DEPARTMENT OF DEFENSE
Systems Engineering

FY 2014 Annual Report

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Department of Defense Systems Engineering FY 2014 Annual Report

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1 EXECUTIVE SUMMARY

The Deputy Assistant Secretary of Defense for Systems Engineering (DASD(SE)) provides this report in response to 10 U.S.C. 139b and section 102(b) of Pub. L. No. 111-23, as amended (set out at 10 U.S.C. 2430 note) addressing the systems engineering capabilities of the Department of Defense (DoD) and systems engineering activities relating to the Major Defense Acquisition Programs (MDAP). This report includes:

- A discussion of the extent to which the MDAPs are fulfilling the objectives of their Systems Engineering Plans (SEP).
- A discussion of the waivers of and deviations from requirements in SEPs that occurred during the preceding year with respect to such programs; any concerns raised by such waivers or deviations; and the actions that have been taken or are planned to be taken to address such concerns.
- An assessment of the organization and capabilities of the DoD for systems engineering and development planning with respect to such programs.
- Any comments on such report that the Secretary of Defense considers appropriate.

The Department defines systems engineering (SE) as a methodical and disciplined approach for the specification, design, development, realization, technical management, operation, and retirement of a system. This report presents an overview of the Department's FY 2014 systems engineering efforts in implementing section 139(b) of the Weapon Systems Acquisition Reform Act (WSARA) of 2009, as well as an overview of the Department's systems engineering planning and focus areas for FY 2015. The Department continues to see strong evidence that robust systems engineering is a key enabler of successful acquisition program execution throughout the Department.

Section 2 summarizes DASD(SE)'s efforts in the areas of policy and guidance, program engagement and oversight, and systems engineering workforce management, all focused on improving the Department's systems engineering capability.

DASD(SE) contributed to a major update to DoD Instruction (DoDI) 5000.02, "Operation of the Defense Acquisition System," the Department's primary acquisition policy document released in interim form in early FY 2014. This revision of DoDI 5000.02 incorporates portions of previous Directive-Type Memorandums (DTM) implementing WSARA, development planning, and reliability and maintainability (R&M) engineering policy.

Section 2 also summarizes DASD(SE)'s continued engagement with the Joint Staff to ensure systems engineering continues to inform requirements maturation. DASD(SE) worked closely on language regarding the capability requirements process in the Joint Capabilities Integration and Development System (JCIDS) to ensure it was consistent with DoDI 5000.02 and systems engineering responsibilities under WSARA. DASD(SE), working with the Under Secretary of Defense for Intelligence (USD(I)), the DoD Chief Information Officer, and the Military Departments, played a key role in maturing system security engineering practices within the Department. DASD(SE) led the formation of a new Joint Federated Assurance Center (JFAC) to fulfill the requirements of

section 937 of the FY 2014 National Defense Authorization Act (NDAA) to ensure security of DoD software and hardware.

Section 2 describes DASD(SE) efforts to mentor program offices during program formulation and restructuring, review acquisition documentation, and perform Program Support Assessments (PSA) for all MDAPs and Major Automated Information System (MAIS) programs as they approach major milestone decision points. DASD(SE) had no requests for waivers or deviations from approved SEPs in FY 2014.

DASD(SE) serves as the Functional Leader for the Engineering (ENG) and Production, Quality, and Manufacturing (PQM) acquisition workforce career fields. Section 2 contains an overview of changes being made to the Defense Acquisition University (DAU) curriculum to better support the engineering workforce. DASD(SE) is working to identify competency-based function-specific requirements to support implementation of a new Key Leadership Position (KLP) qualification process. Section 2 also identifies several initiatives under way to strengthen organic engineering capabilities in support of Better Buying Power effort 3.0 as well as supporting research projects being conducted as part of the DoD Systems Engineering Research Center's (SERC) Human Capital Development Research Portfolio.

Section 3 contains an overview of the Military Departments' systems engineering capability and capacity. Individual Military Department self-assessments are provided in appendices A through C. This section highlights the progress of the Military Departments in aligning their organizations to better enable effective systems engineering focused on achieving affordable programs and improving program oversight. Each Military Department continues to implement key provisions of the WSARA, including development planning and early systems engineering, R&M, and systems engineering support to the JCIDS and contracting.

The Military Departments, in partnership with DASD(SE), continued to make workforce development a priority for effective systems engineering through a diverse set of initiatives designed to attract and retain a qualified systems engineering workforce. The Army's current systems engineering workforce projections indicate slight planned decline into FY 2016, with workforce size remaining level thereafter into FY 2019. The Navy and Air Force project slight declines through FY 2019.

Section 4 contains assessments of 46 MDAPs, MAIS programs, and special interest programs that were the focus of significant DASD(SE) activity in FY 2014. The assessments provide a status of program SEPs, Program Protection Plans (PPP), requirements, and measurable performance criteria. The assessments also summarize DASD(SE) involvement in program reviews.

