, opportunities for improvement based on a "design for reliability" concept are limited; the program is focused on improving systems affecting availability the most.
- **Software** – The Program Office, contractor, and user have a well-defined process for determining capability improvement cycles via regularly scheduled software builds. This methodology has been effective in stabilizing software changes and allowing for systematic upgrades. The program lacks sufficient software metrics to allow proper developmental resource and schedule planning. The contractor uses an in-house methodology that limits the Government's visibility into resource requirements, schedule planning, and software metric assessment. The program and contractor acknowledge this shortfall and have agreed to establish a more robust process to include establishing development metrics and source lines of code estimations.
- **Integration** – Integration of new sensors, data links, communications, and other payload packages presents ongoing schedule challenges. The need to balance software development, support ongoing operations, and enhance capability routinely overburdens existing contractor resources.
- **Manufacturing** – The Air Force Research Laboratory performed a qualitative Manufacturing Readiness Review of the contractor and found that MQ-9 production capacity is sufficient to meet expected demands and will increase by a factor of 2 over the next year and potentially double again in FY 2011.

Summary of FY 2009 Systems Engineering Assessments

- **Program Support Reviews (PSRs)** – DSE will conduct a PSR in preparation for MS C in CY 2010.
- **Use of Systems Engineering Principles and Best Practices** – The program is one of several that, due to urgent deployment requirements to support war efforts, is simultaneously developing, fielding, sustaining, and upgrading the system. Recognized systems engineering process and best practices have been minimized to meet urgent needs. Attempts to improve systems engineering requirements are often superseded by new urgent needs imposed on Government and contractor teams.
- **Program Health Metrics** – Technical Performance Measures (TPMs) were not initially identified. Following the SRR for Block 5, the program recognized the need to develop TPMs and track achievement during the EMD cycle. Entrance criteria for the Preliminary Design Review require the establishment of TPMs and other metrics.
- **Conclusion** – The program has fielded incremental capability and is continuing to incrementally add improvements toward full Block 5 requirements.

Wideband Global SATCOM (WGS)



Prime Contractor: Boeing Satellite Systems

Executive Summary

Wideband Global SATCOM (WGS) provides flexible, high-capacity communications for the nation's warfighters by developing, launching, and testing the WGS satellites and control systems. WGS provides an order-of-magnitude increase in communications bandwidth to our infrastructure users. Milestone (MS) C was approved November 6, 2000, and no further milestones are planned.

Mission Description

Combatant Commanders (COCOMs), U.S. Joint warfighters, and allied partners will use the capabilities of the WGS space-based communications system for all military operations short of nuclear war. Commanders will employ the WGS to alleviate the spectrum saturation of X-band, to provide increased single-user data rate availability, and to increase total satellite communications capacity over that available with the current Defense Satellite Communications System (DSCS) III satellites.

System Description

WGS is the latest wideband component in the Department's military satellite communication architecture, providing warfighters with unprotected wideband communications in both the X-band and military Ka-band frequency spectrums during all levels of conflict short of nuclear war. Eight satellites are planned for the constellation, providing service in both the X and Ka-band frequency spectrums. The objective of the WGS program is to produce and field additional communications satellites that will provide theater and global communications for the warfighter. WGS is composed of Space, Control, and Terminal Segments.

Developmental Test and Evaluation Activity

- The program is post MS C and no further milestones are planned. The Air Force competitively awarded the original WGS contract to Boeing Satellite Systems (BSS) for three satellites to provide a limited, interim communications capability pending the development of other wideband SATCOM programs. The original contract was modified to include time-phased options for up to

six satellites, and BSS was awarded a sole-source WGS Block II contract for these satellites. All six satellites are currently in production, with some funding being provided by Australia in exchange for proportional usage of the WGS system. There are no requirement changes between Blocks I and II.

- The Block II Follow-On maintains the same capabilities as the previous WGS Block II satellites. Block II Follow-On guidance from Program Decision Memorandum III, dated October 31, 2008, added $2.894B in FY 2010 through FY 2015 to "Procure WGS Satellite Vehicles 7 through 11 to support and maintain an 8-satellite constellation, to begin launching in FY 2015, and launch every year through FY 2019." The most recent-biannual status working group on September 14–15, 2009 highlighted no major issues and showed continued support for WGS.
- U.S. Strategic Command accepted WGS-1 for operational use, and deployed users transitioned from a DSCS satellite to WGS-1, in April 2008.
- Since activation of WGS-1, more than 130 receiver suites utilizing WGS completed DT/OT testing in accordance with the current TEMP and were fielded to Pacific Command, and more than 200 operational missions were completed.
- WGS-2 was successfully launched April 3, 2009, by an Atlas launch vehicle. Final deployments and in-orbit test and checkout of the bus and payload were completed. The COCOM accepted WGS-2 on August 17, 2009. WGS-2 began operations over the Indian Ocean in August 2009 and can provide SATCOM support to U.S. and coalition forces from the Eastern Mediterranean to Western Australia.
- Boeing resolved the attitude control system commanding issue identified from another program. Analysis and simulation were used to determine that lengthening the minimum thruster pulse duration has minimal performance impact.
- WGS-3 launch processing was on hold pending resolution of the spacecraft battery cell leaks. WGS-3 battery cells were cleared for flight and launch processing. In addition, the Loop Heat Pipe issue was closed for WGS-3. WGS-3 shipped to Cape Canaveral on September 29, 2009, and launched December 2, 2009.
- WGS-3 is in its test orbit. Boeing expects to complete payload-in-orbit tests and turn the spacecraft over to the Air Force in February 2010. The spacecraft is expected to be operational in April 2010.
- Spacecraft battery cell leaks were discovered on Block II (WGS-4). The program determined the root cause and instituted new manufacturing procedures. Test lots of newly manufactured battery cells will undergo weld testing and destructive physical analysis.
- The launch schedule for WGS 4, 5, and 6 is 1st quarter FY 2012, 4th quarter FY 2012, and 3rd quarter FY 2013, respectively. The launch schedule for Block II Follow-On WGS-7 to WGS-12 is 3rd quarter FY 2015 to 3rd quarter FY 2020.

Developmental Test and Evaluation Assessment

- USD(AT&L) requested approval of the Acquisition Strategy to procure long-lead items for WGS-7 and obtain options for WGS-7 to 12 as a result of the cancellation of the Transformational Satellite Communications (TSAT) program. Block II Follow-On is modeled on the Block II Contract, and lessons learned are incorporated. Block II Follow-On satellites are planned to be functionally equivalent to Block II satellites. There are no new requirements for the program. The WGS program must ensure an obsolescence plan is prepared to characterize the amount of system change due to Form-Fit-Function replacement of space vehicle components that are no longer being manufactured. The current Test and Evaluation Master Plan (TEMP) was approved March 2003. The TEMP requires update to provide the plan for adequate regression testing and Follow-on Test and Evaluation (both DT&E and OT&E) of those Form-Fit-Function changes as well as the system changes necessitated by the addition of more space vehicles to the WGS constellation.

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6.4 Assessments of Joint MDAPs

8 programs:

- F-35 Joint Strike Fighter (JSF)
- Joint Air-to-Ground Missile (JAGM)
- Joint Light Tactical Vehicle (JLTV)
- Joint Tactical Radio System Handheld, Manpack, Small Form Fit (JTRS-HMS)
- Medium Extended Air Defense System (MEADS)
- Mine Resistant Ambush Protected (MRAP) Vehicle
- Multi-Functional Information Distribution System–Joint Tactical Radio System (MIDS-JTRS)
- Small Diameter Bomb Increment II (SDB II)

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F-35 Joint Strike Fighter (JSF)

Service: Air Force/Navy/Marine Corps

Prime Contractor: Lockheed Martin with partners Northrop Grumman and BAE

Executive Summary

The F-35 Lightning II Joint Strike Fighter (JSF) is a single-seat, single-engine aircraft capable of performing and surviving lethal strike warfare missions with three variants for the U.S. Air Force (USAF), Navy (USN), and Marine Corps (USMC), and international partners. Concurrency of production, development, and testing increased significantly in FY 2009 as verification and flight test did not attain the planned rate due to late delivery of System Development and Demonstration (SDD) test aircraft. As of November 1, 2009, 2 of 12 primary SDD test aircraft deliveries had started flight test and none of the aircraft had been delivered to the flight test centers at Naval Air Station (NAS), Patuxent River, Maryland, or Edwards Air Force Base, California.

Mission Description

The F-35 Lightning II JSF is a single-seat, single-engine aircraft capable of performing and surviving lethal strike warfare missions using an affordable blend of advanced technologies to meet an advanced threat (year 2010 and beyond), while improving lethality, survivability, and supportability. The reality of downsized coalition forces and regionally oriented strategy demands an affordable, multi-mission aircraft that possesses improved mission flexibility, effectiveness, supportability, and mobility. The F-35 will be capable of striking and destroying a broad range of targets, day or night, in adverse weather conditions. These targets include: fixed and mobile land targets, enemy surface units at sea, and air threats ashore and at sea including anti-ship and land attack cruise missiles. The F-35 will be operated by the USAF, USN, USMC, and eight partners including the United Kingdom, Australia, Canada, Denmark, Italy, the Netherlands, Norway, and Turkey.

System Description

The F-35 program will provide three variants: the Air Force Conventional Takeoff and Landing (CTOL), the Marine Corps Short Takeoff and Vertical Landing (STOVL), and the Navy aircraft carrier (CV). The F-35 CTOL will be used to support the Air Force core competencies of Air and Space Superiority, Global Attack, Precision Engagement, and Agile Combat Support. It will complement a force structure that includes fighter, bomber, and support assets operating with F-22. The F-35B STOVL variant will perform land and sea-based operations within the broad functions of Offensive Air Support, Anti-Air Warfare, Aerial Reconnaissance, Electronic Warfare, escort of Assault Support, and Control of Aircraft and Missiles. It will be capable of operating from Amphibious Assault Ships and CVN aircraft carriers.

The F-35B will be fully integrated with the Future Amphibious Assault Ship (LHA-6) to ensure compatibility. The F-35C CV variant will be capable of conducting carrier-based offensive and defensive air-to-air and air-to-surface missions. It will operate as a deterrent force in peacetime and as a strike force in conflict and will transition seamlessly between these stages. All F-35 variants

will be seamlessly integrated and interoperable with all command and control nodes of air, land, and sea elements of U.S., joint, and combined force structure operating within the projected C4ISR (command, control, communications, computers, intelligence, surveillance, and reconnaissance) architecture. The eight Key Performance Parameters (combat radius, STOVL performance, CV recovery, RF (radio frequency) signature, reliability, sortie generation rate, logistics, and interoperability) are the key drivers for the program.

Developmental Test and Evaluation Activity

- The flight testing has been delayed by the late delivery of SDD test aircraft. Two of the 12 primary SDD aircraft (BF-1 and BF-2) have been delivered to flight test, although aircraft AA-1, the non-weight-optimized CTOL SDD test article for production risk reduction, has provided initial flight test risk mitigation for the program. SDD aircraft deliveries are about 4–7 months behind the February 29, 2008, approved production delivery schedule. Only 16 of the 168 planned FY 2009 SDD flights were completed.
- The CTOL static and durability test articles were delivered to the test facilities in the United Kingdom and static testing initiated. The BF-1 and BF-2 flew a total of 16 test flights at the contractor's facility during FY 2009; AA-1, a production risk reduction test article, completed 36 flights prior to its scheduled ferry to China Lake, California, in FY 2010 for storage and eventual Live-Fire Test and Evaluation. The Cooperative Avionics Test Bed (CATB) aircraft accomplished two deployments to Edwards Air Force Base, California, and a deployment to Eglin Air Force Base, Florida. Testing included radar, electronic warfare, and communications/ navigations/identification systems.
- Revision 3 of the F-35 JSF Test and Evaluation Master Plan (TEMP) was completed and submitted for Service coordination. The Marine Corps highlighted STOVL-carrier integration shortfalls that are being analyzed by the Department of Navy. The TEMP Revision 3 was submitted to OSD in December 2009 and approved December 11, 2009.

Developmental Test and Evaluation Assessment

Concurrency of production, development, and testing increased significantly in FY 2009 as verification and flight test did not attain the planned rate due to late delivery of SDD test aircraft. As of November 1, 2009, 2 of 12 primary SDD test aircraft deliveries started flight test and none of the aircraft had been delivered to the flight test centers at NAS Patuxent River, Maryland, or Edwards Air Force Base, California.

- The first aircraft, BF-1, was delivered to NAS Patuxent River, Maryland, in November 2009.
- The contractor conducted initial structural loads testing on the STOVL test article with loads up to 150 percent of the design load limit.
- Results from the STOVL static test article correlated with the STOVL model, thus allowing the test team to complete 92 percent of the testing 2 months ahead of schedule by the end of FY 2009.
- BF-1 completed the initial hover pit testing at the contractor's facility in Fort Worth, Texas. Although the testing was completed later than planned, test objectives were completed and engineering concluded that the F135 engine provides sufficient thrust for STOVL operations.
- Due to the late delivery of SDD test aircraft to the flight test program, the Program Office is evaluating the flight test schedule and is planning to adjust the testing schedule to compensate for late deliveries.

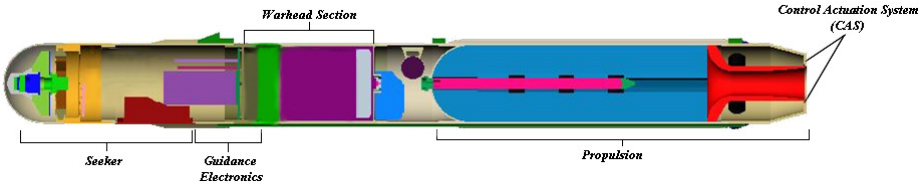
Summary of FY 2009 Systems Engineering Activities

- **Systems Engineering Plan (SEP)** – The program is updating the SEP and is currently adjudicating the Services and OSD comments. The Program Office anticipates a December 2009 OSD approval of the SEP. The SEP will reflect the Program Office and contractor's management reorganization and new processes implemented by the program.
- **Cooperative Avionics Test Bed (CATB)** – As part of mission system/software risk reduction, the CATB accomplished two deployments to Edwards Air Force Base, California, and a deployment to Eglin Air Force Base, Florida, during FY 2009. It began the first mission systems CATB flight test activity in March 2009 with Block 0.5 software, 5 months later than planned. Testing included radar, electronic warfare, and communications/navigation/identification systems.
- **Verification, Validation, and Accreditation (VV&A)** – The JSF Program Office initiated a roadmap for the VV&A of the labs and models intended to become test venues, per the mid-course risk reduction strategy of 2007. The roadmap serves as a gauge to measure the contractor's progress in completing the accreditation support packages needed before success criteria can be resolved using the models.
- **Technical Issues and Risks** – In August 2009 the F-35 JSF program was tracking 13 program risks and is currently undergoing a review of the risk assessment process.
  - Program risk assessments had been structured predominantly to the SDD program without extensive consideration to the Low-Rate Initial Production (LRIP) and global supply chain management risk.
- **Verification Plans** – The contractor and Program Office continued to develop verification plans and flight test plans for the completion of SDD.
  - The contractor reorganized senior test management to place verification activities within the purview of the Integrated Test Force.
  - The contractor continued to refine the Air System Capabilities Matrix and Capabilities Cross Reference Matrix, which are intended to present the goals for producing and increasing functionality, envelope, weapons loads, and autonomic logistics support to each LRIP lot of systems delivered to the Services.
- **Simulators** – The contractor continued product development of the Verification Simulation, a man-in-the-loop simulation for verification of mission effectiveness in a virtual operational environment.

Summary of FY 2009 Systems Engineering Assessments

- The program conducted a Production Readiness Review on the contractor and approximately 77 of the suppliers in preparation for the LRIP Lot 4 Defense Acquisition Board decision in the 2nd quarter FY 2010.
  - The production program is about 4 months behind schedule.
  - Forty-five affordability initiatives have been funded.
  - Approximately 97 percent of design is complete.
  - A pulse line is in place with transition to moving line between LRIP Lots 6 and 7.
- **Conclusion –** The F-35 JSF LRIP Lot 4 Defense Acquisition Board is scheduled for the 2nd quarter FY 2010. The program is currently assessed as high risk.

Joint Air-to-Ground Missile (JAGM)



Notional JAGM

Service: Army (lead)/Navy

Prime Contractor: Competition – Raytheon vs. Lockheed Martin

Executive Summary
The Joint Air-to-Ground Missile (JAGM) is a precision-guided munition for use on joint rotary and fixed wing platforms and unmanned aerial vehicles. The program is in the Technology Development phase with Milestone (MS) B planned for 1st quarter FY 2011. JAGM is one of the first programs to follow the life cycle framework model established in the December 2008 update to DoDI 5000.02, to include competitive prototyping and completion of Preliminary Design Review prior to MS B.

Mission Description
JAGM will destroy high-value stationary, moving, and relocatable land and naval targets. It will provide joint operability in all environments while providing extended range to improve platform standoff, survivability, and lethality eventually replacing the HELLFIRE, Air-to-Ground TOW, and Maverick.

System Description
JAGM will use advanced seeker and guidance technologies using a multi-mode seeker (Millimeter Wave, Infra-Red, and Laser) to improve targeting and resistance to enemy countermeasures. Incorporating advanced warhead technologies, JAGM will provide improved lethal effects against both heavy armored vehicles and an expanded, nontraditional target set. The design incorporates modularity to ease maintenance and repair. Additional increments are not currently planned; however, the modular design should accommodate insertion of technology upgrades.

Summary of FY 2009 Systems Engineering Activities

- **Systems Engineering Plan (SEP)** – The SEP is currently in development to support MS B, 1st quarter FY 2011. DSE reviewed the draft SEP provided prior to the program System Functional Review. The draft SEP was adequate for this point in the program. No waivers or deviations from the SEP are currently anticipated.
- **Requirements** – The Joint Requirements Oversight Council revalidated the JAGM Capabilities Development Document in January 2008. While a formal update is not planned prior to MS B, the Service is evaluating a potential administrative update to address the cancellation of one of the threshold platforms, the Armed Reconnaissance Helicopter. The program has six multi-component Key Performance Parameters (KPPs): targeting capability, combat effectiveness/ reliability, missile range, interoperability, carrier/shipboard operability, and sustainability (materiel availability). All KPPs are expected to be demonstrated in developmental and operational test. The requirements have been stable. The requirements are considered reasonable; however, several may be conflicting and design trades may still be considered. For example, min-smoke vs. cold temperature and low weight vs. lower cost. The program has stated that in their view the only non-tradable requirements at this point are KPPs.

- **Critical Technologies** – A formal Technology Readiness Assessment has not yet been conducted; however, the program assesses the Technology Readiness Levels at 6+. The program has critical technologies related to the integrated tri-mode seeker, the propulsion system, and the warhead/fuze. The Army will conduct a formal Technology Readiness Assessment in support of MS B. Each competitor will demonstrate prototype missiles (ground launched) prior to MS B. Each Technology Development phase competitor is responsible for planning and integrating technology maturation efforts into their integrated master plan and schedule.
- **Technical Reviews** – Each contractor conducted a System Requirements Review/System Functional Review in the 4th quarter FY 2009, successfully establishing their functional baselines. The reviews were supported by an independent technical review team consisting of senior personnel from both Services. Although the Army is the lead service, JAGM has elected to adopt a tailored set of the NAVAIR systems engineering technical review processes. System Preliminary Design Reviews are scheduled for 3rd quarter FY 2010.
- **Technical Issues and Risks** – Issues include meeting the 108-lb missile weight, seeker algorithm maturity, rocket motor performance in conflicting environments (min-smoke vs. cold temperature), and platform integration on six threshold platforms prior to Full-Rate Production.
- **Reliability** – The JAGM program has established Materiel Availability and in-flight reliability requirements for initial fielding and at system maturity. System maturity is defined as Initial Operational Capability + 2 years. The program has initiated a Reliability Growth Planning Working Group to determine a projected growth path to meet initial and mature program requirements. The relatively high in-flight reliability requirement may pose a significant challenge in terms of the number of resources required to demonstrate achievement with significant confidence.
- **Systems Engineering Support of Life Cycle Management and Sustainability** – A tailored supportability analysis program will be established during Engineering Manufacturing and Development. The anticipated strategy is to procure the weapon as a "wooden round" with only minor maintenance activity at the unit.
- **Software** – The JAGM Statement of Work requires the contractors to complete their requirements decomposition and allocation of system performance requirements to hardware and software/algorithms subsystems/components by the system Preliminary Design Review.
- **Integration** – Integration is a major design consideration and challenge for the JAGM program, especially given the number of platforms and launchers required. Platform interoperability and integration issues are managed through a Platform Integration Integrated Product Team and the Joint Interface Control Working Group (JICWG). The JICWG manages/monitors compliance and design of physical/functional protocols between the missile/launcher(s)/platforms.
- **Manufacturing** – The program will conduct Manufacturing Readiness Level (MRL) assessments to evaluate design producibility, reliability, and affordability before each systems engineering technical review and milestone. The Army is planning an independent review prior to MS B. Previous informal program assessments indicate JAGM will achieve at least MRL 6 at MS B.

Summary of FY 2009 Systems Engineering Assessments

- **Program Support Reviews (PSRs)** – A PSR will be conducted in advance of MS B.
- **Program Health Metrics** – Each contractor manages to an established set of Technical Performance Measures (TPMs). The JAGM Statement of Work requires the contractors to generate and track the status of TPMs, which include the KPPs and Key System Attributes as well as the key technical measures.
- **Conclusion** – JAGM is in Technology Development with MS B planned for 1st quarter FY 2011. Technical risk is assessed as moderate due to the min-smoke/multi-environment rocket motor, tri-mode seeker development, and complexity of simultaneous integration on multiple platforms.