The Military Departments' FY 2014 achievements and FY 2015 plans captured in this report demonstrate a continued commitment to the provisions of WSARA focused on improving DoD systems engineering.

2 DASD(SE) ACTIVITIES

In FY 2014, DASD(SE) updated DoD systems engineering policy and guidance, provided technical assessments and systems engineering support for MDAP and MAIS programs, and continued efforts to grow and strengthen the Department's engineering workforce.

As required by DoDI 5134.16, "Deputy Assistant Secretary of Defense for Systems Engineering," DASD(SE) hosts the DoD Systems Engineering Forum, bringing together systems engineering representatives from DoD and other Federal agencies responsible for developing complex systems. These forums serve as a mechanism to coordinate systems engineering efforts and support the exchange of lessons learned and best practices. Participants in FY 2014 included representatives from the Office of the Secretary of Defense (OSD), the DoD Components, the Department of Homeland Security, Federal Aviation Administration, NASA, the National Oceanic and Atmospheric Administration, and the Intelligence Community. In FY 2014, DASD(SE) held five forums with emphasis on sharing best practices among Federal agencies, engineering workforce development, the use of digital modeling in acquisition and engineering, system of systems (SoS) engineering, and the Under Secretary of Defense for Acquisition, Technology, and Logistics (USD(AT&L)) Better Buying Power 3.0 focus on technological superiority and innovation.

2.1 Policy and Guidance

DASD(SE) oversees the implementation of existing policy and develops new policy and guidance to improve systems engineering practices across the Department. DASD(SE) supported the implementation of new and existing policy and guidance on the Defense Acquisition System, R&M, counterfeit prevention, system security engineering, and systems engineering-related standards.

2.1.1 Interim DoDI 5000.02

On November 26, 2013, the Deputy Secretary of Defense released the interim DoDI 5000.02, "Operation of the Defense Acquisition System." DASD(SE) participated in the update and implementation of the instruction, which provides systems engineering direction for acquisition programs and reflects the USD(AT&L) Better Buying Power initiatives. The instruction incorporates portions of DTM 09-02, "Implementation of Weapon Systems Acquisition Reform Act (WSARA) of 2009" (which established DASD(SE)); DTM 10-017, "Development Planning (Materiel Development Decision (MDD) Review and Support Analysis of Alternatives (AoA))"; and DTM 11-003, "Reliability Analysis, Planning, Tracking, and Reporting." DASD(SE) significantly revised the systems engineering enclosure (Enclosure 3) of the instruction.

Revisions to DoDI 5000.02 contain refined policies and procedures for development planning, systems engineering trade-off analyses, technical risk and opportunity management, Technical Performance Measures (TPM) and metrics, modeling and simulation, manufacturing and producibility, software, R&M, program protection, open systems architecture, Insensitive Munitions, design reviews (Preliminary Design Review (PDR) and Critical Design Review (CDR)), and PSAs. In the area of development planning, the updated policy includes a requirement to conduct early systems engineering analysis and assessments to provide a strong technical foundation in support of

the MDD, during the Materiel Solution Analysis (MSA) phase, and for the Milestone A decision point. The updated engineering enclosure also includes the requirement to use open systems architecture design principles where feasible and cost-effective to support an open business model.

DoDI 5000.02 updates also address the SEP; technical reviews; configuration management; corrosion prevention and control; environment, safety, and occupational health (ESOH); item unique identification; and spectrum supportability. DASD(SE) significantly revised the section on the SEP to emphasize effective management and control of the program's overall technical approach to balance system performance, life cycle cost, and risk in addressing Warfighter needs.

In addition, DASD(SE) incorporated program protection policy into the systems engineering enclosure. Programs use system security engineering practices to guide and manage system security risks associated with a program throughout its life cycle. Protection measures include hardware, software, and information critical to the program. With respect to software, the updated enclosure incudes a requirement for program managers to use automated software vulnerability analysis tools to ensure remediation of software vulnerabilities.

DASD(SE) is updating the Defense Acquisition Guidebook (DAG) Chapter 4 on Systems Engineering, which will provide the implementation guidance for the updated DoDI 5000.02. The updated DAG will be released in 2015.

2.1.2 Reliability and Maintainability Engineering

DASD(SE) improved reliability analysis, planning, tracking, and reporting by institutionalizing reliability planning methods and reporting requirements timed to key acquisition activities. In collaboration with the Office of the Deputy Assistant Secretary of Defense for Materiel Readiness (DASD(MR)) and the Joint Staff's Logistics Directorate, J-4, DASD(SE) reviewed the then draft Manual for the Operation of the Joint Capabilities Integration and Development System (JCIDS). DASD(SE) provided recommendations on the definitions of *reliability* and *maintainability,* improvements in the specification of maintainability attributes, and explanation regarding the differences between mission and logistics reliability. In addition, DASD(SE) provided an update to the Recommended Sustainment Metrics table by characterizing the materiel availability, operational availability, and reliability parameters for different categories of weapon systems. The revised table provides clear and concise guidance on specific parameters, including their definitions and formulas, which different weapon systems should be using. DASD(SE) adjudicated the changes, which will be included in the next revision of the JCIDS Manual with the Joint Staff's Force Structure, Resources, and Assessment Directorate, J-8, and other relevant stakeholders.