Joint Light Tactical Vehicle (JLTV)

BAE Systems

Lockheed Martin

General Tactical Vehicles

Service: Army (lead)/Marine Corps; international partners include Australia, with others such as the United Kingdom and Israel expressing interest.

Prime Contractor: Three competing Technology Development (TD) phase contractors: BAE Systems, Lockheed Martin, and General Tactical Vehicles (partnership between AM General and General Dynamics Land Systems)

Executive Summary: The JLTV Family of Vehicles (FoV) is a Joint U.S. Army and U.S. Marine Corps program, with the U.S. Army designated as the lead service. International partners include Australia, with others such as the United Kingdom and Israel expressing interest. A Pre-Major Defense Acquisition Program, JLTV is in the TD phase, having entered at Milestone (MS) A in December 2007. The program's three vendors have completed Preliminary Design of prototype vehicles and are working to finalize designs based on user feedback at design reviews. Government testing of prototypes will begin in April 2010.

Mission Description

Intending to supplement and potentially replace the High Mobility Multipurpose Wheeled Vehicle (HMMWV), Marine Corps and Army units will use the JLTV to maneuver throughout the extended land battle space to concentrate combat power, support, and sustainment at decisive points. JLTV objectives include increased protection and performance over the current fleet, air transportability, minimizing ownership costs by maximizing commonality, and fuel efficiency. Units will employ the JLTV with adaptive levels of force protection and survivability for personnel and materiel. These adaptive levels will protect personnel from direct fire, indirect fire, mine blast, improvised explosive devices (IEDs), rocket-propelled grenades, and explosively formed penetrator (EFP) attacks.

System Description

The JLTV FoVs will consist of three Payload Categories—A (3,500 lbs); B (4,500 lbs); and C (5,100 lbs)—each equipped with a companion trailer capable of carrying an equivalent payload. Essential combat configuration weights will be between 14,300 and 16,800 pounds. All configurations will be designed to maximize commonality of parts. Payload categories will be further tailored with a set of mission-specific components (command and control, armor, weapons) to achieve requirements of all sub-configurations.

Summary of FY 2009 Systems Engineering Activities

- **Systems Engineering Plan (SEP) –** DoD approved the JLTV SEP in January 2008. The program is meeting the objectives and will update the SEP in preparation for the MS B decision in FY 2011.
- **Requirements –** Because the JLTV program was initially preparing for a MS B decision when it was redirected to MS A, the program has a mature draft Capability Development Document (CDD). The three vendor preliminary designs predict the Key Performance Parameters (KPPs) of mobility, helicopter transportability, force protection, survivability, availability, and payload are achievable. Each is making lower level trade decisions to meet higher requirements such as force protection and transportability.
  - Following the Critical Design Review, the three vendors will build prototypes for Government test and evaluation (T&E) in FY 2010.
- **Critical Technologies** – Underbody armor and the hull-frame are the technology elements assessed at Technical Readiness Level (TRL) 5, but the Program Office is confident they will mature to TRL 6 or 7 prior to MS B. Both are identified as critical due to their relationship to weight and their adverse effect on transportability.
- **Technical Reviews**
  - **System Requirements Reviews (SRRs)**: Post contract award in 2009, the program conducted SRRs with each vendor to establish requirement baselines for the TD phase. These reviews included user representatives to clarify questions and to provide each vendor with feedback on priorities. All three vendors met exit and entrance criteria.
  - **Preliminary Design Reviews (PDRs)**: The program conducted separate PDRs with each vendor between June and July 2009 to establish the TD phase prototype functional and design baselines. Each team presented designs and trade decisions along with performance expectations. Army, Marine, and Australian user representatives attended the reviews to provide feedback on trade decisions. The competing vendors also presented prototype production schedules and plans to demonstrate their ability to meet scheduling requirements.
- **Technical Issues and Risks** – Army Aviation is revising their external lift capability requirement, which will likely reduce the allowable weight for JLTV configurations in the next phase. An assessment of the impact to JLTV will be conducted when the revised Army Aviation requirement is completed.
- **Reliability –** Although reliability requirements for the JLTV are planned to be twice that of the current fleet of light vehicles, the competing vendors are on a path to achieve the requirements with reasonable reliability growth plans. Design for reliability efforts include Reliability Block Diagrams, Physics of Failure, Fault Tree Analysis, and other best practices.
- **Systems Engineering Support of Life Cycle Management and Sustainability** – The commonality and supportability aspects of the design will facilitate a smaller logistics footprint and low ownership costs.
- **Software** – The competing vendors are executing appropriate software builds totaling approximately 100,000 lines of code and integrating reuse of commercial off-the-shelf software, where appropriate.
- **Integration** – Each of the three vendors is using System Integration Laboratories to model integration of selected systems and building contractor owned asset vehicles to establish a learning curve before building deliverable vehicles. Following the Critical Design Review, the three vendors will build prototypes for Government test and evaluation in FY 2010.

- **Manufacturing** – At the PDRs, each vendor presented their plans to build the TD phase prototypes either on an assembly line or using assembly line techniques to reduce manufacturing risks and learn during the TD phase.

Summary of FY 2009 Systems Engineering Assessment

- **Program Support Reviews (PSRs)** – The Department conducted a PSR in April 2007. Another PSR is planned for 1st quarter FY 2011 to support program initiation and entry into the Engineering and Manufacturing Development phase (MS B).
- **Use of Systems Engineering Principles and Best Practices**
  - Because the program had a mature draft CDD, this enabled detailed requirements analysis with which to issue a Government-prepared purchase description (PD) specification. Socializing several versions of the draft PD with industry prior to contract award using the Request for Information process enabled the program to begin the Start of Work Meetings concurrent with an SRR.
  - A potential best practice candidate, the JLTV program established a series of Knowledge Point Reviews to be held after key events. The reviews consider design feedback from the vendors, lessons learned in Iraq and Afghanistan, and the changing threat environment to update and modify both the draft CDD and PD specification in preparation for the MS B decision.
  - The JLTV program received a Top 5 DoD Program Award at the 2009 National Defense Industrial Association Systems Engineering Conference.
- **Program Health Metrics** – The program has established a program health metric dashboard to assess each contractor's status as well as overall program health metrics. The program also conducts a program-wide assessment each quarter. There are no significant cost, schedule, or performance risks.
- **Conclusion** – JLTV competitive prototyping is yielding the needed information with which to mature a low-risk requirements document for an Engineering and Manufacturing Development phase MS B decision at the end of FY 2011.

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

Service: Army (Chief Acquisition Component)/Navy (Joint Program Executive Officer)

Prime Contractor: General Dynamics

Executive Summary

The Joint Tactical Radio System Handheld, Manpack, and Small Form Fit (JTRS-HMS) program Increment 1 uses an evolutionary acquisition strategy to field incremental Warfighter-Centric Network capabilities in two phases. Phase 1 focuses on one- and two-channel radio sets that require National Security Agency (NSA) Type 2 encryption. Phase 2 will develop the more complex multi-mode sets with NSA Type 1 encryption. The JTRS-HMS Acquisition Program Baseline is being restructured based on guidance from the October 2009 OSD Overarching Integrated Product Team meeting.

Mission Description

The JTRS-HMS program satisfies Joint Service requirements for Handheld, Manpack, and Small Form Fit (SFF) applications, including support for Early-Infantry Brigade Combat Team and Ground Soldier System (GSS) technical performance and integration. SSFs are radios embedded in various other platforms. The SFF versions of HMS will be used for Joint Service Ground Sensor Networks, Intelligent Munitions deployment and usage, Non-Line of Sight Weapon Systems, and other applications. HMS provides the warfighter with a software re-programmable, networkable multi-mode system of systems capable of simultaneous voice, data, and video communications.

System Description

JTRS-HMS Increment 1 consists of two phases of development. Phase 1 is developing the SFF-A (1 or 2 Channels), SFF-D, and SFF-C(v)1 (AN/PRC-154 Rifleman Radio) sets. Phase 1 radio sets will use the SFF-A, and AN/PRC-154 Rifleman Radio sets will use the Soldier Radio Waveform for a sensitive but unclassified environment (Type 2). SFF-A will be embedded in Intelligent Munitions Systems and Unattended Ground Sensors, and SFF-D will be embedded into Class I Unmanned Aerial Vehicles (UAVs) and Small Unmanned Ground Vehicle. In order to mitigate program waveform porting and integration challenges, the Soldier Radio Waveform application, which is managed by the JTRS Network Enterprise Domain, was developed on a Waveform Development Environment with HMS as the lead platform for porting. SFF-C(v)1 (AN/PRC-154 Rifleman Radio) is a stand-alone, networking radio with Type 2 encryption.

Increment 1, Phase 2 is developing the 2-Channel Manpack, 2-Channel Handheld, SFF-B, and SFF-J. SFF-B will be embedded into GSS leader ensemble, and SFF-J will be embedded into the Non-Line of Sight Launch System and Class IV UAVs. The Joint Staff Working Group decided to defer the 2-Channel Handheld development until the current technical challenges are resolved. Waveforms to be ported to HMS include UHF (Ultra High Frequency) Satellite Communications, Soldier Radio Waveform, High Frequency, Enhanced Position Location and Reporting System, Mobile-User Objective System, and Single Channel Ground to Air Radio System.

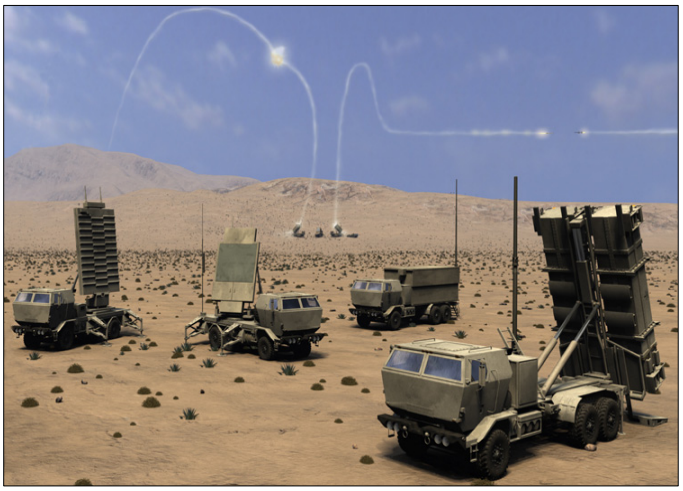
Summary of FY 2009 Systems Engineering Activities

- **Systems Engineering Plan (SEP)** – The SEP is in draft.
- **Technical Reviews** – The program held a Design Readiness Review in September 2009 for Type 1 encrypted radios.
- **Technical Issues and Risks –** Issues and risks are undefined at this time.
- **Reliability** – Reliability is undefined at this time.
- **Software** – The Soldier Radio Waveform is still in development.

Summary of FY 2009 Systems Engineering Assessments

- **Program Support Reviews (PSRs)** – No PSRs were conducted in FY 2009.
  - The Overarching Integrated Product Team met October 20, 2009; several subsequent senior-level meetings resulted in indefinite postponement of the MS C Defense Acquisition Board for the Rifleman Radio component.
- **Program Health Metrics** – The program is in a restructuring phase as a result of Rifleman Radio issues.
- **Conclusion** – The program will spin out a Rifleman Radio capability increment in the coming months. The more focused (narrower) acquisition strategy, SEP, and test strategy will reduce risk by resolving key integration and production readiness issues unique to the Rifleman Radio.

Medium Extended Air Defense System (MEADS)



Service: Tri-National Co-Development Program among the United States, Germany, and Italy being financed in shares of 58, 25, and 17 percent respectively. Army has a national product office responsible for interface with the MEADS program.

Prime Contractor: MEADS International (MI) Inc., a consortium of Lockheed Martin and EuroMEADS

Executive Summary

MEADS is a tri-national, network-centric air and missile defense program. It is currently in Design and Development. It held Milestone (MS) B in August 2004 and will complete a system-level Critical Design Review (CDR) in August 2010.

Mission Description

MEADS will provide joint and coalition forces with critical asset and defended area protection against multiple and simultaneous attacks by low- to medium-altitude air and missile defense with the capability to counter, defeat, or destroy tactical ballistic missiles and air-breathing threats to include cruise missiles, unmanned aerial vehicles, tactical air-to-surface missiles, and anti-radiation missiles.

System Description

The objective MEADS battery, which will be scalable and tailorable to operational requirements, will consist of five major end items (MEIs):

- Battle Management Command, Control, Communications, Computers and Intelligence (BMC4I) Tactical Operations Center, enabling distributed system operations and Beyond-Line-of-Sight engagements
- Near-vertical launcher capable of transporting and launching up to eight missiles/Reloader
- UHF Surveillance Radar that provides 360-degree coverage and near-range detection of targets having low radar cross-section signatures
- X-band Multi-Function Fire Control Radar that provides 360-degree coverage designed for high-precision handover to the in-flight missile, discrimination capabilities, and short-range target detection and horizon search.
- The PATRIOT Missile Segment Enhancement (MSE) missile is the baseline missile for MEADS. It is being developed by the United States.

Summary of FY 2009 Systems Engineering Activities

- **Systems Engineering Plan (SEP)** – MI has a Systems Engineering Management Plan.
- **Requirements** – The requirements for MEADS have been formalized among the participating nations in an International Common Operational Requirements document approved in September 2002.
  - The MEADS program has 28 International Key Performance Parameters (IKPPs). The IKPPs cover topics such as target set, transportation and mobility, degree of protection, interoperability, and distributed architecture. The Independent Review Team (2008) recommended that two transportability IKPPs (C-130 roll-on/roll-off, CH-47) should be reassessed to identify possible opportunities to relax these requirements as they currently will not be achieved without additional investment. The three nations are working within their respective systems to make this change.
- **Critical Technologies** – The MEADS program has critical technologies related to radar technology including transmitter and receiver modules.
- **Technical Reviews** – A system-level CDR began in 2009 and will complete in a summary review in August 2010. Various subsystem CDRs were held in 2009 and will continue in 2010.
- **Integration** – The program initiated software integration for all MEIs at MEADS Verification Facility in late summer with software drops for each MEI completed in October 2009.

Summary of FY 2009 Systems Engineering Assessments

- **Program Support Reviews (PSRs)** – Although OSD has not conducted a formal PSR, it led an Independent Review Team in late 2008 that documented significant MEADS findings.
  - Key technical findings included: The MEADS program will not produce the required performance within the cost and schedule allotted; system performance of MEADS radar elements must improve to meet the nation's capability needs. There was inadequate agreement and understanding of several concepts and methods, which has resulted in significant BMC4I issues. MSE has experienced development delays and failures, and there is not a firm baseline for the MSE program. Necessary integration, verification, and testing of the MEADS elements are late in the Design and Development schedule.
  - Major technical recommendations included: Nations and NATO Medium Extended Air Defense System Management Agency agree on MEADS BMC4I architecture definitions, expectations and MI implementation. Army establish an MSE baseline/way-ahead. Develop an end-to-end performance verification/test plan: Incorporate several systems engineering and technical management tasks into the program. Finalize the Design and Development program baseline and evaluate the new restructured program. MEADS Operational Advisory Group review the MEADS requirements to provide a better MEADS capability.
  - During 2009, the program was restructured and made significant progress on contract changes, management/governance changes, and systems engineering improvements. The program will be closely tracked as it progresses to CDR.
- **Conclusion –** MEADS is addressing risks identified by the Independent Review Team, with resolution anticipated by the System Program Review required after completion of CDR.

Mine Resistant Ambush Protected (MRAP) Vehicle

MATV

MAX PRO

Cougar

Service: Marine Corps (lead)/U.S. Special Operations Command (USSOCOM) acquisition with multinational participation.

Prime Contractor: The Joint Program Office established contracts with several manufacturers to rapidly field earlier MRAP variants to Iraq. These include contracts with Force Protection Industries, Navistar Defense, BAE, General Dynamics Land Systems-Canada, and Oshkosh.

Executive Summary

The MRAP program entered at Milestone C in February 2007 and was designated Acquisition Category ID in September 2007. It is in the Production and Deployment phase with more than 16,000 vehicles delivered and more than 6,000 MRAP-All Terrain Vehicles (MATVs) being procured for fielding in Afghanistan. Developmental testing (DT) continues on Low-Rate Initial Production (LRIP) 12–14 vehicles and MATV. Specific testing is being conducted on USSOCOM variants and variants receiving improved suspension systems. Systems engineering and testing activities are being conducted to verify mobility and survivability requirements, key user requirements, capability and technology insertions, and engineering change proposals.

Mission Description

Joint Forces are currently engaged in long-term stability operations in a very complex and highly restricted rural, mountainous, and urban environment against an adaptive enemy using aggressive tactics with an inexhaustible supply of low-tech, highly lethal munitions. They are conducting small unit combat operations in urban or confined areas; ground logistics support operations; and mine and improvised explosive device (IED) clearing operations. Effective and suitable vehicles with force protection, crew and mission payload, mobility, maneuverability, reliability, and net-centric capabilities are needed to be successful on the battlefield.

System Description

The MRAP family of vehicles provides Joint Forces with four categories of vehicles weighing between 25,000 and 78,500 pounds, and capable of carrying 5–11 soldiers with equipment while mitigating the effects of IEDs, rocket-propelled grenades (RPGs), underbody mines, and small arms fire threats. The MATVs are capable of operating in the restrictive terrain of Afghanistan and are designed to provide improved mobility, reduced vehicle height and weight, improved turning radius and ground clearance, and improved vehicle capability at high altitudes while providing similar protection.

Developmental Test and Evaluation Activities

- Test and Evaluation Master Plan (TEMP) – The MRAP TEMP, approved on December 4, 2009, was updated to address the test activities for the MATV and several LRIP vehicles needed to support an Afghanistan mission profile.

Developmental Test and Evaluation Assessment

- DT plans are approved and consistent with the updated MRAP TEMP.
- Key FY 2009 DT activities included MRAP and MATV source selection and Phase 1 DT. Phase 2 MATV DT began in November 2009 and will continue until March 2010. An Initial Operational Test and Evaluation (IOT&E) began in December 2009. DT has experienced delays due to Government-furnished equipment (GFE) integration, corrective maintenance actions, and modifications. Twenty-five percent of the planned MATV DT reliability testing was complete prior to the start of IOT&E.
- All vehicles are currently demonstrating successful Survivability and Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance and Fire Support integration testing. Test results are mixed with challenges occurring with respect to ride quality, turning radius, and reliability.
- The vehicles are making progress toward meeting their six Key Performance Parameters of force protection, survivability, MATV curb weight, MATV passenger capacity, availability, and net-ready. Force Protection and Survivability testing is ongoing and is assessed as low risk. The MATV slightly exceeds the threshold Curb Weight by about 600 pounds and is assessed as low risk. Crew passenger and net-readiness will be tested during IOT&E and are assessed as low to moderate risk. Availability will also be tested during IOT&E and is assessed as moderate risk to high risk.
- Due to the challenges with respect to mobility and reliability, and the lack of sufficient MATV reliability DT miles being completed, demonstrating acceptable effectiveness and suitability during IOT&E is assessed as moderate to high risk.

Summary of FY 2009 Systems Engineering Activities

- **Systems Engineering Plan (SEP)** – The SEP, approved in April 2009 with a Joint Interoperability Test Command approved waiver, is being updated to address the systems engineering activities planned for the acquisition of the MATV.
- **Requirements** – The first MRAP Capability Production Document, approved by the Joint Staff in 2008, was updated in 2009 to address the new requirements for MRAP capability insertions and the requirements for the new MATV.
    - Engineering Change Proposals (ECPs) – The program continues to manage numerous ECPs across the fleet, such as improved suspension systems. ECPs for the recently acquired MATV include a silent watch capability; an antenna structure to support command and control; a rear cargo bed; Self-Protection Adaptive Roller Kit; and a rear-view camera.
- **Critical Technologies –** MRAP critical technologies are at or above Technology Readiness Level 9, with the exception of an active RPG defeat capability. This item is being developed outside the MRAP program and will be furnished by the Government. In the interim, bar armor is being produced and installed on a portion of the MRAP fleet for RPG defeat. The program has instituted a Capability and Technology Insertion process to provide additional capabilities that have the potential to sustain or improve MRAP vehicle performance. These upgrades provide additional capabilities to perform the current role or mission profile and include a remote weapon

system, counter-sniper sensors, gunner's overhead protection kit, Check-6 camera, and an additional power generation.

- **Technical Reviews** – Production Baseline Physical Configuration Audits were completed in FY 2009 on all procured MRAP variants. The Government is verifying these audits in order to revise the Indentured Bill of Materials, which will establish the Product Baseline. Preliminary and Critical Design Reviews of the USSOCOM MATV variant will be conducted in FY 2010.
- **Technical Issues** – The significant technical issues are: producing solutions to mitigate the probability and consequences of rollovers; implementing and verifying fixes for outstanding critical failure modes to improve reliability; and meeting the critical mobility and maneuverability requirements. Plans to resolve these issues are on track. The program continues to deal with the challenge of integrating new equipment on the vehicles to meet user requests and the associated configuration management of those changes.
- **Reliability** – The program has a reliability requirement of not less than 600 Mean Miles Between Operational Mission Failure. Most of the vehicles are currently not meeting this requirement at 80 percent confidence. The program is using test results and theater-provided data to implement corrective actions to improve reliability. The program has established a reliability Integrated Product Team to address this issue.
- **Systems Engineering Support of Life Cycle Management and Sustainability** – Due to the urgency to rapidly field vehicles, a hybrid approach of using both contractors and organic assets to provide logistics support and sustainment spares is being utilized. The Joint Program Office is evaluating long-term logistics support options to improve availability and reliability.
- **Software** – Computer software for the MRAP Family of Vehicles is a mix of commercial off-the-shelf, Government off-the-shelf, and non-developmental items (NDIs). The Joint Program Office is managing all changes to the MRAP Family of Vehicles software product baseline.
- **Integration and MATV Source Selection** – The integration of GFE onto MRAPs was initially conducted at two U.S. facilities and the Kuwait MRAP Sustainment Facility. Source selection peer reviews during the MATV acquisition process were helpful in implementing changes to the MATV acquisition, so that contract was written to ensure that the vehicles arrive "kit-ready."
- **Manufacturing** – To meet urgent needs, existing contractor NDI commercial and defense-related production capabilities/facilities are being used for production. The MRAP program has a DX rating to obtain priority of resources allocation, if it becomes necessary.

Systems Engineering Assessment

- **Program Support Reviews (PSRs)** – No MRAP PSRs have been conducted and none are planned.
- **Systems Engineering Principles and Best Practices** – Because of the numerous requests for improvements to the vehicles, the program instituted a process to consolidate, prioritize, and develop a prioritized requirements execution and funding plan. The second round of these prioritization activities was completed in October 2009. An online database is being used to track and manage the requirements prioritization process.
- **Program Health Metrics** – The program is meeting key metrics of fielding vehicles on schedule, maintaining an operational readiness rate above 90 percent, conducting operator training, and inserting new capabilities.
- **Conclusion** – The MRAP program has rapidly met an urgent need and incorporated critical design changes to meet user needs. There remain technical performance risks, and reliability is still a concern. The lack of a long-term sustainment strategy will continue to be a risk until organic support can be utilized.

Multifunction Information Distribution System–
Joint Tactical Radio System (MIDS-JTRS)

Service: Army (Chief Acquisition Executive)/Navy (Joint Program Executive Officer)

Prime Contractor: BAE Systems/Rockwell Collins Data Link Solutions L.L.C. and ViaSat, Inc.

Executive Summary

The Multi-functional Information Distribution System–Joint Tactical Radio System (MIDS-JTRS) is in development; however, F/A-18E/F Developmental Test and Evaluation indicate performance concerns with the current software version. Laboratory tests indicate potential future growth issues due to inadequate processor utilization margin. MIDS-JTRS is seeking a limited production decision in 1st quarter FY 2010.

Mission Description

MIDS-JTRS is a pre-planned product improvement of the MIDS-Low Volume Terminal (LVT) system. When integrated into a host platform, MIDS-JTRS provides MIDS-LVT capabilities, plus three additional programmable channels capable of hosting JTRS Software Communications Architecture compliant waveforms in the 2 to 2,000 megahertz radio frequency bandwidth. The system under test includes the MIDS-JTRS terminal and the host platform interfaces such as controls, displays, antenna, high-power amplifiers, and any radio frequency notch filters. The MIDS-JTRS design is plug-and-play interchangeable with U.S. Navy and U.S. Air Force platforms that use MIDS-LVT, while accommodating future technologies and capabilities. Total program requirements include terminal development, F/A-18 Level 0 integration, software hosting (Operating Environment/JTRS Waveforms), implementation of National Security Agency guidelines and production transition.

System Description

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

Developmental Test and Evaluation Activity

- The overarching MIDS Test and Evaluation Master Plan (TEMP) was approved in October 2000. Annex J to this TEMP is for development of the MIDS-JTRS variant core terminal, and Annex K is for integrating the MIDS-JTRS core terminal into the F/A-18E/F aircraft. These annexes were approved in October 2008 and April 2009 respectively.

- Naval Air Weapons Station, China Lake, California, and Naval Air Station (NAS) Patuxent River, MD, conducted DT&E flight testing in support of the limited production decision.
- Contractor and Government First Article Qualification T&E in support of the limited production decision are ongoing.

Developmental Test and Evaluation Assessment

- MIDS-JTRS is meeting 5 of 7 Key Performance Parameters (KPPs); however, the assessment is based on a non-production software version. MIDS-JTRS capability could not be fully assessed because the DT&E software version did not meet all requirements and the Low-Rate Initial Production and Initial Operational Test and Evaluation software version is not released for flight.
- MIDS-JTRS demonstrated less than 10 percent processor utilization margin, which is less than the specification required 37.5 percent and may affect meeting the growth KPP requirement.
- MIDS-JTRS reliability and operational availability estimates indicate they are achieving TEMP and KPP requirements, but confidence is low due to the limited number of system flight hours.
- Prior to the limited production decision, the program should complete ground and flight regression T&E to validate that performance thresholds are met, to demonstrate intended hardware/software configuration operations, to stress the MIDS terminal in the operational environment, and to interact with aircraft mission computer off-board sources.

Summary of FY 2009 Systems Engineering Activities

- **Systems Engineering Plan (SEP)** – The SEP developed as an annex to the overarching JTRS SEP was approved by the JTRS Joint Program Executive Officer. The Overarching SEP was approved by OUSD(AT&L) in April 2007. DSE reviewed the annex in August 2007.

Summary of FY 2009 Systems Engineering Assessments

- **Program Support Reviews (PSRs)** – A PSR was held July 2008, resulting in an Acquisition Decision Memorandum (ADM) of September 5, 2008.
  - The Overarching Integrated Product Team meeting of August 5, 2009, and several subsequent senior-level meetings resulted in postponement of the MS C Defense Acquisition Board until December 2009.
- **Software** – Software build 1.7.3 has been installed and will undergo flight testing during 1st quarter FY 2010.
- **Conclusion** – DSE input in support of the December 16, 2009, ADM established a collaborative reliability growth effort to mature the radios while proceeding with Low-Rate Initial Production and continued developmental testing.

Small Diameter Bomb Increment II (SDB II)

Service: Air Force (lead)/Navy

Prime Contractor: Competition – Boeing vs. Raytheon

Executive Summary
SDB II is a 250-lb class glide weapon designed to engage moving targets in the weather. The program completed a 42-month Technology Demonstration phase in October 2009. The program is currently in source selection, and Milestone (MS) B is planned for May 2010. Risk Reduction objectives included competitive system prototyping leading to a near Critical Design Review (CDR) level of maturity prior to down-select and MS B.

Mission Description
The SDB II mission is to engage mobile targets in degraded weather conditions while minimizing collateral damage. SDB II will use a weapons data link between the weapon and either the launch aircraft or a third party to provide flexibility in the kill chain with the following capabilities: in-flight retargeting, in-flight tracking, exclusion zone, abort, and a bomb hit indication. SDB II has three principal attack modes: normal, laser-illuminated, and coordinate attack. The normal attack target set is defined as 11 moving or stationary mobile targets. The threshold platforms are the F-15E (Air Force) and the F-35B and F-35C (Department of the Navy (DoN)).

System Description
SDB II is a 250-lb class weapon with an operating range of at least 40 nm. The system consists of the weapon, mission planning modules, containers, and interfaces with the Common Munitions Built-in-Test/Reprogramming Equipment and the existing four-place pneumatic Bomb Release Unit (BRU-61/A) Carriage System. Two of the SDB II container designs are simply minor dunnage modifications to the SDB I designs. In addition, there will be a new two-place container design to support shipboard handling and stacking for the DoN. Although SDB II is the final of two increments of the Miniature Munitions capability, the data link provides potential growth opportunities such as alternate source in-flight re-targeting. Flight testing and aircraft integration will occur in three phases to allow timely fielding of the normal attack capability on the F-15E and to accommodate a lag in F-35B and F-35C development.

Summary of FY 2009 Systems Engineering Activities
- **Systems Engineering Plan (SEP)** – The MS B SEP is in development; no issues are anticipated. No waivers or deviations are anticipated. Though not final, the SEP development informed the Engineering and Manufacturing Development RFP release in October 2009.
- **Requirements** – The Capability Development Document (CDD) was validated in June 2009. The program has five Key Performance Parameters (KPPs): scenario weapons effectiveness (SWE), weapon loadout, carrier operability, materiel availability, and net-readiness. The capabilities outlined are generally reasonable; however, the SWE KPP and Weapons Effectiveness (WE) Key System Attribute present significant verification and validation challenges. These top-level requirements are effectively a roll-up of reliability, accuracy, and lethality across the target set and in a variety of complex scenarios (weather, environments, clutter, etc.). The complexity drives the program to modeling and simulation (M&S)–based acquisition.
- **Critical Technologies** – The SDB II critical technologies are the multi-mode seeker, target classification algorithms, data-link, and the warhead/fuze. An independent Technology Readiness Assessment (TRA) is under way to support MS B. Initial indications are one or both contractors are on track to achieve Technology Readiness Level 6 or greater by MS B.

- **Technical Reviews** – The program conducted informal final design reviews with each contractor in June 2009. The Government will conduct a full system level CDR within 6 months of Engineering and Manufacturing Development contract award.
- **Technical Issues and Risks** – Due to the competition sensitivity, design-specific technical issues and risks will not be discussed. Schedule is a significant program driver, specifically the FY 2014 required assets available target date as defined in the CDD. These pressures are most noticeable in the developmental free-flight test program and may lead to verification and validation challenges.
- **Reliability** – The CDD defines reliability growth for storage, captive, free-flight reliability, and materiel availability. The reliability growth plan consists of a combination of design for reliability activities, highly accelerated life testing, environmental stress screening, captive, and free-flight testing.
- **Systems Engineering Support of Life Cycle Management and Sustainability** – SDB II is being procured as a "wooden round" with a 20-year warranty. One concern is that reliability maturation is defined as the end of the fifth production lot. As mitigation, the program is planning a Production Reliability Incentive Demonstration Effort program to incentivize growth.
- **Software** – There are no significant software development risks currently identified.
- **Integration** – The program uses the Joint Interface Control Working Group to manage and facilitate multi-platform weapon systems interfaces. All threshold and most objective platforms participate; Interface Control Documents have been established. One risk identified by the program is concurrent development with the F-35B and F-35C and potential for unknown design changes. Specifically, F-35B and F-35C availability lag SDB II development by approximately 2 years.
- **Manufacturing** – An independent Manufacturing Readiness Assessment (MRA) is being conducted in support of MS B. Preliminary indications are one or both contractors will be at least at Manufacturing Readiness Level 6 by MS B.

Summary of FY 2009 Systems Engineering Assessments

- **Program Support Reviews (PSRs)** – DSE initiated a PSR in February 2009. Labeled a Joint Integrated Program Review Assessment, this "pilot" review was conducted in conjunction with several Service-conducted reviews (e.g., TRA, MRA, etc.). The review team provided preliminary findings to the program prior to RFP release and source selection entry. The review will be finalized approaching MS B. Key findings included a highly experienced Program Office staff, a commendable effort to advance small warhead modeling, and the contractors' ability to leverage extensively from previous weapons developments. The extended risk reduction helped mature technologies and manufacturing in advance of program initiation. Concerns include the following: Extensive requirements lead to a heavily M&S-dependent program, and a lack of robust developmental testing may lead to challenges in adequately validating the model and system performance. The reliability growth program lacks robustness, and although the requirements effectively set a "reliability floor," the actual free-flight reliability must be significantly higher to achieve the WE and SWE requirements. This inconsistency may lead to additional challenges in validating performance by the production decisions. The Program Office concurred with a majority of the findings; however, recommendations with respect to test resources and M&S validation are still under assessment. A combined OSD-Service working group has been convened to develop options that will be presented to Department leadership.
- **Program Health Metrics** – The contractors have developed and are routinely tracking Technical Performance Parameters. The program maintains insight through monthly reviews.
- **Conclusion** – MS B is planned for May 2010. The technical risk is assessed as moderate primarily due to limited free-flight testing and challenges associated with validating model and system-level performance.

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6.5 Systems Engineering Special Assessments

This section includes summaries of 10 systems engineering special assessments completed in FY 2009. The reviews may include Joint Analysis/Assessment Teams (JATs), Independent Program Assessments (IPAs), or other reviews directed by the Under Secretary of Defense for Acquisition, Technology, and Logistics (USD(AT&L)), or they may include Non-Advocate Reviews initiated by the Service.

10 special assessments:

- Advanced Extremely High Frequency (AEHF) Satellite Reliability Review
- Aircraft Survivability Equipment (ASE) Joint Analysis Team
- Extended Range/Multi-Purpose Unmanned Aircraft System (ER/MP UAS) Defense Support Team Review of Software Development
- F-15C Joint Assessment Team
- Global Positioning System (GPS) Next Generation Operational Control System (OCX) Independent Program Assessment
- MAXPOWER Non-Advocate Review
- National Polar-Orbiting Operational Satellite System (NPOESS) Tri-Agency Joint Analysis Team
- Networked Systems Security Certification (NSSC) Joint Analysis Team
- Radar Phase II Joint Assessment Team
- Space Fence Independent Program Assessment

Advanced Extremely High Frequency Satellite Reliability Review

In an Acquisition Decision Memorandum (ADM) resulting from a Nunn-McCurdy certification review in December 2008, the USD(AT&L) directed a Reliability Review of the Advanced Extremely High Frequency (AEHF) program. The Directorate of Systems Engineering (DSE) led the review, which included participants from the Director, Operational Test and Evaluation (DOT&E), the Office of the Deputy Under Secretary of Defense for Acquisition and Technology, Logistics and Materiel Readiness, Mitre, and Booz Allen. The team was tasked to determine whether appropriate engineering and management processes were in place and sufficient resources available for the program to achieve its reliability requirements while managing program risk. The review team found that the program had a strong reliability program in place and considered reliability throughout the systems engineering process. The review team identified the following risks, however:

- Support costs for non-mission critical failures may significantly exceed expected values because the program does not have a specific requirement for overall system reliability.
- The Mission Planning Element (MPE) could have unforeseeable performance issues in operational test because of the complex structure of possible user paths.
- MPE Increment 5 software has 90 Category I deficiency reports, and the software may not perform reliably during operational test if not sufficiently matured in time for the event.

The program accepted the findings and began to take action to mitigate the identified risks.

Aircraft Survivability Equipment Joint Analysis Team

The purpose of this JAT was to advise the USD(AT&L), and others as directed, regarding the Aircraft Survivability Equipment (ASE) investment and divestment options in support of Program Objective Memorandum (POM)-10 by developing a coordinated Defense Enterprise ASE Roadmap. This investment strategy was to address both immediate and long-term ASE investment with a vision through 2018. In addition, the JAT was to address the coverage of aviation community requirements, analyze the effectiveness and suitability of available countermeasure technologies, determine the need for a systems approach to ASE component acquisition, address the coordination and efficiency of the Services' acquisition strategies, and address competition and prototyping in technology development efforts.

As documented in the ASE ADM, the JAT found that the Military Departments have generally fielded effective Infrared Countermeasures equipment; however, several aspects of ASE development require additional attention. Specifically, competition in prototyping, coordination of Service efforts, and focus on Total Ownership Cost (with emphasis on reliability) need greater emphasis and oversight.

As documented in the ASE ADM, USD(AT&L) designated the Advanced Threat Infrared Counter Measures/Common Missile Warning System (ATIRCM/CMWS) and the Large Aircraft Infrared Counter Measures (LAIRCM) system as ACAT ID programs. USD(AT&L) designated the Joint and Allied Threat Awareness System (JATAS), and the Department of the Navy LAIRCM (DON-LAIRCM) effort as special interest ACAT ID programs.

The ADM established an ASE Senior Steering Group (SSG) dedicated to fostering a Modular Open Systems Approach (MOSA) for ASE for large and small, fixed and rotary wing aircraft. In addition, the ASE SSG will ensure that progress is being made against the other goals of the Defense Enterprise ASE Roadmap developed by the JAT.

In addition to other specific direction to ASE programs, the ADM sponsored the establishment of the Joint IRCM T&E Working Group with the DOT&E Center for Countermeasures and OSD/DDT&E, and the implementation of a standard reliability metric tracking and reporting system by key ASE programs in coordination with DSE, to ensure meaningful reliability metrics.

Extended Range/Multi-Purpose Unmanned Aircraft System Defense Support Team Review of Software Development

The Defense Acquisition Executive directed a Defense Support Team (DST) Review of the Software and Information Assurance assessment of the Extended Range/Multi-Purpose Unmanned Aircraft System (UAS) program. The DST was to establish a baseline of the effectiveness of the software approach, including: Software Management, Development and Technologies, Resources and Processes, Design and Build Schedule, System Assurance and Security, Verification and Validation, and Integration and Test. The DST team was led by DSE and included subject matter experts with experience in complex embedded information systems and unmanned air systems in warfighting.

The review findings included the following:

- Fulfilling near-term requirements may result in significant delays in delivering all future capabilities and potentially may delay meeting all required capabilities at Initial Operational Capability.
- The inability to manage software development may result in inaccurate baseline establishment, poor future schedule and cost estimation, and continual replanning.
- The lack of software-level formal qualification testing and equivalent system-level testing could lead to late discovery of performance shortfalls or other defects.
- The prime contractor has grown rapidly to address the increased demand for UAS and has built an impressive development and manufacturing capability.
- The Program Management Office and prime contractor have begun implementing a more rigorous system and software engineering process.
- The UAS software architecture is flexible and modular, facilitating many parallel, simultaneous changes without affecting other parts of the system.

The review team recommended that the Department remain engaged in assisting the Services and the contractor to improve the software development processes. As a result, the contractor developed a more robust software process, including improved software requirements decomposition, the definition and tracking of key software metrics, improved estimation, and other factors to reduce the software development risk.

F-15C Joint Assessment Team

The USD(AT&L) directed the F-15C JAT to review the November 2, 2007, F-15C mishap that occurred during a training mission over Missouri. The team was to conduct an independent assessment of all aspects of the F-15 mishap, leverage the Air Force accident investigation, consider all issues to provide a view of the F-15 fleet's current health, long-term potential, the prospects for longeron replacement or structural upgrade kits, and the benefit of enhanced maintenance and inspection. The team found that the F-15C mishap resulted from a fatigue crack in the upper right longeron that grew over time to critical length at a previously unknown "hot spot" area caused by the culmination of high local bending stresses.

JAT recommendations included the following:

- Air Force take immediate action to rapidly mitigate F-15 safety and economic risks.
- Air Force fully implement, resource, and manage the F-15 Aircraft Structural Integrity Program (ASIP) with assigned technical and fiscal responsibilities.
- Air Force accelerate the development and implementation of an "F-15 Weapon System Capability and Sustainment Plan" to be consistent and compatible with the ALC F-15 Way Forward Plan, the ACC F-15 Force Structure Plan through 2025, and the USAF F-15 ASIP.
- Air Force establish service life limits in the Airworthiness Certificate.
- Air Force brief the USD(AT&L) within 90 days on actions taken in response to the F-15 JAT recommendations.

The Air Force largely concurred and implemented the JAT recommendations.

Global Positioning System Next Generation Operational Control System Independent Program Assessment

DSE participated in the Air Force-led Global Positioning System (GPS) Next Generation Operational Control System (OCX) Independent Program Assessment (IPA) in May 2009 in support of Key Decision Point-B (KDP-B). The team was chartered to assess the program's readiness to enter the Preliminary Design phase (Phase B). During the IPA process, DoD 5000.02 was released, which required the program to switch from NSS 03-01 guidance to DoD 5000.02 guidance. Consequently, the KDP-B was transitioned to a Milestone (MS) B and moved to the 1st quarter FY 2011. The IPA will perform an update to its report to support the MS B. The team performed the review following the well-established IPA methodology.

DSE found that overall the program's systems engineering processes were based on best practices and continuing to mature; however, the following risks were also identified:

- Card development process is inadequate
- OCX Technical Performance Measures (TPM) are not fully defined
- Structured process to provide Service Oriented Architecture (SOA) analysis needed by Preliminary Design Review (PDR)

The program accepted the findings and began addressing the issues.

MAXPOWER Non-Advocate Review

MAXPOWER is an Air Force-managed program, funded by the Joint Improvised Explosive Device Defeat Organization. DSE conducted a review of the program to assess risks, systems engineering processes, and the status of the program relative to performance, cost, and schedule.

The review findings included the following:

- Systems Engineering Plan (SEP): The Program Manager approved the MAXPOWER SEP in November 2007. The prototype design drawings are under configuration control and management.
- The program is employing rigorous systems engineering processes outlined in the SEP. The program made significant progress in completing the installation and integration of all major sub-systems for the prototype in 2009.
- The schedule planned for full system integration testing, and integrated test in a relevant environment is under-scoped and not adequate.
- Final system integration efforts are scheduled for completion in early FY 2010 with testing scheduled soon thereafter.

National Polar-Orbiting Operational Satellite System Tri-Agency Joint Analysis Team

The mission of the National Polar-Orbiting Operational Satellite System (NPOESS) Tri-Agency JAT was to develop and recommend a comprehensive set of options for presentation to the Executive Committee for decision. The JAT was supported by staff from the Office of the Secretary of Defense, NOAA, NASA, the Integrated Program Office, and the Services. The recommended set of options will address any on-orbit adjustments that must be made to prolong the constellation life, delays in spacecraft launch availability, delays in payload availability, a risk and operational assessment of a gap in space weather coverage, and detailed analysis of payload alternatives.

Networked Systems Security Certification Joint Analysis Team

The purpose of the Networked Systems Security Certification (NSSC) JAT was to address acquisition challenges associated with evolving security certification requirements, specifically to:

- Recommend reasonable, achievable security certification standards, criteria, and certification processes for programs currently in development.
- Define the next block of criteria for future programs to address security certification criteria.