As stated in the interim DoDI 5000.02, programs are required to prepare an initial Reliability, Availability, Maintainability, and Cost (RAM-C) Rationale Report in support of Milestone A and to update the report for Milestones B and C. DASD(SE) is working to update the RAM-C Rationale Report Manual, first published in 2009, to assist programs in developing the report. Among the revisions, the update will include an annotated outline for practitioners to use. DASD(SE) expects to release the revised manual in FY 2015.

Working with R&M Military Department leads, DASD(SE) initiated updates to 11 R&M Data Item Descriptions (DID) that were either out of date or obsolete. These DIDs support the contractual execution of effective R&M programs throughout the DoD. Leveraging Military Department expertise and inputs, DASD(SE) developed an update schedule for the 11 DIDs based on their criticality and impact to DoD programs. To date, DASD(SE) and the R&M Military Department Leads have completed the review, revision, and upload of the four highest priority DIDs. DASD(SE) plans to complete the revision of the remaining R&M DIDs in FY 2015.

2.1.3 Systems Engineering in JCIDS

DASD(SE) continued its engagement with the Joint Staff's J-8 to promote greater awareness of systems engineering principles during requirements maturation. DASD(SE) has worked proactively to ensure that evolving policy for the JCIDS supports continuous interaction with the systems engineering communities at necessary organizational levels.

In addition to the efforts described in Section 2.1.2 regarding reliability, DASD(SE) ensured the capability requirements process in the JCIDS was aligned and consistent with the Defense Acquisition System in the interim DoDI 5000.02 released in late 2013. Key elements synchronized include the draft Capability Development Document (CDD) due before Milestone A, the validated CDD used as a basis for PDR, and the role of the Configuration Steering Boards (CSB). DASD(SE) participation in the development of JCIDS policy and guidance and in engagement with the programs provides opportunities to define and improve best practices for integrating systems engineering into requirements processes and implement them as the Department develops the requisite capabilities.

2.1.4 System Security Engineering

DASD(SE) led efforts to mature system security engineering practices within the Department, including improvements in program protection policy and guidance, acquisition regulations, and hardware and software assurance.

Program Protection Policy and Guidance. DASD(SE) developed guidance to complement recent development and publication of foundational program protection requirements in several key policies, including the interim DoDI 5000.02; DoDI 5200.39; and DoDI 5200.44, "Protection of Mission Critical Functions to Achieve Trusted Systems and Networks (TSN)." DASD(SE) prepared updates to the DAG Chapter 13 on Program Protection as well as the Program Protection Plan (PPP) Outline and Guidance, both of which are expected to be published in FY 2015. DASD(SE) published additional guidance materials for the acquisition community, including "Program Protection Plan Evaluation Criteria, Version 1.1," "Trusted Systems and Networks Analysis," and "Software Assurance Countermeasures in Program Protection."

DASD(SE) led efforts to mature DoD practices to protect DoD systems and technology that are vital to U.S. technological superiority. DASD(SE) and USD(I) revised DoDI 5200.39, "Critical Program Information (CPI) Identification and Protection Within Research, Development, Test, and Evaluation." This instruction will require programs to maintain the U.S. Warfighter technical advantage and preserve operational effectiveness of DoD capabilities by identifying and protecting critical program information. DASD(SE) and USD(I) also initiated a working group to develop an

implementing DoD Manual 5200.39 to provide procedures for identifying and protecting critical program information. In addition, DASD(SE) led the development of DoD Directive 5200.JJE, "Anti-Tamper." When published, this directive will formalize the DoD Anti-Tamper program governance structure and define the roles and responsibilities associated with identifying and implementing the appropriate anti-tamper protections for critical program information. These key policy initiatives support exportability goals outlined in USD(AT&L)'s Better Buying Power 2.0 and the early design and implementation of Defense Exportability Features (DEF). Details on the DEF Pilot Program and participating programs may be found in the FY 2014 USD(AT&L)/International Cooperation report to Congress, *Defense Exportability Features Pilot Program* (classified).

Safeguarding Technical Information. DASD(SE) coordinated Department efforts to implement actions directed in the Secretary of Defense October 10, 2013, memorandum, "Safeguarding Unclassified Controlled Technical Information." Among these efforts, DASD(SE) led, in collaboration with the office of Defense Procurement and Acquisition Policy (DPAP), the final coordination, publishing, and implementation of Defense Federal Acquisition Regulation Supplement (DFARS) clause 252.204-7012, "Safeguarding of Unclassified Controlled Technical Information." DASD(SE) also led the development of guidance to assist with implementing the clause. This clause requires contractors to protect unclassified controlled technical information from cyber intrusions and report cyber incidents that may have affected the Department's unclassified controlled technical information. DASD(SE) is looking for ways to improve the partnership between the acquisition community and the intelligence community to perform comprehensive assessments of technical information losses and determine consequences in order to inform requirements, acquisition, programmatics, and strategic courses of action.