The JAT included more than 80 representatives from USD(AT&L), Army, the National Security Agency/Information Assurance Directorate, the Assistant Secretary of Defense for Networks and Information Integration, Navy, Program Manager–Future Combat Systems, Joint Staff, Air Force, Joint Program Executive Office (PEO) Joint Tactical Radio System, STRATCOM, Marine Corps, and PEO–Space Systems.

The USD(AT&L) memo focused on security certification and the NSA role in the security certification process; thus the NSSC JAT focused on the NSA Type 1 Communications Security (COMSEC) certification process, which certifies that COMSEC equipment can be used to protect classified information up to Top Secret. The process performs verification and validation that a cryptographic product was designed, developed, and tested in accordance with NSA Information Assurance Directorate security requirements. The NSSC JAT did not address the overall system security certification process. The final report was issued December 22, 2008.

JAT recommendations included the following:

- Strengthen NSA partnership through early engagement.
- Clarify ambiguous security certification requirements.
- Improve communications security knowledge, systems engineering, and expertise.
- Manage changes to operational requirements and capabilities.

Radar Phase II Joint Assessment Team

The purpose of the Radar Phase II JAT was to advise the USD(AT&L), and others as directed, regarding radar investment and divestment options in support of the POM-10 Defense Enterprise ASE Roadmap by developing a coordinated roadmap for radar technology, radar development, and radar procurement.

The JAT found that as a result of the significant commonality found across all radar domains by the JAT, a Radar Overarching Integrated Product Team was established to accomplish the following:

- Conduct biannual reviews of all radar programs
- Maintain Open Systems Architecture (OSA) knowledge base and best practices
- Maintain radar system attributes and procurement strategy database
- Maintain visibility on all Service/Missile Defense Agency radar acquisition strategies to ensure cross-domain commonality
- Participate in radar requirements process with the Services and Joint Staff
- Encourage cooperation/interaction with all DoD radar stakeholders via symposiums, electronic media, lessons learned, etc.

As documented in the Radar OSA DST ADM resulting from this JAT, USD(AT&L) established the OSA DST, in support of the Radar Overarching Integrated Product Team (OIPT), to review the DoD's current inventory of radar systems, obtain insights from radar industrial base suppliers, and recommend options to meet new radar capability needs with consideration given to hardware and software open architecture designs and a MOSA. The goal is to lower radar life cycle cost while providing for enhanced technology refresh and, potentially, radar performance. The DST also will consider constraints to fully implementing radar OSA, such as intellectual property constraints, information assurance, and interoperability. Three other ADMs resulted from the JAT, providing direction to sets of radar programs with significant commonality. The Radar OIPT is conducting ongoing reviews to ensure that the direction provided in these ADMs is being executed as planned.

Space Fence Independent Program Assessment

DSE participated in the Air Force-led Space Fence IPA in August 2008 in support of Key Decision Point-A (KDP-A). The team was to assess the program's readiness to enter the Concept Development Phase (Phase A). The team visited the Program Office and performed the review following the well-established IPA methodology. The team performed in-depth review of those areas of particular criticality, controversy, or risk.

IPA findings included the following:

- The current IPT organization does not provide product accountability.
- Critical product deliverables are not defined in detail and are not controlled.
- Critical additional work needs to be performed to strengthen schedule and technical management.

The program accepted the findings and began addressing the issues.

APPENDIXES

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Appendix A. Programs Assessed by DDT&E and DSE for FY 2009 Report

Following is a list of programs DDT&E and DSE assessed for the FY 2009 report, by Service and type of assessment.

Army			
Program Acronym	**Program Name**	**DDT&E Reporting**	**DSE Reporting**
ATIRCM/ CMWS	Advanced Threat Infrared Countermeasures/ Common Missile Warning System		X
AB3	Apache (AH-64D) Block III		X
E-IBCT	Early-Infantry Brigade Combat Team (Formerly known as Spin Out 1 of Future Combat Systems)	X	X
ER/MP	Extended Range/Multi-Purpose Unmanned Aircraft System (Sky Warrior)		X
IAMD	Integrated Air and Missile Defense		X
Stryker	Stryker Family of Vehicles	X	X

Department of Navy (Navy and Marine Corps)			
Program Acronym	**Program Name**	**DDT&E Reporting**	**DSE Reporting**
BAMS UAS	Broad Area Maritime Surveillance Unmanned Aircraft System		X
CH-53K	CH-53K Heavy Lift Replacement Helicopter		X
CEC	Cooperative Engagement Capability		X
CVN 78	CVN 78 Ford Class Nuclear Aircraft Carrier	X	X
DDG 1000	DDG 1000 Zumwalt Class Destroyer		X
E-2D	E-2D Advanced Hawkeye	X	X
E/A-18G	E/A-18G "Growler"	X	X
EFV	Expeditionary Fighting Vehicle		X
H-1 Upgrades	H-1 Upgrades (4BW/4BN) – U.S. Marine Corps Upgrade to AH-1W Attack and UH-1N Utility Helicopters	X	
JHSV	Joint High Speed Vessel	X	X
LCS	Littoral Combat Ship	X	X
P-8A	P-8A Poseidon Multi-Mission Maritime Aircraft		X
SSC	Ship-to-Shore Connector		X
SM-6	Standard Missile-6	X	X
SSN 774	SSN 774 Virginia Class Submarine	X	X

Air Force			
Program Acronym	**Program Name**	**DDT&E Reporting**	**DSE Reporting**
AEHF	Advanced Extremely High Frequency Satellite	X	
BCS-F	Battle Command Support-Fixed		X
C-5 M	C-5 M Super Galaxy (includes C-5 RERP and C-5 AMP)		X
C-5 RERP	C-5 Reliability Enhancement and Re-engining Program	X	
C-130 AMP	C-130 Avionics Modernization Program	X	X
CITS	Combat Information Transport System		X
Global Hawk (RQ-4B)	Global Hawk (RQ-4B) Unmanned Aircraft System		X
HC/MC-130 Recap	HC/MC-130 Recapitalization		X
ISPAN	Integrated Strategic Planning and Analysis Network, Block 1		X
JCA	Joint Cargo Aircraft		X
MPS	Mission Planning System, Increment IV		X
MQ-9A Reaper	MQ-9A Reaper Unmanned Aircraft System		X
WGS	Wideband Global SATCOM	X	

Joint			
Program Acronym	**Program Name**	**DDT&E Reporting**	**DSE Reporting**
F-35 JSF	F-35 Joint Strike Fighter (Air Force, Navy, Marine Corps)	X	X
JAGM	Joint Air-to-Ground Missile (Army, Navy)		X
JLTV	Joint Light Tactical Vehicle (Army, Marine Corps, international)		X
JTRS-HMS	Joint Tactical Radio System Handheld, Manpack, Small Form Fit (Army, Navy)		X
MEADS	Medium Extended Air Defense System (Army, international)		X
MRAP	Mine Resistant Ambush Protected Vehicle (Marine Corps, USSOCOM, international)	X	X
MIDS-JTRS	Multi-Functional Information Distribution System–Joint Tactical Radio System (Army, Navy)	X	X
SDB II	Small Diameter Bomb Increment II (Air Force, Navy)		X

Appendix B. USD(AT&L) List of Major Defense Acquisition Programs

The Under Secretary of Defense for Acquisition, Technology, and Logistics (USD(AT&L)) approved a list of 147 Major Defense Acquisition Programs (MDAPs) on July 6, 2009. Following is an excerpt from the July 6, 2009 USD(AT&L) memorandum.

SUBJECT: FY 2009 Major Defense Acquisition Program (MDAP) Lists

The attached lists comprise the Department's FY2009 MDAPs. As the Defense Acquisition Executive, I am the milestone decision authority (MDA) for acquisition category (ACAT) ID programs. The cognizant DoD Component Head is delegated authority as the MDA for ACAT IC programs and may re-delegate that authority to the DoD Component Acquisition Executive. No further delegation of authority as MDA is authorized for MDAPs, to include post-Milestone C decisions.

All Pre-MDAPs are presumed to become ACAT ID programs that would require specific delegation as ACAT IC programs. The cognizant DoD Component Head will provide a readiness briefing to the appropriate Overarching Integrated Product Team for each new Pre-MDAP at least 6 months prior to its intended first Defense Acquisition Board/Information Technology Acquisition Board Milestone Decision meeting.

FISCAL YEAR 2009
MAJOR DEFENSE ACQUISITION PROGRAM LISTS

LEGEND

UNBOLDED ENTRY - Indicates no change from previous published list

BOLDED ENTRY - Indicates change from previous published list and an addition; either:
- a new entry or added information; or
- movement from another list

~~**BOLDED ENTRY STRIKETHROUGH**~~ - Indicates that the change is a deletion to that list

Italicized Entry - Provides explanation of the change

COMPONENT - The Military Department or Defense Agency to whom the USD(AT&L) has delegated Milestone Decision Authority (MDA) for oversight of Acquisition Category (ACAT) IC (C for "Component") programs.

DAB (Defense Acquisition Board) - The board of Principals and Advisors on which the USD(AT&L) serves as Chairman in the oversight of ACAT ID (D for "DAB") programs and on which the USD(AT&L) serves as MDA.

DISA - Defense Information Systems Agency

~~**DSAB (Defense Space Acquisition Board)**~~ - The board of Principals and Advisors on which the USD(AT&L) serves as Chairman in the oversight of MDAP Space programs and on which the USD(AT&L) serves as MDA. *The DSAB was disestablished, and all Space Programs for which the USD(AT&L) is the MDA are now under the DAB, per March 23, 2009, USD(AT&L) memorandum.*

IRB - Investment Review Board. An IRB fulfills OIPT Leader responsibilities in the oversight of Defense Business Systems programs.

ITAB (Information Technology Acquisition Board) - The board of Principals and Advisors on which the USD(AT&L) may serve as Chairman or may delegate MDA to the Assistant Secretary of Defense for Networks and Information Integration, in accomplishment of the DoD Chief Information Officer's acquisition-related responsibilities for IT, including National Security Systems.

JIAB - Joint Intelligence Acquisition Board: USD(AT&L) co-chairs JIAB with Director of National Intelligence Senior Acquisition Executive on programs where MDA is jointly shared.

MDAP (Major Defense Acquisition Program) - Defined in 10 USC § 2430 as a Department of Defense (DoD)

acquisition program that is not a highly sensitive classified program (as determined by the Secretary of Defense) and that is designated by the Secretary of Defense as a major defense acquisition program, or that is estimated by the Secretary of Defense to require an eventual total expenditure for research, development, test, and evaluation of more than $365,000,000 (updated to FY 2000 constant dollars) or an eventual total expenditure for procurement of more than $2,190,000,000 (updated to FY 2000 constant dollars). By DoD policy, MDAPs are broken out into two sub-categories: ACAT ID; and ACAT IC.

MDEB - Missile Defense Executive Board, **chaired by the USD(AT&L),** makes recommendations ~~**to the USD(AT&L)**~~ with respect to the Ballistic Missile Defense System Program **to the Deputy Secretary of Defense regarding the implementation of strategic policies and plans, program priorities, and investment options.**

PNO (Program Number) - Major Defense Acquisition Program-unique three-digit numeric/alphanumeric identifier and shown in parentheses after each program on the MDAP lists. Some new PreMDAPs may reflect a PNO as to be assigned (TBA).

OIPT - Overarching Integrated Product Team Leader oversight authority:

Symbol		OIPT Leader
A&T/PSA	-	Director, Portfolio Systems Acquisition
A&T/JAC	-	Director, Joint Advanced Concepts
A&T(MDEB)	-	Director, Portfolio Systems Acquisition (for MDEB)
DUSD(BT)	-	Deputy Under Secretary of Defense, Business Transformation
~~**NII**~~	~~-~~	Assistant Secretary of Defense, Networks & Information Integration
NII	-	Deputy Assistant Secretary of Defense, Command, Control, Communications, Intelligence, Surveillance, Reconnaissance and Information Technology Acquisition. *Existing Command, Control, Communications, Intelligence, Surveillance, Reconnaissance, and Space OIPT disestablished, per June 5, 2008 USD(AT&L) memorandum.*
NCB	-	Deputy Assistant to the Secretary of Defense, Chemical Demilitarization & Threat Reduction
SIO	-	Director, Space and Intelligence Capabilities Office. *Space and Intelligence OIPT established as primary advisor to the USD(AT&L) on issues associated with end-to-end Space and Intelligence infrastructure, per June 5, 2008 USD(AT&L) memorandum. SIO is under the purview of the Deputy Under Secretary of Defense for Acquisition and Technology, per June 5, 2009, USD(AT&L) memorandum. Also serves as OIPT Leader on JIAB programs for which the USD(AT&L) is co-MDA.*

Functional Capability Board (FCB):

Battlespace Awareness	BA
Building Partnerships	BP
Command and Control	CC
Corporate Management and Support	CMS
Force Application	FA
Force Support	FS
Logistics	L
Net Centric	NC
Protection	P

MAJOR DEFENSE ACQUISITION PROGRAM (MDAP) LISTS BY FUNCTIONAL CAPABILITY BOARD

BATTLESPACE AWARENESS (BA):

ASIP - Airborne Signals Intelligence Payload ~~**Program**~~. *ASIP Baseline program designated Air Force ACATID program, per January* 23, *2009, USD(AT&L) memorandum.* (AIR FORCE DAB (ACAT ID)) *(A&T/PSA)* (PNO 375)

~~**AWACS UPGRADE**~~ - Airborne Warning and Control System Block *40/45* Upgrade Program. *AWACS UPGRADE deleted from Battlespace Awareness FCB and re-entered under Command and Control FCB, per May 28, 2009, J8 coordination.* (AIR FORCE COMPONENT (ACAT IC)) *(A&T/PSA)* (PNO 277)

BAMS UAS - Broad Area Maritime Surveillance Unmanned Aircraft System. *BAMS name expanded to BAMS UAS program and designated Navy ACAT ID program, per April 18, 2008, USD(AT&L) memorandum.* (NAVY DAB (ACAT ID)) (A&T/PSA) (PNO 373)

COBRA JUDY REPLACEMENT - Ship-based radar system. *OIPT oversight responsibility redesignated, per April 24, 2009, USD(AT&L) memorandum.* (NAVY DAB (ACAT ID)) (~~**NII**~~A&T/SIO) (PNO 365)

~~**E 2D AHE**~~ - E-2D Advanced Hawkeye. *E-2D AHE deleted from Battlespace Awareness FCB and re-entered under Command and Control FCB, per May 28, 2009, J8 coordination. OIPT oversight responsibility redesignated, per April 24, 2009, USD(AT&L) memorandum.* (NAVY DAB (ACAT ID)) (~~**NII**~~A&TIPSA) (PNO 364)

ER/MP UAS - Extended Range Multi-Purpose Unmanned Aircraft System. *Sky Warrior deleted from below as Army ACAT ID List and, renamed ER/MP UAS.* (ARMY DAB (ACAT ID)) *(A&T/PSA)* (PNO 420)

GLOBAL HAWK (RQ-4A/B) - High Altitude Endurance Unmanned Aircraft System. (AIR FORCE DAB (ACAT ID)) (A&T/PSA) (PNO 252)

MP RTIP - Multi-Platform Radar Technology Insertion Program. (AIR FORCE DAB (ACAT ID)) (A&T/PSA) (PNO 293)

NAS - National Airspace System. *OIPT oversight responsibility redesignated, per April 24, 2009, USD(AT&L) memorandum.* (AIR FORCE COMPONENT (ACAT IC)) (**NII**) (PNO 537)

NPOESS - National Polar-Orbiting Operational Environmental Satellite System. Multi-Agency weather satellite system with NASA participation and Department of Commerce (DoC) as lead agency. *OIPT oversight responsibility redesignated, per April 24, 2009, USD(AT&L) memorandum.* (AIR FORCE ~~**DSAB**~~**DAB** (ACAT ID)) **(~~NII~~A&T/SIO)** (PNO 239)

PREDATOR- Unmanned Aircraft System. (AIR FORCE DAB (ACAT ID)) (A&T/PSA) (PNO 271)

SBIRS HIGH - Space-Based Infrared System Program, High Component. *OIPT oversight responsibility redesignated, per April 24, 2009, USD(AT&L) memorandum.* (AIR FORCE **~~DSAB~~DAB** (ACAT ID)) **(~~NII~~A&T/SIO)** (PNO 210)

SBSS B1O - Space-Based Space Surveillance Block 10. *OIPT oversight responsibility redesignated, per April 24, 2009, USD(AT&L) memorandum.* (AIR FORCE **~~DSAB~~DAB** (ACAT ID)) **(~~NII~~A&T/SIO)** (PNO 328)

~~SKY WARRIOR~~ - Unmanned Aircraft System. *Sky Warrior deleted from Army ACAT 1D List, renamed ER/MP UAS, and re-entered above.* (ARMY DAB (ACAT ID)) (A&T/PSA) (PNO **~~353~~420**)

VTUAV - Vertical Takeoff and Land Tactical Unmanned Air Vehicle (Fire Scout). NAVY COMPONENT (ACAT IC)) (A&T/PSA) (PNO 253)

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12 programs

BUILDING PARTNERSHIPS (BP):

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0 programs

COMMAND AND CONTROL (CC):

AWACS UPGRADE - Airborne Warning and Control System Block 40/45 Upgrade Program. *AWACS UPGRADE deleted from Battlespace Awareness FCB and re-entered under Command and Control FCB, per May 28, 2009, J8 coordination.* (AIR FORCE COMPONENT (ACAT IC)) (A&T/PSA) (PNO 277)

E-2D AHE - E-2D Advanced Hawkeye. *E-2D AHE deleted from Battlespace Awareness FCB and re-entered under Command and Control FCB, per May 28, 2009, J8 coordination. OIPT oversight responsibility redesignated, per April 24, 2009, USD(AT&L) memorandum.* (NAVY DAB (ACAT ID)) (**~~NII~~A&T/PSA**) (PNO 364)

FBCB2 - Force XXI Battle Command Brigade and Below Program. *OIPT oversight responsibility redesignated, per April 24, 2009, USD(AT&L) memorandum.* (ARMY COMPONENT (ACAT IC)) (**NII & A&T/PSA**) (PNO 294)

JPALS - Joint Precision Approach and Landing System. *JPALS deleted from Navy Pre-MDAP List and moved to Navy ACAT ID List, per July 14, 2008, USD(AT&L) memorandum, and OIPT oversight responsibility redesignated, per April 24, 2009, USD(AT&L) memorandum.* (NAVY DAB (ACAT ID)) (**~~NII~~A&T/PSA**) (PNO 238)

~~MPS INCREMENTS I-III~~ - Mission Planning System Increments I-III. *Air Force restructured MPS into two programs, Increments I–III and Increment IV. MPS Increments I–III retained as ACAT ID, per April 15, 2008, USD(AT&L) memorandum and subsequently deleted from Air Force*

ACAT ID List as 90% complete. OIPT oversight responsibility redesignated, per April 24, 2009, USD(AT&L) memorandum. (AIR FORCE ITAB (ACAT ID **and ACAT lAM**)) (**NII & A&T/PSA**) (PNO 394)

~~**MPS INCREMENT IV**~~ - Mission Planning System Increment IV. *Air Force restructured MPS into two programs, Increments I–III and Increment IV MPS Increment IV below MDAP threshold as a MAIS ACAT IAM program.* (AIR FORCE ITAB (ACAT ID)) (NII) (**PNO ~~394~~N35**)

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4 programs

CORPORATE MANAGEMENT AND STRUCTURE (CMS):

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0 programs

LOGISTICS (L):

BLACK HAWK UPGRADE (UH-60M) - Utility Helicopter Upgrade Program. (ARMY DAB (ACAT ID)) (A&T/PSA) (PNO 341)

C-130 AMP - C-130 Aircraft Avionics Modernization Program. (AIR FORCE DAB (ACAT ID)) (A&T/PSA) (PNO 298)

C-130J - HERCULES Cargo Aircraft Program. (AIR FORCE COMPONENT (ACAT IC)) (A&T/PSA) (PNO 220)

C-17A - GLOBEMASTER III Advanced Cargo Aircraft Program. (AIR FORCE COMPONENT (ACAT IC)) (A&T/PSA) (PNO 200)

C-5 AMP - C-5 Aircraft Avionics Modernization Program. (AIR FORCE COMPONENT (ACAT IC)) (A&T/PSA) (PNO 273)

C-5 RERP - C-5 Aircraft Reliability Enhancement and Re-engining Program. (AIR FORCE DAB (ACAT ID)) (A&T/PSA) (PNO 327)

CH-47F - Cargo Helicopter. CH-47D Helicopter Upgrade Program. (ARMY COMPONENT (ACAT IC)) (A&T/PSA) (PNO 278)

CH-53K - Heavy Lift Replacement Program. (NAVY DAB (ACAT ID)) (A&T/PSA) (PNO 390)

FMTV - Family of Medium Tactical Vehicles. (ARMY COMPONENT (ACAT IC)) (A&T/PSA) (PNO 746)

GCSS ARMY - Global Combat Support System Army. *GCSS Army deleted from Army Pre-MDAP*

List and moved to Army ACAT ID List, per July 21, 2008, USD(AT&L) memorandum.(ARMY DAB (ACAT ID **and ACAT IAM**)) (IRB) (PNO 347)

JCA - Joint Cargo Aircraft. (DoD DAB (ACAT ID)) (A&T/PSA) (PNO 183)