Joint Federated Assurance Center. The JFAC will establish a federation of software assurance and hardware assurance capabilities to support acquisition program protection planning and execution. DASD(SE) led the formation of a JFAC to fulfill requirements of section 937 (Joint Federated Centers for Trusted Defense Systems for the Department of Defense) of the FY 2014 NDAA, which directs the establishment of a joint federation of capabilities to ensure security of DoD software and hardware.

The JFAC will support program offices across the life cycle by identifying and facilitating access to Department software assurance and hardware assurance expertise and capabilities, policies, guidance, requirements, best practices, contracting language, training, and testing support. In addition, the JFAC will coordinate across the DoD research and development communities to develop and deploy innovative and affordable vulnerability analysis, testing, and protection tools. Software and hardware technical working groups, a multidisciplinary policy team, and a Senior Executive Steering Committee have been established and have agreed on an organizational construct, initial operational construct, and a charter. The JFAC is on track to achieve Initial Operational Capability (IOC) during 4th quarter FY 2015.

In response to a Senate Appropriations Committee tasking, DASD(SE) also published a report, Department of Defense Assurance Microelectronics Policy, Senate Report 113-85, July 2014, describing DoD progress toward implementing an assured microelectronics policy. The report presents a Department-wide systems engineering approach for promoting hardware assurance through the process of program protection planning. It includes an assessment of potential threats to

microelectronics and their supply chain vulnerabilities. The report also describes the countermeasures being used to mitigate the risk of malicious acts occurring that might otherwise undermine the trustworthiness of the microelectronics and the related microelectronic hardware used in DoD weapon and information technology systems.

2.1.5 Additional Engineering Policy and Guidance

In 2014, DASD(SE) continued to develop and refine policy and guidance in counterfeit prevention, safety, and systems engineering-related standards.

Counterfeit Prevention. DASD(SE) supported the implementation of the DoDI 4140.67, "DoD Counterfeit Prevention Policy," which addresses counterfeit materiel in the DoD supply chain. DASD(SE) led the effort to incorporate counterfeit prevention design considerations in the DAG Chapter 4. DASD(SE) acted as the principal point of contact for Government-Industry Data Exchange Program (GIDEP), examining a series of policy and procedure options to expand GIDEP's usefulness and robustness in support of the defense and Federal global supply chains.

DASD(SE) was a primary contributor on the DoD and Federal Government teams that drafted a series of regulations required under NDAA 2012 section 818 (Pub. L. 112-81): (1) "Detection and Avoidance of Counterfeit Electronic Parts," which provides guidance to prime contractors and their supply chains (DFARS case 2012-D055); (2) "Higher Level Contract Quality Requirements" for critical items procured under Cost Accounting Standard (CAS) covered contracts (FAR case 2012-032); and (3) "Expanded Reporting of Nonconforming Items" to ensure known cases of nonconforming items (including counterfeits) are communicated to the contracting officer and throughout the industrial base, as appropriate, using GIDEP (FAR case 2013-002).

DASD(SE) also participated in a series of FAR and DFARS public meetings to gather industry perspectives on these proposed regulations, which resulted in a fourth case, "Detection and Avoidance of Counterfeit Electronics–Further Implementation," which aims to address areas that industry has identified as requiring further clarification or guidance (DFARS case 2014-D005).

Safety. DASD(SE) led efforts with the Military Departments' system safety communities to conduct collaborative weapon system safety reviews. On July 30, 2014, USD(AT&L) issued the manual DoD 5000.69-M, Joint Services Weapon Safety Review Process, implementing DoDI 5000.69, "Joint Services Weapon and Laser System Safety Review Processes." The manual assigns responsibilities and provides procedures for managing the Joint Services Weapon Safety Review (JSWSR) process for weapons, weapon systems, ammunition, and any items containing explosives and energetic materials intended to be used by two or more DoD Components. These joint reviews include the Military Departments' existing weapon, fuze, ignition system, and software review boards working collaboratively to provide one set of joint weapon safety findings for a joint system. Program managers of jointly developed and used munitions realize time and cost benefits by undergoing a single system safety review performed collectively by the Military Departments' system safety experts.

Systems Engineering-Related Standards. As the Defense Standardization Executive, DASD(SE) supported the development of four defense-focused, non-government standards to improve the coordination and efficiency of engineering activities.

With the Institute of Electrical and Electronics Engineers (IEEE), DASD(SE) collaborated to develop two addenda to the ISO/IEC/IEEE 15288, "Systems and Software Engineering System Life Cycle Processes." IEEE 15288.1, "Application of Systems Engineering on Defense Programs," provides the basis for selection, negotiation, agreement, and performance of systems engineering activities and delivery of products across the system life cycle, while allowing for tailoring to meet the specific needs of each program. IEEE 15288.2, "Technical Reviews and Audits on Defense Programs," establishes the purpose, description, and review criteria for technical reviews and configuration audits to be performed throughout the DoD acquisition life cycle. It is intended to be placed on contract to establish an agreement between acquirers and suppliers on the focus and expectations of each applicable technical review and audit, and also allows for tailoring to meet the specific needs of each program. DASD(SE) also participated in a National Defense Industrial Association (NDIA) working group to develop tailoring and implementation guidance for putting these standards on contract and for assessing compliance by the supplier. The standards successfully completed IEEE balloting in 2014 and will be published in early 2015.

With SAE International, DASD(SE) initiated two efforts, SAE AS6500, "Manufacturing Management Program," and EIA-649-1, "Configuration Management Requirements for Defense Contracts," in response to Component feedback and gap analyses identifying the need for standardization in these areas. The manufacturing community created SAE AS6500 to implement management practices aimed at promoting the timely development, production, modification, fielding, and sustainment of affordable products by addressing manufacturing issues throughout the program life cycle. The standard is applicable to all phases of the system acquisition life cycle and is intended for use on all programs with manufacturing content. It requires proven manufacturing management practices with the goal of delivering affordable and capable systems. The standard is intended primarily for use in the defense industry but may be applicable to other commercial industries.

EIA-649-1 implements the configuration management principles identified in SAE EIA-649B, "Configuration Management," by outlining requirements for placing configuration management on defense contracts. DASD(SE) oversaw the working group activities and ensured related documents, such as the DIDs and DoD Forms, were updated in parallel to support contractual implementation. DoD-wide participation ensured the EIA-649-1 contains the DoD enterprise requirements for consistent and effective use by programs in all phases of the acquisition life cycle. SAE International successfully completed balloting of AS6500 and EIA-649-1 in November 2014, and the standards will be formally published and adopted in FY 2015.

Designed for application across military and commercial sectors, the IEEE and SAE standards enable consistent implementation of systems engineering processes across the life cycle. The standards are structured for use on defense contracts and are intended to be tailored to each program's needs. When published and formally adopted in FY 2015, these standards will provide the basis for more consistent implementation of systems engineering processes across the Military Departments and the defense industrial base, resulting in potential cost savings.

Systems of Systems Engineering. In August 2014, DASD(SE) released the guide Recommended Practices: SoS Considerations in the Engineering of Systems, a collaborative product of the Systems of Systems Work Stream of the Technical Panel on Systems Engineering and Modernization within The Technical Cooperation Program (TTCP). TTCP is an international organization that collaborates on technical exchange and shared research. DASD(SE) serves as U.S. National Lead on this systems engineering Technical Panel. The guide brings together the collective knowledge from across the United States, United Kingdom, Canada, and Australia on SoS considerations that need to be addressed at key points in the system development process. The recommended practices are intended for use by systems engineers, program managers, and acquisition oversight organizations in government and industry who are engaged in the development of defense systems in particular, but the practices apply more generally across large systems in other domains as well.

2.2 Program Engagement and Oversight

DASD(SE) engages in substantive and technical systems engineering activities with MDAPs and MAIS programs throughout all phases of the acquisition life cycle. Program managers use the requirements documents, SEP, and PPP as foundational documents to plan systems engineering, design, development, production, protection, and requirements verification efforts. DASD(SE) reviews and comments on requirements documents and works with programs to document their technical planning in both SEPs and PPPs. DASD(SE) is the final approval authority for SEPs for MDAPs and MAIS programs, and leads the review and recommendation for approval of PPPs by the USD(AT&L).

Before Milestone A, DASD(SE) participates in development planning activities including reviewing the Initial Capabilities Document (ICD) and the AoA Study Plan and participates in AoA Senior Advisory Group (SAG) meetings. Throughout all phases, DASD(SE) participates in Integrating Integrated Product Teams (IIPT), Overarching Integrated Product Teams (OIPT), Systems Engineering Working Integrated Product Teams (SE WIPT), Systems Engineering Technical Reviews (SETR), and other program technical engagements such as Program Management Reviews.

DASD(SE) developed the Defense Acquisition Program Support (DAPS) methodology to assess program planning and execution during technical reviews. DASD(SE)'s independent systems engineering assessments and recommendations throughout the program life cycle provide support to programs with information on potential program risks and issues as well as recommendations for leadership to consider during OSD reviews and OIPT meetings, which in turn inform the Defense Acquisition Board (DAB) and Milestone Decision Authority. DASD(SE) documents non-attributed results from reviews in a systemic root cause analysis (SRCA) database to analyze patterns and root causes of issues that occur across DoD programs. The data inform subsequent analyses and future policy and guidance as appropriate.

Table 2-1 lists the number of engagements by category and program for the programs highlighted in Section 4, and a summary entry for all other program engagement. Figure 2-1 shows DASD(SE) FY 2014 program engagement by acquisition phase.