JHSV - Joint High Speed Vessel. *JHSV deleted from Navy Pre-MDAP List and moved to Navy ACAT ID List, per November 12, 2008, USD(AT&L) memorandum.* Intra-theater logistics transport. (NAVY DAB (ACAT ID)) (A&T/PSA) (PNO 247)

~~**KC-45**~~ - Tanker Replacement Program. *KC-45 deleted from Air Force ACAT ID List and re-entered below as KC-X program, as a result of GAO-sustained protest.* (AIR FORCE DAB (ACAT ID)) (A&T/PSA) (PNO 387)

KC-X - Tanker Replacement Program. *KC-45 deleted from Air Force ACAT ID List and re-entered from above as KC-X program, as a result of GAO-sustained protest.* (AIR FORCE DAB (ACAT ID)) (A&T/PSA) (PNO 387)

LUH - Light Utility Helicopter. (ARMY COMPONENT (ACAT IC)) (A&T/PSA) (PNO 182)

MH-60S - Multi-Mission Combat Support Helicopter. (NAVY COMPONENT (ACAT IC) (A&T/PSA) (PNO 282)

T-AKE - LEWIS AND CLARK Class of Auxiliary Dry Cargo Ships. (NAVY COMPONENT (ACAT IC» (A&T/PSA) (PNO 592)

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16 programs

FORCE APPLICATION (FA):

AB3 - Apache Block III. (ARMY DAB (ACAT ID)) (A&T/PSA) (PNO 202)

AGM-88E AARGM - AGM-88E Advanced Anti-Radiation Guided Missile (AARGM) Program. (NAVY COMPONENT (ACAT IC)) (A&T/PSA) (PNO 368)

AIM-9X - Air-to-Air Missile Upgrade. (NAVY COMPONENT (ACAT IC)) (A&T/PSA) (PNO 581)

AMRAAM - Advanced Medium Range Air-to-Air Missile. (AIR FORCE COMPONENT (ACAT IC)) (A&T/PSA) (PNO 185)

~~**ARH**~~ - Armed Reconnaissance Helicopter. *In compliance with Section* 2433 *of Title 10, United States Code* ("*Unit Cost Reports"*), *ARH not certified and terminated, per October 17, 2008, USD(AT&L) memorandum. Re-entered as Kiowa Warrior Upgrade Pre-MDAP; restart program pending MDD to establish appropriate Milestone, per May 28, 2009, J8 coordination.* (ARMY DAB) (ACAT ID)) (A&T/PSA) (PNO 179)

B-2 RMP - B-2 Radar Modernization Program. (AIR FORCE COMPONENT ACAT IC) (A&T/PSA) (PNO 376)

BRADLEY UPGRADE - Bradley Fighting Vehicle System Upgrade. (ARMY COMPONENT (ACAT IC)) (A&T/PSA) (PNO 601)

CVN ~~21~~78 - ~~Next Generation~~GERALD R. FORD CLASS Nuclear Aircraft Carrier. (NAVY DAB (ACAT ID)) (A&T/PSA) (PNO 223)

~~CVN 68~~ - NIMITZ CLASS Nuclear Powered Aircraft Carrier. *CVN 68 deleted from Navy ACAT IC List as 100% delivered.* (NAVY COMPONENT (ACAT IC)) (A&T/PSA) (PNO 161)

DDG 51- ARLEIGH BURKE CLASS Guided Missile Destroyer, which includes basic ship and all variants. (NAVY COMPONENT (ACAT IC)) (A&T/PSA) (PNO 180)

DDG 1000 - ZUMWALT CLASS Destroyer. (NAVY DAB (ACAT ID)) (A&T/PSA) (PNO 197)

EA-6B ICAP III - EA-6B Improved Capability (ICAP) III Program. (NAVY COMPONENT (ACAT IC)) (A&T/PSA) (**PNO ~~102~~418**)

EA-18G - Airborne Electronic Attack variant of the F/A-18 aircraft. (NAVY DAB (ACAT ID)) (A&T/PSA) (PNO 378)

EFV - Expeditionary Fighting Vehicle. (NAVY DAB (ACAT ID)) (A&T/PSA) (PNO 515)

~~ERM~~ - Extended Range Munition. *ERM program terminated, per July 25, 2008, USD(AT&L) memorandum.* (NAVY DAB (ACAT ID)) (A&T/PSA) (PNO 256)

EXCALIBUR- Family of Precision, 155mm Projectiles. (ARMY COMPONENT (ACAT IC)) (A&T/PSA) (PNO 366)

F/A-18E/F - SUPER HORNET Naval Strike Fighter. (NAVY COMPONENT (ACAT IC)) (A&T/PSA) (PNO 549)

F-22 - RAPTOR Advanced Tactical Fighter. (AIR FORCE DAB (ACAT ID)) (A&T/PSA) (PNO 265)

F-35 - Lightning II Joint Strike Fighter (JSF) Program. (Reporting alternates between the Navy and Air Force Acquisition Executives; program currently reports through the **~~Navy~~Air Force** Acquisition Executive). (DoD DAB (ACAT ID)) (A&T/PSA, with Net Centric interest) (PNO 198)

FCS - Future Combat Systems. (ARMY DAB (ACAT ID)) (A&T/PSA, with Net Centric interest) (PNO 301)

GMLRS/GMLRS AW - Guided Multiple Launch Rocket System/**Guided Multiple Launch Rocket System Advanced Warhead.** (ARMY COMPONENT (ACAT IC)) (A&T/PSA) (PNO 260)

H-1 UPGRADES (4BW/4BN) - United States Marine Corps Mid-life Upgrade to AH-1W Attack

Helicopter and UH-1N Utility Helicopter. (NAVY DAB (ACAT ID)) (A&T/PSA) (PNO 101)

HIMARS - High Mobility Artillery Rocket System. (ARMY COMPONENT (ACAT IC)) (A&T/PSA) (PNO 367)

JASSM (JASSM/JASSM-ER) - Joint Air-to-Surface Standoff Missile **(JASSM and JASSM Extended Range (JASSM ER).** (AIR FORCE DAB (ACAT ID)) (A&T/PSA) (PNO 555)

JDAM - Joint Direct Attack Munition. (AIR FORCE COMPONENT (ACAT IC)) (A&T/PSA) (PNO 503)

JSOW (BASELINE/UNITARY) - Joint Stand-Off Weapon Baseline Variant and Unitary Warhead variant. (NAVY COMPONENT (ACAT IC)) (A&T/PSA) (PNO 766)
Subprograms:
BASELINE/BLU-108
UNITARY

LCS - Littoral Combat Ship. (NAVY DAB (ACAT ID)) (A&T/PSA) (PNO 374)

LHA 6~~REPLACEMENT~~ AMERICA CLASS ~~New~~ Amphibious Assault Ship. (NAVY DAB (ACAT ID)) (A&T/PSA) (PNO 333)

LONGBOW APACHE - Airframe modifications on the APACHE Helicopter. (ARMY COMPONENT (ACAT IC)) (A&T/PSA) (PNO 831)

LPD 17 - SAN ANTONIO CLASS Amphibious Transport Dock **Ship.** (NAVY DAB (ACAT ID)) (A&T/PSA) (PNO 542)

MH-60R - Multi-Mission Helicopter Upgrade. (NAVY COMPONENT (ACAT IC)) (A&T/PSA) (PNO 191)

~~**MINUTEMAN III GRP**~~ - Guidance Replacement Program. *Minuteman III GRP in sustainment and deleted from Air Force ACAT ID List, per January 28, 2009, USD(AT&L) memorandum.* (AIR FORCE DAB (ACAT ID)) (A&T/PSA) (PNO 302)

~~**MINUTEMAN III PRP**~~ - Propulsion Replacement Program. *Minuteman III PRP in sustainment and deleted from Air Force ACAT ID List, per January 28, 2009, USD(AT&L) memorandum.* (AIR FORCE DAB (ACAT ID)) (A&T/PSA) (PNO 248)

P-8A - Poseidon Program. (NAVY DAB (ACAT ID)) (A&T/PSA, with Battlespace Awareness interest) (PNO 334)

REAPER - Unmanned Aircraft System. (AIR FORCE DAB (ACAT ID)) (A&T/PSA) (PNO 424)

SDB I - Small Diameter Bomb Increment 1. (AIR FORCE COMPONENT (ACAT IC)) (A&T/PSA) (PNO 354)

SSN 774 - VIRGINIA Class Submarine. (NAVY DAB (ACAT ID)) (A&T/PSA) (PNO 516)

STRYKER - Armored Vehicle. (ARMY DAB (ACAT ID)) (A&T/PSA) (PNO 299)

TACTICAL TOMAHAWK - Follow-on to TOMAHAWK Baseline missile program. (NAVY COMPONENT (ACAT IC)) (A&T/PSA) (PNO 289)

TRIDENT II MISSILE - Sea Launched Ballistic Missile. (NAVY COMPONENT (ACAT IC)) (A&T/PSA) (PNO 178)

V-22 - OSPREY Joint Advanced Vertical Lift Aircraft. (NAVY DAB (ACAT ID)) (A&T/PSA) (PNO 212)

~~**VH-71**~~ Presidential Helicopter Fleet Replacement Program. *VH-71 deleted from Navy ACAT ID List, per April 8, 2009, Secretary of Defense memorandum, Resource Management Decisions for the FY 2010 Budget Request (U). Re-entered as Pre-MDAP as VXX; restart program pending MDD to establish appropriate Milestone, per May 28, 2009, J8 coordination.* (NAVY DAB (ACAT ID)) (A&T/PSA) (PNO 392)

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36 programs

FORCE SUPPORT (FS):

DIMHRS (PERS/PAY) - Defense Integrated Military Human Resources System (Personnel and Pay) Program. *DIMHRS reclassified ACAT ID, per January 17, 2009, USD(AT&L) memorandum.* **(~~BTA~~ ACAT ~~IC~~ID and ACAT IAM)** (IRB) (PNO M26)

JPATS - Joint Primary Aircraft Training System. (AIR FORCE COMPONENT (ACAT IC)) (A&T/PSA) (PNO 560)

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2 programs

PROTECTION (P):

ATIRCM/CMWS - Advance Threat Infrared Countermeasures / Common Missile Warning System. *ATIRCM/CMWS redesignated Army ACAT ID, per April 15, 2009, USD(AT&L) memorandum.* (ARMY COMPONENT (ACAT **ID~~IC~~))** (A&T/PSA) (PNO 219)

Subprograms:
ATIRCM QRC - Advance Threat Infrared Countermeasures Quick Reaction Capability
CMWS - Common Missile Warning System
NG ATIRCM - Next Generation Advance Threat Infrared Countermeasures.

BMDS - Ballistic Missile Defense System Program. (Missile Defense Agency Acquisition Executive). (DoD DAB (ACAT ID)) (A&T/MDEB) (PNO 362)

CHEM DEMIL-ACWA - Chemical Demilitarization Program - Assembled Chemical Weapons

Alternatives. (DoD DAB (ACAT ID)) (DATSD/NCB) (PNO 243)

CHEM DEMIL-CMA - Chemical Demilitarization (Chern Demil)-CMA Program - Chemical Materials Agency (Army Executing Agent). (DoD DAB (ACAT ID)) (DATSD/NCB) (PNO 285)

~~**CSAR-X**~~ - Combat Search and Rescue Replacement Vehicle. *CSAR-X program deleted from Air Force ACAT ID List, per April 8, 2009, Secretary of Defense memorandum, Resource Management Decisions for the FY 2010 Budget Request (U).* (AIR FORCE DAB (ACAT ID)) (A&T/PSA) (PNO 329)

DON-LAIRCM - Department of Navy Large Aircraft Infrared Counter Measures Program. *DON-LAIRCM designated Navy ACAT IC program, per April 15, 2009, USD(AT&L) memorandum.* (NAVY COMPONENT (ACAT IC)) (A&T/PSA) (PNO 426)

IDECM - Integrated Defensive Electronic Countermeasures (IDECM). (NAVY COMPONENT (ACAT IC)) (A&T/PSA) (PNO ~~**l03**~~**419)**

Subprograms:
BLOCKS 2/3
BLOCK 4

JTAS - Joint and Allied Threat Awareness System. *JTAS designated Navy ACAT IC program, per April 15, 2009, USD(AT&L) memorandum.* (NAVY COMPONENT (ACAT IC)) (A&T/PSA) (PNO 427)

JLENS - Joint Land Attack Cruise Missile Defense Elevated Netted Sensor System. *OIPT oversight responsibility redesignated, per April 24, 2009, USD(AT&L) memorandum.* (ARMY DAB (ACAT ID)) **(**~~**NI**~~**HA&TIPSA)** (PNO 372)

JOINT MRAP - Joint Mine Resistant Ambush Protected Vehicles: (NAVY DAB (ACAT ID)) (A&T/PSA) (PNO 353)

LAIRCM - Large Aircraft InfraRed CounterMeasures Program. (AIR FORCE COMPONENT (ACAT IC)) (A&T/PSA) (PNO 357)

PATRIOT/MEADS CAP - Patriot/Medium Extended Air Defense System Combined Aggregate Program. (ARMY DAB (ACAT ID)) (A&T/PSA) (PNO 531)

Subprograms:
FIRE UNIT
MISSILE

PATRIOT PAC-3 - Patriot Advanced Capability 3 (Missile only). (ARMY COMPONENT (ACAT IC)) (A&T/PSA) (PNO 148)

RMS - Remote Minehunting System. (NAVY COMPONENT (ACAT IC)) (A&T/PSA) (PNO 286)

SM-6 - Standard Missile-6. (NAVY DAB (ACAT ID)) (A&T/PSA) (PNO 391)

14 programs

NET CENTRIC (NC):

AEHF - Advanced Extremely High Frequency (AEHF) Satellite Program. *In compliance with Section* 2433 *of Title 10, United States Code* ("*Unit Cost Reports"*), *AEHF restructured, certified, and Air Force ACAT ID designation of revised program retained, per December 29, 2008, USD(AT&L) memorandum. OIPT oversight responsibility redesignated, per April 24, 2009, USD(AT&L) memorandum.* (AIR FORCE ~~**DSAB**~~**DAB** (ACAT ID)) (~~**NII**~~**A&T/SIO**) (PNO 261)

AMF JTRS - Joint Tactical Radio System Airborne & Maritime/Fixed Station. *AMF JTRS returned to acquisition oversight under DAB & OIPT process. OIPT co-chaired by OUSD(AT&L) Director, Portfolio Systems Acquisition and OASD(NII)/Deputy Assistant Secretary of Defense (Command, Control, Communications, Intelligence, Surveillance & Reconnaissance & Information Technology Acquisition, per September 5, 2008, USD(AT&L) memorandum. OIPT oversight responsibility redesignated, per April 24, 2009, USD(AT&L) memorandum.* (DoD DAB (ACAT ID)) (**NII & A&T/PSA**) (PNO 380)

B-2 EHF **SATCOM AND COMPUTER** INCREMENT I - B-2 Advanced Extremely High Frequency SatCom Capability. (AIR FORCE COMPONENT (ACAT IC)) (A&T/PSA, with Net Centric interest) (PNO 224)

CEC - Cooperative Engagement Capability. (NAVY DAB (ACAT ID)) (A&T/PSA) (PNO 582)

FAB-T - Family of Beyond Line-of-Sight Terminals. *OIPT oversight responsibility redesignated, per April 24, 2009, USD(AT&L) memorandum.* (AIR FORCE ~~**DSAB**~~**DAB** (ACAT ID)) (~~**NII**~~**A&T/SIO**) (PNO 199)

GBS - Global Broadcast Service. *OIPT oversight responsibility redesignated, per April 24, 2009, USD(AT&L) memorandum.* (AIR FORCE ~~**DSAB**~~**DAB** (ACAT ID)) (~~**NII**~~**A&T/SIO**) (PNO 237)

GPS-IIIA - Global Positioning Satellite III. *OIPT oversight responsibility redesignated, per April 24, 2009, USD(AT&L) memorandum.* (AIR FORCE ~~**DSAB**~~**DAB** (ACAT ID)) (~~**NII**~~**A&T/SIO**) (PNO 292)

~~**HPCM**~~ - High Performance Computing Modernization (D,DR&E Executing Agent). *HPCM deleted from DoD DAB List, per April 8, 2009, USD(AT&L) memorandum.* (DOD DAB (ACAT ID)) (NII) (PNO 352)

JTRS GMR- Joint Tactical Radio System Ground Mobile Radio. *JTRS GMR returned to acquisition oversight under DAB & OIPT process. OIPT co-chaired by OUSD(AT&L) Director, Portfolio Systems Acquisition and OASD(NII)/Deputy Assistant Secretary of Defense (Command, Control, Communications, Intelligence, Surveillance & Reconnaissance & Information Technology Acquisition, per September 5, 2008, USD(AT&L) memorandum. OIPT oversight responsibility redesignated, per April 24, 2009, USD(AT&L) memorandum.* (DoD DAB (ACAT ID)) (**NII &**

A&T/PSA) (PNO 360)

JTRS HMS - Joint Tactical Radio System Handheld, Manpack, and Small Form Fit Radios. *JTRS HMS returned to acquisition oversight under DAB & OIPT process. OIPT co-chaired by OUSD(AT&L) Director, Portfolio Systems Acquisition and OASD(NII)/Deputy Assistant Secretary of Defense (Command, Control, Communications, Intelligence, Surveillance & Reconnaissance & Information Technology Acquisition), per September 5, 2008, USD(AT&L) memorandum. OIPT oversight responsibility redesignated, per April 24, 2009, USD(AT&L) memorandum.* (DoD DAB (ACAT ID)) **(NII & A&TIPSA)** (PNO 385)

JTRS NED - Joint Tactical Radio System Network Enterprise Domain. *JTRS NED returned to acquisition oversight under DAB & OIPT process. OIPT co-chaired by OUSD(AT&L) Director, Portfolio Systems Acquisition and OASD(NII)/Deputy Assistant Secretary of Defense (Command, Control, Communications, Intelligence, Surveillance & Reconnaissance & Information Technology Acquisition, per September 5, 2008, USD(AT&L) memorandum. OIPT oversight responsibility redesignated, per April 24, 2009, USD(AT&L) memorandum.* (DoD DAB (ACAT ID)) **(NII & A&T/PSA)** (PNO 284)

MIDS - Multi-Functional Information Distribution System (Includes Low Volume Terminal and JTRS). *MIDS-JTRS returned to acquisition oversight under DAB & OIPT process. OIPT co-chaired by OUSD(AT&L) Director, Portfolio Systems Acquisition and OASD(NII)/Deputy Assistant Secretary of Defense (Command, Control, Communications, Intelligence, Surveillance & Reconnaissance & Information Technology Acquisition, per September 5, 2008, USD(AT&L) memorandum. OIPT oversight responsibility redesignated, per April 24, 2009, USD(AT&L) memorandum.* (DoD DAB (ACAT ID)) **(NII & A&T/PSA)** (PNO 554)

MUOS - Mobile User Objective System. Follow-on to UHF Follow-on Communications Satellite system (Navy Executing Agent). *OIPT oversight responsibility redesignated, per April 24, 2009, USD(AT&L) memorandum.* **(~~AIR FORCE~~NAVY ~~DSAB~~DAB** (ACAT ID)) **(~~NII~~A&T/SIO)** (PNO 345)

NAVSTAR GPS - Global Positioning System (Includes Satellites, Control and User Equipment). *OIPT oversight responsibility redesignated, per April 24, 2009, USD(AT&L) memorandum.* (AIR FORCE **~~DSAB~~DAB** (ACAT ID)) **(~~NII~~A&T/SIO)** (PNO 166)

Subprograms:
SPACE & CONTROL
USER EQUIPMENT

NMT - Advanced Extremely High Frequency Navy Multiband Terminal Satellite Program. *OIPT oversight responsibility redesignated, per April 24, 2009, USD(AT&L) memorandum.* (NAVY COMPONENT (ACAT IC)) (NAVY COMPONENT (ACAT IC)) **(~~NII~~A&T/SIO)** (PNO 290)

WGS - Wideband Global SATCOM Program. *OIPT oversight responsibility redesignated, per April 24, 2009, USD(AT&L) memorandum.* (AIR FORCE **~~DSAB~~DAB** (ACAT ID)) **(~~NII~~A&T/SIO)** (PNO 326)

WIN-T INCREMENT 1 - Warfighter Information Network - Tactical Increment 1. *OIPT oversight responsibility redesignated, per April 24, 2009, USD(AT&L) memorandum.* (ARMY DAB (ACAT ID)) **(NII & A&T/PSA)** (PNO 346)

WIN-T INCREMENT 2 - Warfighter Information Network - Tactical Increment 2. *OIPT oversight responsibility redesignated, per April 24, 2009, USD(AT&L) memorandum.* (ARMY DAB (ACAT ID)) **(NII & A&T/PSA)** (PNO 349)

WIN-T INCREMENT 3 - Warfighter Information Network - Tactical Increment 3. *OIPT oversight responsibility redesignated, per April 24, 2009, USD(AT&L) memorandum.* (ARMY DAB (ACAT ID)) **(NII & A&T/PSA)** (PNO 350)

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18 programs

PRE-MAJOR DEFENSE ACQUISITION PROGRAM (PRE-MDAP) LISTS BY FUNCTIONAL CAPABILITY BOARD

The Office of the Secretary of Defense has identified the below listed activities as efforts that *may* eventually become Major Defense Acquisition Programs (MDAPs) as defined by 10 U.S.C. 2430.