Table 2-1. FY 2014 DASD(SE) Program Engagement by Category

Program Name (Acronym)	SE Activities			Technical Review and Assessments											DASD(SE) Support to OSD Reviews		
	WIPT	SEP	PPP	PSA/ Focused Reviews	NAR	NM/CCR	RFP Peer Review	Subsys PDR	Sys PDR	PDR Asmt	Subsys CDR	Sys CDR	CDR Asmt	DAES	Other SETRs	AoA SAG	OIPT	DAB
3DELRR		1	1	1													1	1
AEHF														✓	1			
AMDR	1							1	1					✓	6			
AOC-WS	1		1			1						1	1	✓	2			
B-2 DMS-M				1					1								1	
B61 TKA			1					1	1					✓				
CANES		1	1			1	1							✓			1	
CH-53K	3										1			✓	2			
CIRCM										1							1	1
CVN 78														✓				
DDG 51		1												✓	1		1	1
EPS		1	1	1						1	1	1			1		1	1
Excalibur														✓				1
F-22 3.2b														✓	2			
F-35				1										✓	9		1	2
GCV				1					2						3			
GMLRS-AW	1													✓				
GPS ENT	2	1	1											✓			1	
HH-60W (CRH)	1	1															1	1
HMS JTRS														✓	2			
IFPC2		1	1												5			1
IPPS-A Inc 1	10	1	1									1	1	✓			2	2
ISPAN Inc 4	3	1	1	1				5	1	1							3	2
ITEP	2			1												1		
JASSM-ER				1										✓	3			
JLTV	1													✓	6		1	
JMS Inc 2											1			✓	4			
JPALS Inc 1A	1					1								✓				
KC-46A	1			1							1		1	✓	1			

Program Name (Acronym)	SE Activities			Technical Review and Assessments											DASD(SE) Support to OSD Reviews		
	WIPT	SEP	PPP	PSA/ Focused Reviews	NAR	NM/CCR	RFP Peer Review	Subsys PDR	Sys PDR	PDR Asmt	Subsys CDR	Sys CDR	CDR Asmt	DAES	Other SETRs	AoA SAG	OIPT	DAB
LCS (SF & MM)	8													✓	2			
MQ-4C Triton	2													✓	1		2	2
MQ-8 Fire Scout						1								✓			1	1
MUOS														✓	1			
NGEN	3			1					1		1	1		✓	8		1	
OR	1																	1
P-8A		1	1					1						✓	2		1	1
PAC-3 MSE		1		1										✓			1	1
PIM	5	1									2			✓	2			1
PKI	2		1			1								✓			2	1
RMS	1	1												✓	1		1	1
RQ-4B GH			1											✓			2	2
SDB II			1	1										✓	4			
SSC								1			6			✓				
UCLASS	1						1	20	4	4					3		1	
VH-92A			1								2				1		1	1
WIN-T Inc 2	1													✓	2			
Other Programs	47	4	4	3	1		2	6			9	1	1		39	21	18	26
Total	**98**	**17**	**18**	**15**	**1**	**5**	**4**	**35**	**11**	**7**	**24**	**5**	**4**		**114**	**22**	**46**	**51**

WIPT – Working Integrated Product Team
SEP – Systems Engineering Plan
PPP – Program Protection Plan
PSA – Program Support Assessment
NAR – Non-Advocate Review
NM/CCR – Nunn-McCurdy / Critical Change Review certification
Subsys PDR – Subsystem-level Preliminary Design Review
Sys PDR – System-level Preliminary Design Review
PDR Asmt – Preliminary Design Review assessment complete
Subsys CDR – Subsystem-level Critical Design Review
Sys CDR Sys – System-level Critical Design Review
CDR Asmt – Critical Design Review assessment complete
DAES – Defense Acquisition Executive Summary assessments for program schedule, system performance, management, interoperability information security, and production (✓ Required to submit DAES assessments)
Other SETRs – Other Systems Engineering Technical Reviews, such as System Requirements Review (SRR), System Functional Review (SFR), Technical Information Meeting (TIM)
AoA SAG – Analysis of Alternatives Senior Advisory Group review meeting
OIPT – Overarching Integrated Product Team
DAB – Defense Acquisition Board (including deep dives, principals meetings, etc.)
Other Programs – Programs other than those featured in Section 4.

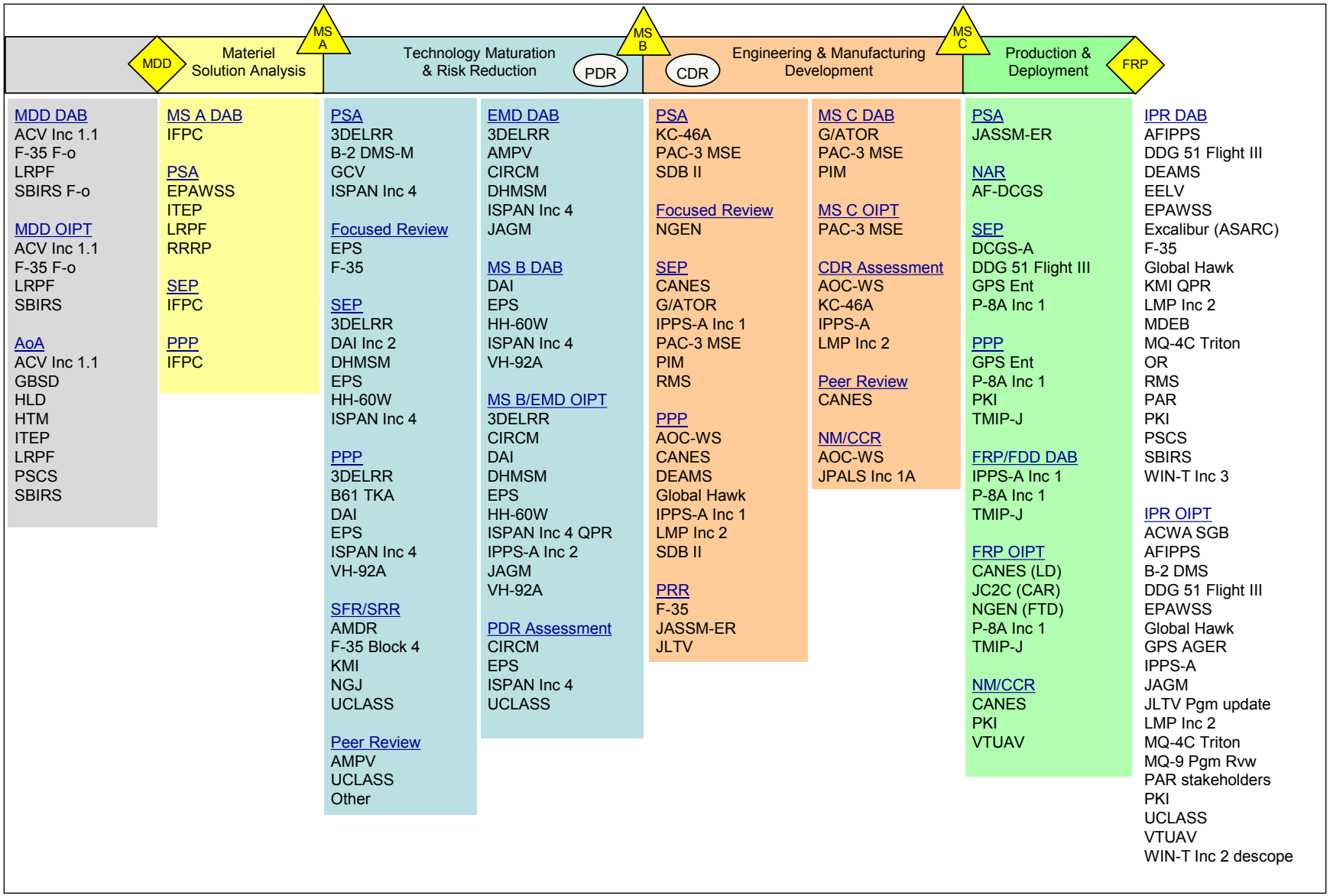

Figure 2-1. FY 2014 DASD(SE) Program Engagement by Acquisition Phase

2.2.1 Development Planning

Development planning advances informed decision making by the Milestone Decision Authority. It also promotes a clear mutual understanding of a needed capability between the user and the acquisition office. During development planning, DASD(SE) evaluates areas such as schedule feasibility, funding, interdependency, metrics, planning, and staffing. In FY 2014, DASD(SE) development planning activities included participating in SE WIPTs, IIPTs, and OIPTs; reviewing the ICD and commenting on AoA study guidance and plans in advance of the MDD; and participating in AoA activities and reviewing draft CDDs in support of Milestone A. These early, foundational activities and documents are critical because they shape a program's technical planning for the Milestone A phase and beyond.

DASD(SE) reviewed four draft ICDs to assess whether the programs understood and had clearly defined the capability gaps in their Concept of Operations. DASD(SE) reviewed the ICDs to ensure the capabilities were defined with metrics and minimum values and defined so as not to prefer a particular materiel solution.

DASD(SE) participated in 23 AoA events to advise on the technical feasibility of alternatives to resolve the user's mission needs. DASD(SE) reviewed AoA guidance and AoA Study Plans to ensure the materials adequately addressed systems engineering interests such as the Integrated Master Schedule (IMS), risk management, R&M, and system integration.

DASD(SE) participated in four program MDDs. In the months leading up to the MDD, DASD(SE) supported program preparation for the milestone. During the period following the MDD, DASD(SE) reviewed the technical planning and management approaches documented in the program's pre-Milestone A SEP. During this phase, a program identifies Key Performance Parameters (KPP) or other performance attributes to support the development of a system specification. In addition, the program identifies trade space in which to arrive at a realistic program solution. In reviewing SEPs, DASD(SE) frequently helped programs improve in areas such as technical performance parameters, schedule adequacy, risk management, and the details of planned technical reviews. DASD(SE) also reviewed and informed the development of program Technology Development and Acquisition Strategies.