BATTLESPACE AWARENESS (BA):

~~**21" MRUUVS**~~ - Twenty-one Inch Mission Reconfigurable Unmanned Undersea Vehicle System. *21" MRUUVS terminated and deleted from Navy Pre-MDAP List.* (NAVY PRE-MDAP) (A&T/PSA) (PNO 249)

3DELRR - Three-dimensional Expeditionary Long-Range Radar. (AIR FORCE PRE-MDAP) (A&T/PSA) (PNO TBA)

ACS - Aerial Common Sensor. *OIPT oversight responsibility redesignated, per April 24, 2009, USD(AT&L) memorandum.* (ARMY PRE-MDAP) **(~~NII~~A&TIPSA)** (PNO 371)

BMTC - Ballistic Missile Technical Collection. *OIPT oversight responsibility redesignated, per April 24, 2009, USD(AT&L) memorandum.* (DoD PRE-MDAP) **(~~NII~~A&T/SIO)** (PNO 173)

EP-X - Electronic Patrol - X. *OIPT oversight responsibility redesignated, per April 24, 2009, USD(AT&L) memorandum.* (NAVY PRE-MDAP) **(~~NII~~A&T/PSA)** (PNO TBA)

JOINT SPACE OPERATIONS CENTER MISSION SYSTEM - JSpOC Mission System. *Rapid Attack Identification, Detection and Reporting System deleted from RAIDRS below, reentered as, and merged into the Joint Space Operations Center (JSpGC) Mission System, per March 27, 2009 USD(AT&L) memorandum.* (AIR FORCE PRE-MDAP) (A&T/SIO) (PNO TBA)

~~**RAIDRS**~~ - Rapid Attack Identification, Detection and Reporting System Block 20. *RAIDRS deleted from Air Force Pre-MDAP List and merged above into the Joint Space Operations Center (JSpOC) Mission System (JMS) as a Special Interest Program), per March 27, 2009 USD(AT&L) memorandum, and OIPT oversight responsibility redesignated, per April 24, 2009, USD(AT&L) memorandum.* (AIR FORCE PRE-MDAP) **(~~NII~~A&T/SIO)** (PNO TBA)

SBSS B10 Follow-on - Space-Based Space Surveillance Block 10 Follow-on. *SSBS Block 20 deleted from Air Force Pre-MDAP List below and re-entered as SBSS Block 10 Follow-on, and OIPT oversight responsibility redesignated, per April 24, 2009, USD(AT&L) memorandum.* (AIR FORCE PRE-MDAP) **(~~NII~~A&T/SIO)** (PNO TBA)

~~SBSS B20~~ - Space-Based Space Surveillance Block 20. *SSBS Block 20 deleted from Air Force Pre-MDAP List and re-entered above as SBSS Block 10 Follow-on.* (AIR FORCE PRE-MDAP) (NII) (PNO TBA)

SF - Space Fence. *OIPT oversight responsibility redesignated, per April 24, 2009, USD(AT&L) memorandum.* (AIR FORCE **~~DSAB~~** PRE-MDAP) (**~~NII~~A&T/SIO**) (PNO TBA)

SHADOW - Unmanned Aircraft System. (ARMY PRE-MDAP) (A&T/PSA) (PNO TBA)

COMMAND AND CONTROL (CC):

~~CID/IFF~~ - Combat Identification/Identification Friend or Foe. *CID/IFF deleted from Air Force Pre-MDAP List; not a Pre-MDAP initiative.* (AIR FORCE PRE-MDAP) (A&T/JAC) (PNO TBA)

~~JPALS~~ - Joint Precision Approach and Landing System. *JPALS deleted from Navy Pre-MDAP List and moved to Navy ACAT ID List, per July 14, 2008, USD(AT&L) memorandum.* (NAVY PRE-MDAP) (NII) (PNO 238)

LCC(R) - Command Ship Replacement. (NAVY PRE-MDAP) (A&T/PSA, **with Net Centric interest**) (PNO TBA)

NECC - Net-Enabled Command Capability. *OIPT oversight responsibility redesignated, per April 24, 2009, USD(AT&L) memorandum.* (DISA PRE-MDAP **and PRE-MAIS**) (**NII & A&T/SIO**) (PNO TBA)

CORPORATE MANAGEMENT AND SUPPORT (CMS):

DEAMS - Defense Enterprise Accounting and Management System. (AIR FORCE PRE-MDAP) (IRB) (PNO N20)

LOGISTICS (L):

AR/LSB - Airborne Resupply/Logistics for Seabasing. (NAVY PRE-MDAP) (A&T/PSA) (PNO 320)

C-130 AMP PHASE II - C-130 Avionics Modernization Program Phase II. (AIR FORCE PRE-MDAP) (A&T/PSA) (PNO TBA)

ECSS - Expeditionary Combat Support System. (AIR FORCE PRE-MDAP **and PRE-MAIS**) (IRB) (PNO 221)

~~GCSS-ARMY~~ - Global Combat Support System Army. *GCSS Army deleted from Army Pre-MDAP*

List and moved to Army ACAT ID List, per July 21, 2008, USD(AT&L) memorandum. (ARMY PRE-MDAP) (IRB) (PNO 347)

HC/MC-130 RECAPITALIZATION - (AIR FORCE PRE-MDAP) (A&T/PSA) (PNO **257)**

~~**JHSV**~~ - Joint High Speed Vessel. *JHSV deleted from Navy Pre-MDAP List and moved to Navy ACAT ID List, per November 12, 2008, USD(AT&L) memorandum.* Intra-theater logistics transport. (NAVY PRE-MDAP) (A&T/PSA) (PNO 247)

JLTV - Joint Lightweight Tactical Vehicle. (Army Lead Service) (DoD PRE-MDAP) (A&T/PSA) (PNO 279)

MPF(F) LMSR - Maritime Prepositioning Force (Future) Large, Medium-Speed, Roll-on/Roll-off Ships. (NAVY PRE-MDAP) (A&T/PSA) (PNO TBA)

MPF(F) MLP - Maritime Prepositioning Force (Future) Mobile Landing Platform. (NAVY PREMDAP) (A&T/PSA) (PNO 335)

PAR - Presidential Aircraft Recapitalization Program - Air Force One recapitalization program. *PAR designated Air Force Pre-MDAP, per January 27, 2009, USD(AT&L) memorandum.* (AIR FORCE PRE-MDAP) (A&T/PSA) (PNO 425)

SHIP TO SHORE CONNECTOR - Joint Assured Maritime Access. (NAVY PRE-MDAP) (A&T/PSA) (PNO 303)

FORCE APPLICATION (FA):

ABRAMS TANK MODERNIZATION - Abrams Tank Modernization (MIE3). (ARMY PRE-MDAP) (A&T/PSA) (PNO TBA)

BRADLEY MODERNIZATION – Bradley Tank Modernization (M2A3 V2). (ARMY PRE-MDAP) (A&T/PSA) (PNO TBA)

CG(X) - Next generation cruiser. (NAVY PRE-MDAP) (A&T/PSA) (PNO 242)

GSE~~**GSS**~~ - Ground Soldier **Ensemble**~~**System.**~~ Integrated soldier fighting system for the dismounted Soldier Component for Future Combat System Brigade Combat Teams. (ARMY PRE-MDAP) (A&T/PSA) (PNO TBA)

FCS SO E-IBCT - Spin Out Early-Infantry Brigade Combat Team. *Spin out from the Future Combat System Program.* (ARMY PRE-MDAP) (A&T/PSA, with Net Centric interest) (PNO TBA)

IMS - Intelligent Munitions System "Scorpion." (ARMY PRE-MDAP) (A&T/PSA) (PNO TBA)

JAGM - Joint Air-to-Ground Missile. (ARMY PRE-MDAP) (A&T/PSA) (PNO TBA)

JEF - Joint Expeditionary Fires. (NAVY PRE-MDAP) (A&T/PSA) (PNO TBA)

JMMS - Joint Multi-Mission Submersible. (NAVY PRE-MDAP) (A&T/PSA) (PNO TBA)

KIOWA WARRIOR UPGRADE~~ARH~~ - Armed Reconnaissance Helicopter Follow-on Program. *In compliance with Section* 2433 *of Title 10, United States Code* ("*Unit Cost Reports"*), *ARH not certified and terminated, per October 17, 2008, USD(AT&L) memorandum. Re-entered as Kiowa Warrior Upgrade Pre-MDAP; restart program pending MDD to establish appropriate Milestone, per May 28, 2009, J8 coordination.* (ARMY PRE-MDAP) (A&T/PSA) (PNO 179)

NAVY UCAS - Navy Unmanned Combat Air System. (NAVY PRE-MDAP) (A&T/PSA, with Net Centric interest) (PNO 388)

~~**NB**~~ - New Bomber. *NB deleted from Air Force Pre-MDAP List, per April* 6, *2009, Secretary of Defense Press Briefing.* (AIR FORCE PRE-MDAP) (A&T/~~**JAC**~~**PSA**) (PNO 314)

NGJ - Next Generation Jammer. (NAVY PRE-MDAP) (A&T/~~**JAC**~~**PSA**) (PNO TBA)

SBSD - Sea Based Strategic Deterrent. (NAVY PRE-MDAP) (A&T/PSA) (PNO TBA)

SDB II - Small Diameter Bomb, Increment II ~~**(SDB II is currently incorporated into basic SDB program with a separate end item).**~~ (AIR FORCE PRE-MDAP) (A&T/PSA) (PNO TBA)

STRYKER ~~PIP~~MOD - STRYKER ~~**Product Improvement Program**~~ **Modernization Program.** (ARMY PRE-MDAP) (A&T/PSA) (PNO TBA)

VXX - Presidential Helicopter Fleet Replacement Program. *VH-71 deleted from Navy ACATID List, per April 8, 2009, Secretary of Defense memorandum, Resource Management Decisions for the FY 2010 Budget Request (U). Re-entered as VXX as Pre-MDAP; restart program pending MDD to establish appropriate Milestone, per May 28, 2009, J8 coordination.* (NAVY PRE-MDAP (A&T/PSA) (PNO 392)

PROTECTION (P):

AMDR - Air and Missile Defense Radar. Radar for CG(X). (NAVY PRE-MDAP) (A&T/PSA) (PNO TBA)

IAMD - Integrated Air & Missile Defense. (ARMY PRE-MDAP) (A&T/PSA with Net Centric interest) (PNO 205)

NET CENTRIC (NC):

B-2 EHF SATCOM AND COMPUTER INCREMENT II - B-2 Advanced Extremely High Frequency SatCom and Computer Capability. (AIR FORCE PRE-MDAP) (A&T/PSA, with Net Centric interest) (PNO TBA)

CANES - Consolidated Afloat Network Enterprise Services. *OIPT oversight responsibility*

redesignated, per April 24, 2009, USD(AT&L) memorandum. (NAVY PRE-MDAP **and PRE-MAIS**) (**NII & A&T/PSA**)) (PNO TBA)

EPS - Enhanced Polar System. *OIPT oversight responsibility redesignated, per April 24, 2009, USD(AT&L) memorandum.* (AIR FORCE PRE-MDAP) (~~**NII**~~**A&T/SIO**) (PNO 121)

GPS OCX - Global Positioning Satellite Next Generation Control Segment. *OIPT oversight responsibility redesignated, per April 24, 2009, USD(AT&L) memorandum.* (AIR FORCE PRE-MDAP) (~~**NII**~~**A&T/SIO**) (PNO TBA)

HC3 - High Capacity Communications Capability. *OIPT oversight responsibility redesignated, per April 24, 2009, USD(AT&L) memorandum.* (ARMY PRE-MDAP) (~~**NII**~~**A&T/SIO**) (PNO 348)

NGEN - Next Generation Enterprise Service. (NAVY PRE-MDAP) (A&T/PSA, with Net Centric interest) (PNO TBA)

~~**TSAT**~~ - Transformational Satellite Communications System. Wideband, protected communications satellite to replace AEHF, DSCS, and to augment GBS and Wideband Gapfiller. *TSAT deleted from Air Force Pre-MDAP List, per April 8, 2009, Secretary of Defense memorandum, Resource Management Decisions for the FY 2010 Budget Request (U).* (AIR FORCE PRE-MDAP) (NII) (PNO 382)

WIN-T INCREMENT 4 - Warfighter Information Network - Tactical Increment 4. *OIPT oversight responsibility redesignated, per April 24, 2009, USD(AT&L) memorandum.* (ARMY PRE-MDAP) (**NII & A&T/PSA**) (PNO TBA)

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Appendix C. ASD(NII) List of Major Automated Information Systems

The Assistant Secretary of Defense for Networks and Information Integration (ASD(NII)) approved a list of 52 Major Automated Information System (MAIS) (including 8 Major Defense Acquisition Programs (MDAPs)) in December 2007. A revised list is anticipated in early 2010. Following is an excerpt from the December 26, 2007, ASD(NII) memorandum.

SUBJECT: Designation of Major Automated Information System Programs and Information Technology Services Acquisitions Oversight List

This memorandum updates and replaces the list of IT Programs and Acquisitions under ASD(NII) Oversight, dated September 1, 2006.

Attachment 1 is the updated list of acquisition programs/services acquisitions, sorted by the acquiring DoD Component. Attachment 2 is the list of the acquisition programs/services acquisitions, sorted by OSD Principal Staff Assistant.

The acquisition programs identified in Attachment 1 are divided into the following categories:

- Acquisition Category (ACAT) IAM: A Major Automated Information System (MAIS) for which the USD(AT&L) or the ASD(NII)/DoD CIO will serve as the Milestone Decision Authority (MDA).
- ACAT IAC: A MAIS for which the USD(AT&L) or the ASD(NII)/DoD CIO has delegated MDA to the acquiring DoD Component Head. This authority may be re-delegated to the DoD Component Acquisition Executive, but no further delegation of authority as MDA is authorized, to include post-Milestone C decisions, unless specifically authorized in writing by the USD(AT&L) or the ASD(NII)/DoD CIO.
- Pre-MAIS: A program that has not received Milestone B or program initiation approval but which is expected to be a MAIS; or for which program status is unclear. Attachment 3 further describes this category.
- IT Services Acquisitions: A procurement or acquisition of IT services subject to USD(AT&L) Memorandum "Acquisition of Services Policy" dated October 2, 2006. This policy will be incorporated into DoDI 5000.2 during the next update. OASD(NII) will review IT services acquisitions if total expenditures under the acquisition vehicle are estimated to exceed $500 million dollars (in FY06$) over its estimated contract period of performance.

If a MAIS program is also a Major Defense Acquisition Program (MDAP), the status is noted on the attachments to this memo. A program that is both an MDAP and a MAIS must follow the statutory and regulatory requirements for both MDAP and MAIS.

For each MAIS program listed in Attachment 1, the responsible DoD Component shall:

- Submit, through the Resource Lead Agent, an appropriate Capital Investment Report/Exhibit 300 to the Director, Program Analysis and Evaluation's Select and Native Program Data Input System – Information Technology (SNAP-IT).
- Register in the DoD IT Portfolio Repository.

- Submit a Defense Acquisition Executive Summary (DAES) in the Consolidated Acquisition Reporting System (CARS) or its successor system unless the OASD(NII) has agreed to other reporting.
- Submit its Acquisition Program Baseline (APB) into CARS or its successor system within 90 days. All subsequent APBs must be submitted into CARS or its successor system. All APBs must be submitted using CARS software or its successor system.

All pre-MAIS and MAIS programs that have the ASD(NII) as the MDA and that are not currently being reviewed by the OIPT process will accomplish an initial OIPT within 90 days of the date of this memorandum. All pre-MAIS and new MAIS programs will be considered to be ACAT lAM programs until completion of the initial OIPT review.

Addressees shall identify to the ASD(NII)/DoD CIO all Automated Information System (AIS) and IT spending not listed in Attachment 1 that meet the definition of MAIS or IT Services Acquisition in DoD Instruction 5000.2, including those that do not exceed the MAIS dollar threshold, but should be overseen as a MAIS because of their importance to the Department's mission.

A number of MAIS programs have been removed from the oversight list for various reasons, such as they have received a full-rate deployment decision, are at or near full deployment, or are below the MAIS dollar threshold. Attachment 4 identifies each MAIS program that has been removed from oversight and the rationale for its removal. In October 2006, new requirements for MAIS and a definition of MAIS (covers both product and service programs) was enacted into statute as 10 U.S.C. Chapter 144A.

This statute mandates new reporting requirements for defined MAIS to include annual reporting requirements and notification to Congressional Defense Committees of significant or critical program changes in cost, schedule or performance variance. Updated definitions of MAIS and Automated Information System (AIS) will be incorporated into DoDI 5000.2 during the next update.

ASD(NII) Information Technology Programs/Acquisitions Oversight List by Component, 2007

Attachment 1

Acq Lead	Program	Acronym	ACAT	MDA	Type
Air Force	Air Operations Center-Weapon System	AOC-WS	ID	AT&L	Pre-MDAP
Air Force	Battle Control System-Fixed	BCS-F	lAC	SAE	MAIS
Air Force	Battle Control System-Mobile	BCS-M	lAC	SAE	MAIS
Air Force	Combat Information Transport System	CITS	lAC	SAE	MAIS
Air Force	Combatant Commander Integrated Command and Control System	CCIC2S	lAC	SAE	MAIS
Air Force	Defense Enterprise Accounting Management System	DEAMS	IAM	AT&L	Pre-MAIS
Air Force	Distributed Common Ground System Air Force Increment 2	DCGS-AF Inc 2	lAM	NIl	Pre-MAIS
Air Force	Expeditionary Combat Support System	ECSS	ID	AT&L	Pre-MDAP
Air Force	Integrated Strategic Planning and	ISPAN	IAM	NII	MAIS

	Analysis Network				
Air Force	Mission Planning System	MPS	1D	AT&L	MDAP
Air Force	Network Centric Solutions	NETCENTS	NA	NII	IT-S
Air Force	Space Command and Control	SPACE C2	lAM	NII	Pre-MAIS
Air Force	Theater Deployable Communications	TDC	lAC	SAE	MAIS
Army	Biometrics	BIOMETRICS	IAM	NII	Pre-MAIS
Army	Distributed Common Ground System - Army	DCGS-ARMY	IAM	NII	Pre-MAIS
Army	General Fund Enterprise Business System	GFEBS	IAM	AT&L	Pre-MAIS
Army	Global Combat Support System - Army	GCSS-ARMY	ID	AT&L	Pre-MDAP
Army	Global Command and Control System Army	GCCS-A	IAC	SAE	MAIS
Army	Information Technology Enterprise Solutions – 2 (Services)	ITES-2S	NA	NII	IT·S
Army	Logistics Modernization Program	LMP	IAM	AT&L	MAIS
Army	Maneuver Control System	MCS	IAC	SAE	MAIS
Army	Mounted Battle Command on the Move	MBCOTM	IAC	NII	MAIS
BTA	Defense Integrated Military Human Resources System	DIMHRS	IC	CAE	MDAP
BTA	Defense Travel System	DTS	IAC	CAE	MAIS
DSCA	Defense Security Assistance Management System – Block 3	DSAMS Bk 3	IAM	NII	Pre-MAIS
DISA	Commercial Satellite Communications	COMSATCOM	NA	NII	IT-S
DISA	Defense Information System Network - Next Generation	DISN-NG	NA	NII	IT-S
DISA	Global Combat Support System – COCOM/JTF	GCSS-CC/JTF	IAC	CAE	MAIS
DISA	Global Command and Control System-Joint	GCCS·J	IAM	NII	MAIS
DISA	ENCORE II	ENCORE II	NA	NII	IT·S
DISA	Multi-National Information Sharing	MNIS	IAM	NII	Pre-MAIS
DISA	Net-Centric Enterprise Services	NCES	IAM	NII	MAIS
DISA	Net-Enabled Command Capability	NECC	1D	AT&L	Pre-MDAP
DISA	Teleport Generation I/II	TELEPORT	IAM	NII	MAIS
DSS	Defense Information System for Security	DISS	IAM	AT&L	Pre-MAIS
Navy	Deployable Joint Command and Control System	DJC2	IAM	SAE	MAIS
Navy	Consolidated Afloat Networks and Enterprise Services	CANES	ID	AT&L	Pre-MDAP
Navy	Common Aviation Command and Control System	CAC2S	IAC	NII	MAIS
Navy	Distributed Common Ground System -Navy	DCGS-N	IAM	NII	Pre-MAIS
Navy	Global Combat Support System - Marine Corps	GCSS-MC	IAM	AT&L	MAIS
Navy	Global Command and Control System - Maritime	GCCS·M	IAC	SAE	MAIS
Navy	Navy Enterprise Resource Planning	NAVY ERP	IAM	AT&L	MAIS
NSA	Key Management Infrastructure	KMI	IAM	NII	MAIS
NSA	Public Key Infrastructure	PKI	IAM	NII	MAIS
TMA	Armed Forces Health Longitudinal Technology Application	AHLTA	IAM	NII	MAIS
TMA	Theater Medical Information Program	TMIP	IAM	NII	MAIS
USD(AT&L)	High Performance Computer Modernization	HPCM	1D	AT&L	MDAP

Attachment 2

PSA	PSA Lead Office	Acq Program Lead	Program	Acronym	ACAT	Type
USD(I)	CI&S	DSS	Defense Information System for Security	DISS	IAM	Pre-MAIS
USD(I)	ISR	AF	Distributed Common Ground System - Air Force Increment 2	DCGS-AF Inc 2	IAM	Pre-MAIS
USD(I)	ISR	Army	Distributed Common Ground System-Army	DCGS-ARMY	IAM	Pre-MAIS
USD(I)	ISR	Navy	Distributed Common Ground System-Navy	DCGS-N	IAM	Pre-MAIS
USD(P)	ASD(GSA)	DSCA	Defense Security Assistance Management System – Block 3	DSAMS Bk3	IAM	Pre-MAIS
USD(AT&L)	DDR&E/S&T	OSD	High Performance Computer Modernization	HPCM	1D	MDAP
USD(AT&L)	L&MR	AF	Expeditionary Combat Support System	ECSS	1D	Pre·MDAP
USD(AT&L)	L&MR	Army	Logistics Modernization Program	LMP	IAM	MAIS
USD(AT&L)	L&MR	Army	Global Combat Support System-Army	GCSS-ARMY	1D	Pre-MDAP
USD(AT&L)	L&MR	DISA	Global Combat Support System - COCOM/JTF	GCSS-CC/JTF	IAC	MAIS
USD(AT&L)	L&MR	Navy	Global Combat Service Support - Marine Corps	GCSS-MC	IAM	MAIS
USD(AT&L)	L&MR	Navy	Navy Enterprise Resource Planning	NAVY ERP	IAM	MAIS
USD(C)	A&FP	AF	Defense Enterprise Accounting Management System	DEAMS	IAM	Pre-MAIS
USD(C)	A&FP	Army	General Fund Enterprise Business System	GFEBS	IAM	Pre-MAIS
USD(P&R)	P&R IM	BTA	Defense Integrated Military Human Resources System	DIMHRS	IC	MDAP
USD(P&R)	DTMO	BTA	Defense Travel System	DTS	IAC	MAIS
ASD(HA)	DASD(C&PP)	TMA	Armed Forces Health Longitudinal Application	AHLTA	IAM	MAIS
ASD(HA)	DASD(FHP&R)	TMA	Theater Medical Information Program	TMIP	IAM	MAIS
ASO(NII)	C2 Programs	AF	Integrated Strategic Planning and Analysis Network	ISPAN	IAM	MAIS
ASD(NII)	C2 Programs	AF	Mission Planning System	MPS	ID	MDAP
ASD(NII)	C2 Programs	AF	Air Operations Center- Weapon System	AOC-WS	1D	Pre-MDAP
ASD(NII)	C2 Programs	AF	Battle Control System - Fixed	BCS-F	IAC	MAIS
ASO(NII)	C2 Programs	AF	Battle Control System - Mobile	BCS-M	IAC	MAIS
ASD(NII)	C2 Programs	AF	Combatant Commander Integrated Command and Control System	CCIC2S	IAM	MAIS
ASD(NII)	C2 Programs	AF	Space Command and Control	SPACEC2	IAM	Pre-MAIS
ASD(NII)	C2 Programs	Army	Global Command and Control System - Army	GCCS-A	IAC	MAIS
ASD(NII)	C2 Programs	Army	Maneuver Control System	MCS	IAC	MAIS
ASD(NII)	C2 Programs	Army	Mounted Battle Command on the Move	BCOTM	IC	MAIS
ASD(NII)	C2 Programs	DISA	Global Command and Control System-Joint	GCCS-J	IAM	MAIS
ASD(NII)	C2 Programs	Navy	Deployable Joint Command and Control System	DJC2	IAM	MAIS
ASD(NIl)	C2 Programs	Navy	Common Aviation Command and Control System	CAC2S	IAC	MAIS
ASD(NII)	C2 Programs	DISA	Multi-National Information Sharing	MNIS	IAM	Pre-MAIS
ASD(NII)	C2 Programs	DISA	Net-Enabled Command Capability	NECC	1D	Pre-MDAP
ASD(NII)	C2 Programs	Navy	Global Command and Control System Maritime	GCCS-M	IAC	MAIS
ASD(NII)	Communications	AF	Combat Information Transport System	CITS	IAC	MAIS
ASD(NII)	Communications	AF	Theater Deployable Communications	TOC	IAC	MAIS
ASD(NII)	Communications	DISA	Commercial Satellite Communications	COMSATCOM	NA	IT-S

ASD(NII)	Communications	DISA	Defense Information System Network-Next Generation	DISN-NG	NA	IT-S
ASD(NIl)	Communications	DISA	Teleport Generation I/II	TELEPORT	IAM	MAIS
ASD(NII)	A&I	AF	NETCENTS	NETCENTS	NA	IT-S
ASD(NII)	A&I	Army	Information Technology Enterprise Solutions – 2 (Services)	ITES·2S	NA	IT-S
ASD(NII)	A&I	DISA	ENCORE II	ENCORE II	NA	1T-S
ASD(NII)	IP	DISA	Net-Centric Enterprise Services	NCES	IAM	MAIS
ASD(NII)	IP	Navy	Consolidated Afloat Networks and Enterprise Services	CANES	1D	Pre-MDAP
ASD(NII)	IAP	Army	Biometrics	BIOMETRICS	IAM	Pre-MAIS
ASD(NII)	IAP	NSA	Key Management Infrastructure	KMI	IAM	MAIS
ASD(NII)	IAP	NSA	Public Key Infrastructure	PKI	IAM	MAIS

Attachment 3

Pre-MAIS Category

The "Pre-MAIS" category is analogous to the OUSD(AT&L) pre-MDAP category. A pre-MAIS is a program that has not received Milestone B or program initiation approval, but that is expected to meet one or more MAIS dollar thresholds. The primary purpose of this designation is to ensure early Component, Joint Staff, and OSD insight into planning and analysis activities, and related information in preparation for program initiation, which typically occurs at Milestone B. Given the requirements of the Clinger-Cohen Act and the nature of IT programs, it is important that all stakeholders have insight into the activities and decisions that are made in the early phases of MAIS programs.

Another type of program that may be included in this pre-MAIS category is a program whose status as a MAIS acquisition program is unclear. Such programs will be temporarily classified as pre-MAIS until an OIPT review is held to recommend classification of the program. Based on such a review, the program may be designated a MAIS (either delegated to the Component or not) or designated an ACAT III program.

A Defense Acquisition Executive Summary will not be required for pre-MAIS programs until they have an approved Acquisition Program Baseline unless so specified in an Acquisition Decision Memorandum.

Before program initiation OSD and Joint Staff personnel will also participate in the WIPT/OIPT or IRB/DBSMC oversight process as designated for the program.

Programs Removed from September 1, 2006, IT Programs Oversight List, 2007

Attachment 4

Lead	Program	Acronym	Rationale for Removal
AF	Deliberate and Crisis Action Planning and Execution Segment (Increment 2B)	DCAPES	The program is fully deployed and in the sustainment phase. Program Management oversight will be conducted by the AF CIO and Acquisition Executive.
AF	Global Command & Control System -AF (Infrastructure)	GCCS-AF	Upon review it was determined this program currently does not exceed any dollar threshold for a MAIS program.
AF	Global Combat Support System- AF	GCSS·AF	The program is fully deployed and in the sustainment phase. Program

			Management oversight will be conducted by the AF CIO and Acquisition Executive.
AF	Theater Battle Management Core System – Force Level	TBMCS-FL	TBMCS V1.1.4 was discontinued and the contract was terminated in September 2007. TBMCS V1.1 was entered into sustainment. Program Management oversight will be conducted by the Air Force CIO and Acquisition Executive.
Army	Distributed Learning System	DLS	Upon review it was determined the first 3 Blocks of this program are in sustainment and the remaining Block did not qualify as a MAIS program. DLS Block 4 is designated an ACAT III program. Program Management oversight will be conducted by the Army CIO and Acquisition Executive.
Army	Transportation Coordinators Automated Information for Movements System II	TC-AIMS II	The program is fully deployed and in the sustainment phase. Program Management oversight will be conducted by the Army CIO and Acquisition Executive.
BTA	Defense Business Sourcing Environment	DBSE	The program has been terminated.
BTA	Integrated Data Environment/Global Transportation Network	IGC	Upon review is was determined this program currently does not exceed any dollar threshold for a MAIS program. Program management oversight will be conducted by the Business Transformation Agency CIO and Acquisition Executive as an ERAM program.
BTA	Standard Procurement System	SPS	The program is fully deployed and in the sustainment phase. Program Management oversight will be conducted by the Business Transformation Agency CIO and Acquisition Executive.
DeCA	Commissary Advanced Resale Transaction System	CARTS	The program is fully developed and is moving to the sustainment phase. Program Management oversight will be conducted by the DeCA Director and CIO.
DISA	Global Electromagnetic Spectrum Information System	GEMSIS	Upon review it was determined this program currently does not exceed any dollar threshold for a MAIS program.
DLA	Business System Modernization	BSM	The program is fully deployed and in sustainment. Program Management oversight will be conducted by the DLA Director and CIO.
Navy	Distributed Common Ground System Marine Corps	DCGS·MC	Upon review it was determined this program currently does not exceed any dollar threshold for a MAIS program.
Navy	Naval Tactical Command and Support System	NTCSS	The program is fully deployed and in the sustainment phase. Program Management oversight will be conducted by the Navy CIO and Acquisition Executive.

Appendix D. FY 2009 Test and Evaluation Oversight List by Service

The FY 2009 Test and Evaluation (T&E) Oversight List includes MDAPs, MAISs, and special interest programs. It includes 328 programs (224 on developmental test oversight, 310 on operational test oversight, and 128 on live-fire oversight). The following list was approved January 5, 2009. An asterisk (*) indicates programs assessed for this report.

ARMY

Abrams Tank Modernization (M1A2 SEP Increment 2)
Abrams Tank Upgrade (M1A1 SA / M1A2 SEP)
*Advanced Threat Infrared Countermeasures / Common Missile Warning System (ATIRCM/CMWS)
Aerial Common Sensor (ACS)
AN/ALQ-211 Suite of Integrated Radio Frequency Countermeasures (SIRFC)
*Apache Block III (AB3)
Armored Truck Programs including: Fuel Tankers, Heavy Equipment Transporter, Heavy Expanded Mobility Tactical Truck (HEMTT), M915A5 Family of Vehicles, M939 General Purpose Truck, Palletized Loading System (PLS)
*Army Integrated Air & Missile Defense (IAMD) program (formerly referred to as AIAMD)
Army Mission Planning System (AMPS)
Biometrics
Black Hawk Upgrades (UH-60M) – Utility Helicopter Upgrades
Bradley Modernization (M2A3v2)
CH-47F - Cargo Helicopter
Distributed Common Ground System - Army (DCGS-A)
Enhanced AN/TPQ-36 Radar System (EQ-36)
Excalibur (Family of Precision, 155mm Projectiles)
Family of Medium Tactical Vehicles (FMTV) (including armor modifications)
Force XXI Battle Command Brigade & Below (FBCB2) System
*Future Combat System (FCS) and all associated systems (and active protective systems)
General Fund Enterprise Business System (GFEBS)
Global Combat Support System - Army (GCSS-A)
Global Command and Control System - Army (GCCS-A)
Ground Soldier Ensemble (GSE)
Guided Multiple Launch Rocket System (GMLRS) - Alternative Warhead
Guided Multiple Launch Rocket System (GMLRS) – Dual Purpose Improved Conventional Munitions (DPICM)
Guided Multiple Launch Rocket System (GMLRS) - Unitary
High Capacity Communications Capability (HC3)
High Mobility Artillery Rocket System (HIMARS) including HIMARS Armored Cab
High Mobility Multi-purpose Wheeled Vehicle (HMMWV) Armor
High Mobility Multi-purpose Wheeled Vehicle (HMMWV) Expanded Capacity Vehicle 2 (ECV2)
Identification Friend or Foe Mark XIIA Mode 5 (all development and integration programs)
Intelligent Munitions System (IMS)
Installation Information Infrastructure Modernization Program
Javelin Antitank Missile System - Medium
*Joint Air to Ground Missile (JAGM) (replaces Joint Common Missile)
Joint Battle Command Platform (JBC-P)
Joint Heavy Lift Program
Joint Land Attack Cruise Missile Defense Elevated Netted Sensors (JLENS)
Joint Mission Planning System (JMPS)
Kiowa Warrior Replacement Program (was Armed Reconnaissance Helicopter (ARH))
Land Warrior – Integrated Soldier Fighting System for Infantrymen
Light Utility Helicopter
Logistics Modernization Program (LMP)
M855 5.56MM Green Ammunition
Maneuver Control System (MCS)
Mid-Range Munition
Mounted Battle Command on the Move (MBCOTM)
One Tactical Engagement Simulation System (One TESS)
Paladin/FASSV Integrated Management (PIM)
*PATRIOT/Medium Extended Air Defense System Combined Aggregate Program (PATRIOT/MEADS CAP)
PATRIOT Advanced Capability 3 (PATRIOT PAC-3) Missile
Precision Guidance Kit XM 1156 (PGK)
Precision Guided Mortar Munitions (PGMM)
Shadow Unmanned Aircraft System (Shadow UAS)
*Sky Warrior Unmanned Aircraft System (Sky Warrior UAS) (also called Extended Range / Multipurpose Unmanned Aircraft System (ER/MP UAS)) including Hellfire Missile upgrade and Common Sensor Upgrade
Small Unmanned Aircraft System (Raven UAS)
Spider XM7 Network Command Munition (formerly Anti-Personnel Landmine Alternative (APLA)/Spider)

Stryker - Armored Vehicle and all associated systems (and active protective systems)
*Stryker Modernization Program (formerly called Stryker Product Improvement Program and Stryker Enhanced Platform (StEP))
Surface-Launched AMRAAM (SLAMRAAM)
Warfighter Information Network-Tactical (WIN-T) Increments 1
Warfighter Information Network-Tactical (WIN-T) Increments 2
Warfighter Information Network-Tactical (WIN-T) Increments 3
Warfighter Information Network-Tactical (WIN-T) Increments 4
XM1022 Long Range Sniper Ammunition

NAVY

21″ Mission Reconfigurable Unmanned Undersea Vehicle System (21″ MRUUVS)
Acoustic Rapid COTS Insertion for SONAR (ARCI)
Active Electronically Scanned Array (AESA)
Advanced Extremely High Frequency Multi-Band Terminal Satellite Program (NMT) (formerly Navy Advanced EHF Multi-Band Terminal)
Advanced Seal Delivery System (ASDS)
AGM-88E Advanced Anti-Radiation Guided Missile (AARGM) Program
AIM-9X - Air-to-Air Missile Upgrade including AIM-9X P3I
Air and Missile Defense Radar (AMDR)
Airborne Mine Neutralization System (AMNS)
Airborne Resupply/Logistics for SeaBasing (AR/LSB)
AEGIS Modernization
AN/AAR-47 V2 Upgrade Missile / Laser Warning Receiver
AN/APR-39 Radar Warning Receiver
AN/WSQ-11 Anti-Torpedo Torpedo Defensive System
Anti-Torpedo Torpedo Defensive System
*Broad Area Maritime Surveillance (BAMS)
BYG-1 Fire Control (Weapon Control & TMA)
CG (X) - Next Generation Cruiser
*CH-53K Heavy Lift Replacement (HLR) Program
Close-In Weapon System (CIWS) including SEARAM
Cobra Judy Replacement (CJR) - Ship-based Radar System
Command Ship Replacement (LCC(R))
Common Aviation Command and Control System (CAC2S)
Consolidated Afloat Network and Enterprise Service (CANES)
*Cooperative Engagement Capability (CEC) (including P3I effort)
*CVN 21- Next Generation Nuclear Attack Carrier
DDG-51 Guided Missile Destroyer
*DDG-1000 Zumwalt Class Destroyer (formerly DD(X) Future Surface Combatant) including Long Range Land Attack Projectile
Department of the Navy Large Aircraft Infrared Countermeasures (DoN LAIRCM)
Digital Modular Radio (DMR)
Digital Radio Frequency Modulator – Jammer (DMRF-J)
Distributed Common Ground System - Marine Corps (DCGS-MC)
Distributed Common Ground System – Navy Increment 1 (DCGS-N)
*E-2D Advanced Hawkeye (AHE)
EA-6B Improved Capabilities (ICAP) III & Multiple Upgrades (Low Band Transmitter, Band 7-8 Transmitter, USQ-113 Communications Jammer)
*E/A-18G Airborne Electronic Attack (AEA), variant of F/A-18
Electronic Patrol - X (EP-X)
Evolved Sea Sparrow Missile (ESSM)
*Expeditionary Fighting Vehicle (EFV)
Extended Range Munition (ERM)
F/A-18 E/F Hornet Naval Strike Fighter (All Upgrades)
Global Combat Support System - Marine Corps (GCSS-MC)
Global Command and Control System - Maritime (GCCS-M)
Harpoon Weapon System Block III (A/RGM-84/M)
*H-1 Upgrades (4BW/4BN) – USMC Upgrade to AH-1W Attack Helicopter and UH-1N Utility Helicopter
Identification Friend or Foe Mark XIIA Mode 5 (all development and integration programs)
Integrated Defensive Electronic Countermeasure (IDECM)
Joint and Allied Threat Awareness System (JATAS)
Joint Expeditionary Fires (JEF)
*Joint High Speed Vessel (JHSV)
*Joint Mine Resistant Ambush Protected Family of Vehicles (MRAP) (includes all variants)
Joint Mission Planning System (JMPS) - Navy
Joint Multi-Mission Submersible (JMMS)
Joint Precision Approach and Landing System (JPALS)
Joint Standoff Weapon (JSOW) Baseline Variant, Unitary Warhead Variant, and C-1
KC-130J Aircraft
LHA Replacement – New Amphibious Assault Ship
LHD 8 Amphibious Assault Ship
*Littoral Combat Ship (LCS) (includes 57mm ammunition and NLOS-LS)

LPD 17 Amphibious Transport Dock (includes 30mm ammunition)
Marine Expeditionary Armored Forces (M1A1 Upgrade, LAV Upgrade, AVLB Upgrade, AAV Upgrade)
Maritime Prepositioning Force (Future) (MPF (F)) Large, Medium Speed, Roll-on/Roll-off Ships (LMSR)
Maritime Prepositioning Force (Future) (MPF (F)) Mobile Landing Platform (MLP)
Medium Tactical Vehicle Replacement Program (USMC) (MTVR)
MH-60R Multi-Mission Helicopter Upgrade
MH-60S Multi-Mission Combat Support Helicopter
MK-48 Torpedo Mods
MK 54 Torpedo
Mobile User Objective System (MUOS)
Naval Integrated Fire Control-Counter Air (NIFC-CA)
Navy Enterprise Resource Planning (ERP)
Navy Unmanned Combat Air System (NAVY UCAS) (previously called J-UCAS)
Next Generation Enterprise Network (NGEN)
Next Generation Jammer
*P-8A Poseidon Program
Rapid Airborne Mine Clearance System (RAMICS)
Remote Minehunting System (RMS)
Rolling Airframe Missile (RAM) including RAM Block 1A Helicopter Aircraft Surface (HAS) and RAM Block 2 Programs
Sea Based Strategic Deterrence (SBSD)
Ship Self Defense System (SSDS)
*Ship to Shore Connector - Joint Assured Maritime Access (Planned replacement for Landing Craft Cushion and Landing Craft Utility)
Small Tactical Unmanned Aerial System (STUAS) – UAS Tier II
SSGN OHIO Class Conversion
*SSN 774 VIRGINIA Class Submarine
Standard Missile 2 (SM-2) Block IIIB
*Standard Missile-6 (SM-6)
Submarine External Communications System (SubECS) / Common Submarine Radio Room (CSRR)
Surface Electronic Warfare Improvement Program (SEWIP)
Surveillance Towed Array Sonar System/Low Frequency Active (SURTASS/LFA)
T-AKE LEWIS & CLARK Class of Auxiliary Dry Cargo Ships including T-AKE ships for MPF (F)
Tactical Tomahawk Weapon System (TTWS) (including Tactical Tomahawk All Round Up (AUR), Tactical Tomahawk Weapons Control System (TTWCS), and Tomahawk Command & Control System (TCCS))
TB-33 Array Fiber Optic Thin Line System
TB-34 Next Generation Fat Line Replacement Towed Array
Trident II Missile
V-22 Osprey Joint Advanced Vertical Lift Aircraft
Vertical Take-Off and Land Tactical Unmanned Aircraft System (VTUAS) (also called FireScout) including Tactical Control System (TCS)
VH-71 Presidential Helicopter Fleet Replacement Program

AIR FORCE

20mm PGU-28/B Replacement Combat Round
3rd Generation InfraRed Surveillance (3IRS)
AC-27J SOCOM Gunship
*Advanced Extremely High Frequency Program (AEHF)
Advanced Medium Range Air-to-Air Missile (AMRAAM)
Air and Space Operations Center Weapons System (AOC-WS) Initiatives including 10.0 and 10.1
Air and Space Operations Center - Weapons System (AOC-WS) initiative 10.2
Airborne Signals Intelligence Payload (ASIP)
Airborne Warning and Control System (E-3 AWACS) Upgrades, including Block 40/45, IFF Mode 5, and IABM integration
ALR-69A Radar Warning Receiver
B-2 Radar Modernization Program (B-2 RMP)
B-2 SPIRIT Advanced Extremely High Frequency Satellite Communications Capability (B-2 EHF)
*Battle Control System-Fixed (BCS-F)
Battle Control System-Mobile (BCS-M) and follow-on system
*C-5 Avionics Modernization Program (C-5 AMP)
*C-5 Reliability and Re-engining Program (C-5 RERP)
C-17A - Globemaster III Advance Cargo Aircraft
*C-130 Avionics Modernization Program (C-130 AMP)
C-130 Avionics Modernization Program (C-130 AMP) Prime
C-130 J Hercules Cargo Aircraft
Combat Identification/Identification Friend or Foe (CID/IFF)
*Combat Information Transport System (CITS)
Combat Search and Rescue Replacement Vehicle (CSAR-X) (formerly Personnel Recovery Vehicle (PRV))
Combat Survivor Evader Locator (CSEL) and the PRC family of handheld survivor radios

Combatant Commanders Integrated Command and Control System (CCIC2S)
Command and Control Air Operations Software (C2AOS) (follow-on to Theater Battle Management Core System)
Common Link Integration Processor (CLIP)
Defense Enterprise Accounting Management System (DEAMS)
Deliberate and Crisis Action Planning and Execution Segments (DCAPES)
Distributed Common Ground System - Air Force (DCGS-AF) Block 10
Distributed Common Ground System - Air Force (DCGS-AF) Block 20
E-4B National Airborne Operations Center (NAOC) Aircraft Replacement Program
Enhanced Polar System (EPS)
Expeditionary Combat Support System (ECSS)
F-15E Radar Modernization Program
F-22 - RAPTOR Advanced Tactical Fighter
*F-35 - Joint Strike Fighter (JSF)
Family of Beyond Line of Sight Terminals (FAB-T)
Full Scale Aerial Target
Global Broadcast Service (GBS)
Global Command and Control System – Air Force (GCCS AF)
*Global Hawk High Altitude Endurance Unmanned Aircraft System
Global Positioning System IIIA (GPS IIIA)
Global Positioning System Next Generation Control System (GPS OCX)
Global Positioning System (includes Satellites, Control and User equipment) (NAVSTAR GPS)
*HC/MC-130 Recapitalization Program
Identification Friend or Foe Mark XIIA Mode 5 (all development and integration programs)
Infrared Augmentation Satellite
*Integrated Strategic Planning and Analysis Network (ISPAN) Block 1
Integrated Strategic Planning and Analysis Network (ISPAN) Increment 2
Integrated Space Situational Awareness (ISSA) System
Interim Gateway (IG)
Joint Air-Surface Standoff Missile (JASSM) and JASSM Extended Range (ER) (including Electronic Safe & Fire Fuze (ESAF))
Joint Direct Attack Munition (JDAM) including Laser JDAM
Joint Primary Aircraft Training System (JPATS)
KC-45A
Large Aircraft Infrared Countermeasures (LAIRCM)
Miniature Air Launched Decoy (MALD), including MALD-Jammer (MALD-J)
*Mission Planning System (MPS) Increments I-III including the Joint Mission Planning System (JMPS)
Mission Planning System (MPS) Increments IV
Multi-Platform Radar Technology Insertion Program (MP-RTIP)
National Airspace System (NAS)
National Polar-Orbiting Operational Environment Satellite System (NPOESS)
New Bomber (NB) (formerly called Next Generation Bomber (NGB))
Objective Gateway (OG)
Presidential Aircraft Recapitalization (PAR)
Rapid Attack Identification, Detection and Reporting System (RAIDRS) Block 20
*Reaper MQ 9 Hunter Killer Unmanned Aircraft System (UAS)
Small Diameter Bomb Increment I (SDB I)
*Small Diameter Bomb Increment II (SBD II)
Space-Based Infrared System Program, High Component (SBIRS HIGH)
Space-Based Space Surveillance (SBSS) and follow-on Blocks
Space Command and Control (C2)
Space Fence (SF)
Transformational Satellite Communications System (TSAT)
*Wideband Global Satellite Communications Program (WGS)

DEPARTMENT OF DEFENSE

Ballistic Missile Defense System Program (BMDS)
Armed Forces Health Longitudinal Technology Application (AHLTA)
Ballistic Missile Technical Collection (BMTC)
Chemical Demilitarization Program – Assembled Chemical Weapons Alternatives (CHEM DEMIL – ACWA)
Chemical Demilitarization Program – Chemical Material Agency (CHEM DEMIL-CMA) including Chemical Materials Agency Newport
Collaborative Force Analysis, Sustainment, and Transportation System (CFAST)
Defense Information System for Security (DISS)
Defense Integrated Military Human Resources System (Personnel and Pay) Program (DIMHRS PERS/PAY)
Defense Security Assistance Management System (DSAMS) – Block 3
Defense Travel System (DTS)
Global Combat Support System COCOM/JTF (GCSS-(CC/JTF))

Global Command & Control System - Joint (GCCS-J)
Integrated Air and Missile Defense (IAMD) Roadmap programs
Internet Protocol version 6 (IPv6)
Joint Biological Agent Identification and Diagnosis System (JBAIDS)
Joint Biological Point Detection System (JBPDS)
Joint Biological Stand-Off Detection System (JBSDS)
*Joint Cargo Aircraft (JCA)
Joint Chemical Agent Detector (JCAD)
Joint Counter Radio IED Electronic Warfare (JCREW) Spiral 3.3
*Joint Lightweight Tactical Vehicle (JLTV)
Joint Nuclear Biological Chemical Reconnaissance System (JNBCRS)
Joint Service Lightweight Standoff Chemical Agent Detector (JSLSCAD)
Joint Tactical Radio System Cluster (JTRS) Airborne / Maritime / Fixed Station (AMF)
Joint Tactical Radio System (JTRS) Ground Mobile Radio (GMR)
*Joint Tactical Radio System (JTRS) Handheld and Manpack Radio and Small Form Radio (HMS)
Joint Tactical Radio System (JTRS) Network Enterprise Domain (NED)
Joint Warning and Reporting Network (JWARN)
Key Management Infrastructure (KMI)
*Multi-Functional Information Distribution System (MIDS) (includes Low Volume Terminal and Joint Tactical Radio System)
Multi-National Information Sharing (MNIS)
Net-Centric Enterprise Services (NCES)
Net-Enabled Command Capability (NECC) (formerly Joint Command and Control System)
Public Key Infrastructure (PKI)
Shipboard Enhanced Automated Chemical Agent Detection System (SEACADS)
Single Integrated Air Picture (SIAP), including Integrated Architecture Behavior Model (IABM)
Teleport Generation I/II (Teleport)
Theater Medical Information Program (TMIP) Block

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Appendix E. Traceability of DDT&E-DSE Annual Report to Congress

Systems Engineering			Developmental Test and Evaluation		
Section	**10 U.S.C. 139d**	**Report Section**	**Section**	**10 U.S.C. 139d**	**Report Section**
§139d-(b)(1) Appointment	There is a Director of Systems Engineering, who shall be appointed by the Secretary of Defense from among individuals with an expertise in systems engineering and development planning.	3, para 1	§139d-(a)(1) Appointment	There is a Director of Developmental Test and Evaluation, who shall be appointed by the Secretary of Defense from among individuals with an expertise in test and evaluation.	2
§139d-(b)(2) Principal Advisor for Systems Engineering and Development Planning	The Director shall be the principal advisor to the Secretary of Defense and the Under Secretary of Defense for Acquisition, Technology, and Logistics on systems engineering and development planning in the Department of Defense.	1.2	§139d-(a)(2) Principal Advisor for Developmental Test and Evaluation	The Director shall be the principal advisor to the Secretary of Defense and the Under Secretary of Defense for Acquisition, Technology, and Logistics on developmental test and evaluation in the Department of Defense.	1, 2
§139d-(b)(3) Supervision	The Director shall be subject to the supervision of the Under Secretary of Defense for Acquisition, Technology, and Logistics and shall report to the Under Secretary.	3, para 1	§139d-(a)(3) Supervision	The Director shall be subject to the supervision of the Under Secretary of Defense for Acquisition, Technology, and Logistics and shall report to the Under Secretary.	1.1; 2, para 1
§139d-(b)(4) Coordination with Director of Developmental Test and Evaluation	The Director of Systems Engineering shall closely coordinate with the Director of Developmental Test and Evaluation to ensure that the developmental test and evaluation activities of the Department of Defense are fully integrated into and consistent with the systems engineering and development planning processes of the Department.	3, para 3	§139d-(a)(4) Coordination with Director of Systems Engineering	The Director of Developmental Test and Evaluation shall closely coordinate with the Director of Systems Engineering to ensure that the developmental test and evaluation activities of the Department of Defense are fully integrated into and consistent with the systems engineering and development planning processes of the Department.	2.3.1
§139d-(b)(5)(A)(i) Duties	The Director shall— (A) develop policies and guidance for— (i) the use of systems engineering principles and best practices, generally;	3.2.1.1	§139d-(a)(5)(A)(i) Duties	The Director shall— (A) develop policies and guidance for— (i) the conduct of developmental test and evaluation in the Department of Defense (including integration and developmental testing of software);	2.1 2.2
Section 102-§139d-(b)(5)(A)(ii) Duties	(ii) the use of systems engineering approaches to enhance reliability, availability, and maintainability on major defense acquisition programs;	3.4.1	§139d-(a)(5)(A)(ii) Duties	(ii) in coordination with the Director of Operational Test and Evaluation, the integration of developmental test and evaluation with operational test and evaluation;	2.3
§139d-(b)(5)(A)(iii) Duties	(iii) the development of systems engineering master plans for major defense acquisition programs including systems engineering considerations in support of lifecycle management and sustainability; and	3.2.2.2	§139d-(a)(5)(A)(iii) Duties	(iii) the conduct of developmental test and evaluation conducted jointly by more than one military department or Defense Agency;	2.1, para 2
§139d-(b)(5)(A)(iv) Duties	(iv) the inclusion of provisions relating to systems engineering and reliability growth in requests for proposals;	3.4.2	§139d-(a)(5)(B) Duties	review and approve the developmental test and evaluation plan within the test and evaluation master plan for each major defense acquisition program of the Department of Defense;	2.2

Systems Engineering			Developmental Test and Evaluation		
Section	**10 U.S.C. 139d**	**Report Section**	**Section**	**10 U.S.C. 139d**	**Report Section**
§139d-(b)(5)(B) Duties	review and approve the systems engineering master plan for each major defense acquisition program;	3.1.2	§139d-(a)(5)(C) Duties	monitor and review the developmental test and evaluation activities of the major defense acquisition programs;	2.4
§139d-(b)(5)(C) Duties	monitor and review the systems engineering and development planning activities of the major defense acquisition programs	3.1.3.1	§139d-(a)(5)(D) Duties	provide advocacy, oversight, and guidance to elements of the acquisition workforce responsible for developmental test and evaluation	2.4
§139d-(b)(5)(D) Duties	provide advocacy, oversight, and guidance to elements of the acquisition workforce responsible for systems engineering, development planning, and lifecycle management and sustainability functions;	3.3.2	§139d-(a)(5)(E) Duties	periodically review the organizations and capabilities of the military departments with respect to developmental test and evaluation and identify needed changes or improvements to such organizations and capabilities, and provide input regarding needed changes or improvements for the test and evaluation strategic plan developed in accordance with section 196(d) of this title;	4
-§139d-(b)(5)(E) Duties	provide input on the inclusion of systems engineering requirements in the process for consideration of joint military requirements by the Joint Requirements Oversight Council pursuant to section 181 of this title, including specific input relating to each capabilities development document;	3.2.5	§139d-(a)(5)(F) Duties	perform such other activities relating to the developmental test and evaluation activities of the Department of Defense as the Under Secretary of Defense for Acquisition, Technology, and Logistics may prescribe.	2
§139d-(b)(5)(F) Duties	periodically review the organizations and capabilities of the military departments with respect to systems engineering, development planning, and lifecycle management and sustainability, and identify needed changes or improvements to such organizations and capabilities; and	5	§139d-(a)(7) Concurrent Service as Director of Department of Defense Test Resource Management Center	DEPARTMENT OF DEFENSE TEST RESOURCES MANAGEMENT CENTER.—The individual serving as the Director of Developmental Test and Evaluation may also serve concurrently as the Director of the Department of Defense Test Resource Management Center under section 196 of this title.	N/A
§139d-(b)(5)(G) Duties	perform such other activities relating to the systems engineering and development planning activities of the Department of Defense as the Under Secretary of Defense for Acquisition, Technology, and Logistics may prescribe	General			
§139d-(b)(6) Access to Records	The Director shall have access to any records or data of the Department of Defense (including the records and data of each military department and including classified and proprietary information as appropriate) that the Director considers necessary to review in order to carry out the Director's duties under this subsection.	N/A	§139d-(a)(6) Access to Records	RECORDS.—The Secretary of Defense shall ensure that the Director has access to all records and data of the Department of Defense (including the records and data of each military department and including classified and propriety information, as appropriate) that the Director considers necessary in order to carry out the Director's duties under this subsection.	N/A

Systems Engineering			Developmental Test and Evaluation		
Section	**10 U.S.C. 139d**	**Report Section**	**Section**	**10 U.S.C. 139d**	**Report Section**
§139d-(c)(1) Joint Annual Report	Not later than March 31 each year, beginning in 2010, the Director of Developmental Test & Evaluation and the Director of Systems Engineering shall jointly submit to the congressional defense committees a report on the activities undertaken pursuant to subsections (a) and (b) during the preceding year. Each report shall include a section on activities relating to major defense acquisition programs which shall set forth, at a minimum, the following: **discussion of the extent to which the major defense acquisition programs are fulfilling the objectives of their systems engineering master plans and developmental test and evaluation plans.**	6			
§139d-(c)(2) Joint Annual Report	Not later than March 31 each year, beginning in 2010, the Director of Developmental Test & Evaluation and the Director of Systems Engineering shall jointly submit to the congressional defense committees a report on the activities undertaken pursuant to subsections (a) and (b) during the preceding year. Each report shall include a section on activities relating to major defense acquisition programs which shall set forth, at a minimum, the following: **discussion of the waivers of and deviations from requirements in test and evaluation master plans, systems engineering master plans, 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.**	6			
§139d-(c)(3) Joint Annual Report	Not later than March 31 each year, beginning in 2010, the Director of Developmental Test & Evaluation and the Director of Systems Engineering shall jointly submit to the congressional defense committees a report on the activities undertaken pursuant to subsections (a) and (b) during the preceding year. Each report shall include a section on activities relating to major defense acquisition programs which shall set forth, at a minimum, the following: **an assessment of the organization and capabilities of the Department of Defense for systems engineering, development planning, and developmental test and evaluation with respect to such programs.**	4 and 5			

Systems Engineering			Developmental Test and Evaluation		
Section	**10 U.S.C. 139d**	**Report Section**	**Section**	**10 U.S.C. 139d**	**Report Section**
§139d-(c)(4) Joint Annual Report	Not later than March 31 each year, beginning in 2010, the Director of Developmental Test & Evaluation and the Director of Systems Engineering shall jointly submit to the congressional defense committees a report on the activities undertaken pursuant to subsections (a) and (b) during the preceding year. Each report shall include a section on activities relating to major defense acquisition programs which shall set forth, at a minimum, the following: **any comments on such report that the Secretary of Defense considers appropriate.**	N/A			
§139d-(d)(1) Joint Guidance	The Director of Developmental Test and Evaluation and the Director of Systems Engineering shall jointly, in coordination with the official designated by the Secretary of Defense under section 103 (Performance Assessments and Root Cause Analysis for Major Defense Acquisition Programs) of the Weapon Systems Acquisition Reform Act of 2009, issue guidance on the following: **the development and tracking of detailed measureable performance criteria as part of the systems engineering master plans and the developmental test and evaluation plans within the test and evaluation master plans of major defense acquisition programs.**	3.1.5			
§139d-(d)(2) Joint Guidance	The Director of Developmental Test and Evaluation and the Director of Systems Engineering shall jointly, in coordination with the official designated by the Secretary of Defense under section 103 of the Weapon Systems Acquisition Reform Act of 2009, issue guidance on the following: **the use of developmental test and evaluation to measure the achievement of specific performance objectives within a systems engineering master plan.**	2.3.1			
§139d-(d)(3) Joint Guidance	The Director of Developmental Test and Evaluation and the Director of Systems Engineering shall jointly, in coordination with the official designated by the Secretary of Defense under section 103 of the Weapon Systems Acquisition Reform Act of 2009, issue guidance on the following: **a system for storing and tracking information relating to the achievement of the performance criteria and objectives specified pursuant to this subsection**	1.2			

Abbreviations and Acronyms

ACAT	Acquisition Category
ADM	Acquisition Decision Memorandum
AFMC	Air Force Materiel Command
AGM	Acquisition Guidance Model
AoA	Analysis of Alternatives
AOTR	Assessment of Operational Test Readiness
APB	Acquisition Program Baseline
ASA(ALT)	Assistant Secretary of the Army for Acquisition, Logistics, and Technology
ASN(RDA)	Assistant Secretary of the Navy for Research, Development, and Acquisition
ATEC	Army Test and Evaluation Command
AT&L	Acquisition, Technology, and Logistics
C4	command, control, communications, and computers
CAE	Component Acquisition Executive
CAPPMIS	Career Acquisition Personnel and Position Management Information System
CDD	Capability Development Document
CDR	Critical Design Review
CMMI	Capability Maturity Model Integration
COMOPTEVFOR	Commander, Operational Test and Evaluation Force
CONOPS	Concept of Operations
COTS	commercial off-the-shelf
CPD	Capability Production Document
CTE	critical technology element
CTP	Critical Technical Parameter
DAB	Defense Acquisition Board
DAG	Defense Acquisition Guidebook
DAPS	Defense Acquisition Program Support
DAU	Defense Acquisition University
DAWIA	Defense Acquisition Workforce Improvement Act
DDR&E	Director of Defense Research and Engineering
DDT&E	Director of Developmental Test and Evaluation
DMSMS	Diminishing Manufacturing Sources and Materiel Shortages
DoD	Department of Defense
DoDD	Department of Defense Directive
DoDI	Department of Defense Instruction

DON	Department of the Navy
DOT&E	Director, Operational Test and Evaluation
DSE	Director of Systems Engineering
D&SWS	Develop and Sustain Warfighting Systems
DST	Defense Support Team
DT	developmental test
DT&E	developmental test and evaluation
EMD	Engineering and Manufacturing Development (phase)
EMRL	Engineering Manufacturing Readiness Level
ESOH	environment, safety, and occupational health
EVM	Earned Value Management
FIPT	Functional Integrated Process Team
FL	Functional Leader
FoS	family of systems
FOT&E	Follow-on Operational Test and Evaluation / Follow-on Test and Evaluation
FoV	family of vehicles
FRP	Full-Rate Production
FY	fiscal year
FYDP	Future Years Defense Program
GFE	Government-furnished equipment
GIG	Global Information Grid
IA	information assurance
ICD	Initial Capabilities Document
IFF	Identification, Friend or Foe
IOC	Initial Operational Capability
IOT&E	Initial Operational Test and Evaluation
IPR	In-Progress Review
IPT	Integrated Product Team
ISR	intelligence, surveillance, and reconnaissance
IUID	item-unique identification
JCIDS	Joint Capabilities Integration and Development System
JROC	Joint Requirements Oversight Council
KPP	Key Performance Parameter
KSA	Key System Attribute
LRIP	Low-Rate Initial Production
LUT	Limited User Test

M&S	modeling and simulation
MAIS	Major Automated Information System
MDA	Milestone Decision Authority
MDAP	Major Defense Acquisition Program
MDD	Materiel Development Decision
MRL	Manufacturing Readiness Level
MS	Milestone
MSA	Materiel Solution Analysis (phase)
MSPM	Master of Science in Program Management
NDI	non-developmental item
NDIA	National Defense Industrial Association
NPS	Naval Postgraduate School
O&S	Operations and Support (phase)
OIPT	Overarching Integrated Product Team
ORD	Operational Requirements Document
OSD	Office of the Secretary of Defense
OT&E	operational test and evaluation
OT	operational test
PARCA	Performance Assessment and Root Cause Analysis
PARM	Participating Acquisition Resource Manager
PD	Production and Deployment (phase)
PDR	Preliminary Design Review
PEO	Program Executive Office
PM	Program Manager
POM	Program Objective Memorandum
PPP	Program Protection Plan
PQM	Production, Quality, and Manufacturing
PRR	Production Readiness Review
PSE	Program Systems Engineer
PSR	Program Support Review
QOT&E	Qualification Operational Test and Evaluation
RAM	reliability, availability, and maintainability
RDT&E	research, development, test, and evaluation
RFP	Request for Proposal
RTP	Research and Technology Protection
SAF/AQ	Secretary of the Air Force for Acquisition

SDD	System Development and Demonstration
SE	systems engineering
SEP	Systems Engineering Plan
SETR	Systems Engineering Technical Review
SFR	System Functional Review
SLOC	source lines of code
SoS	system of systems
SPAWAR	Space and Naval Warfare Systems Command
SPRDE	Systems Planning, Research, Development, and Engineering
SRCA	Systemic Root Cause Analysis
SRR	System Requirements Review
STEM	science, technology, engineering, and mathematics
SWaP-C	space, weight, power, and cooling
SwE	software engineering
SYSCOM	Systems Command
TD	Technology Development (phase)
T&E	test and evaluation
TEMP	Test and Evaluation Master Plan
TES	Test Evaluation and Strategy
TPM	Technical Performance Measure
TPP	Technical Performance Parameter
TRA	Technology Readiness Assessment
TRL	Technology Readiness Level
UAS	unmanned aircraft system
USD(AT&L)	Under Secretary of Defense for Acquisition, Technology, and Logistics
USA	United States Army
USAF	United States Air Force
USN	United States Navy
USMC	United States Marine Corps
USSOCOM	United States Special Operations Command
VV&A	Verification, Validation, and Accreditation
WIPT	Working Integrated Product Team

Department of Defense Developmental Test and Evaluation and Systems Engineering
FY 2009 Annual Report

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