DASD(SE) reviewed and commented on 11 draft CDDs. DASD(SE) assessed the CDDs for stable and measurable requirements that are technically achievable within the established schedule and budget. DASD(SE) also reviewed to ensure the requirements were informed by sound systems engineering trade-off analysis conducted during the AoA and Technology Maturation and Risk Reduction (TMRR) phase activities.

Table 2-2 summarizes the number of programs with which DASD(SE) engaged in development planning during FY 2014.

Table 2-2. FY 2014 Development Planning (Early Systems Engineering)

ICDs Reviewed	AoA Engagement	MDDs	CDDs Reviewed
4	8	4	11

2.2.2 Systems Engineering Plan

The SEP is the program's functional technical planning document. It describes the program's overall technical approach, including: organization, major systems engineering activities, processes, resources, metrics, products, risks, event-driven schedules, and design considerations. The SEP evolves with the program. DASD(SE) reviews draft SEPs and approves final SEPs for MDAPs and MAIS programs at Milestones A, B, and C. DASD(SE) provides assistance to programs as they develop the SEP and participates in Program Management Office (PMO)-organized SE WIPTs to help shape and mature the document.

DASD(SE) engages with PMOs approximately 6 to 12 months before a program milestone review to support SEP development. Typically, SEPs that are developed and reviewed in one fiscal year are approved in the following year. After approving a program SEP, DASD(SE) tracks performance to plan in order to assess design maturation, provide early warning of risks, and inform mitigation activities. Table 2-3 summarizes the DASD(SE) FY 2014 SEP review and approval activities. In FY 2014, DASD(SE) reviewed SEPs for 30 programs and approved 17 SEPs. DASD(SE) received no requests for waivers or deviations from approved SEPs in FY 2014.

There is no one-to-one relationship of program SEPs reviewed and approved in any one fiscal year. DASD(SE) staff typically collaborates with PMO staffs during SEP development to support SEP quality and facilitate approval. Consequently, DASD(SE) conducts more SEP reviews than the number of SEPs submitted for final approval.

Table 2-3. FY 2014 SEP Review and Approval Activity

Major Programs	Program SEPs Reviewed			Program SEPs Approved		
	MDAP	MAIS	**Total**	MDAP	MAIS	**Total**
Supporting MS A	1	0	**1**	1	0	**1**
Supporting MS B	2	5	**7**	3	2	**5**
Supporting MS C	6	2	**8**	4	1	**5**
Other (FDD, ADM Action, etc.)	10	4	**14**	3	3	**6**
Total	19	11	**30**	11	6	**17**

DASD(SE) provided outreach briefings emphasizing SEP expectations to improve SEP content to offices including the Assistant Secretary of the Air Force (Acquisition), Assistant Secretary of the Army for Acquisition, Logistics, and Technology (ASA(ALT)), and Naval Air Systems Command (NAVAIR). DASD(SE) also supported individual requests from non-MDAP and lower-level Acquisition Category (ACAT) PMOs for SEP development guidance and insight to systems engineering best practices.

2.2.3 Program Protection Plan

The PPP is the program's integrated system security engineering document. It describes the program's critical program information and mission-critical functions and components, the threats to and vulnerabilities of these items, the plan to apply countermeasures to mitigate associated risks, and planning for exportability and potential foreign involvement. The PPP emphasizes full life cycle planning and execution of all security activities in an acquisition program.

DASD(SE) leads review of draft PPPs for ACAT ID and IAM programs at Milestone A, the Development Request for Proposal (RFP) release decision point, Milestone B, Milestone C, and the Full-Rate Production (FRP)/Full Deployment Decision (FDD). Whereas DASD(SE) is the approval authority for the SEP, the Milestone Decision Authority approves the PPP. DASD(SE) reviews and recommends PPPs for approval by the USD(AT&L). The PPP is a living document, which is updated throughout the life cycle as the system security engineering analyses and controls evolve and mature.

DASD(SE) provides assistance to programs as they develop the PPP and participates in PMO-organized Integrated Product Teams (IPT) and DEF In-Process Reviews to help shape and mature selection of the countermeasures. DASD(SE) endorses early and frequent engagement with PMOs to facilitate PPP development. As with the SEP, the PPPs may begin development in one year and be approved in the next. In FY 2014, DASD(SE) reviewed and supported the development of 50 PPPs. USD(AT&L) approved 18 PPPs.

2.2.4 Systems Engineering Assessments

DASD(SE) provides a range of systems engineering assessments on programs, as required, including PSAs, Focused Reviews, SETRs, and Non-Advocate Reviews, to assess program planning and execution on behalf of USD(AT&L). DASD(SE) uses its DAPS methodology (see 2.2.4.1) to conduct the assessments, which are intended to assist the PMO to assess program health, identify risks, and consider corrections to keep the program on track in terms of schedule, performance, and cost. DASD(SE) reviews major programs before and in support of an OIPT or DAB review. DASD(SE) also assesses programs in support of monthly and quarterly Defense Acquisition Executive Summary (DAES) reporting (see 2.2.6).

DASD(SE) conducted the following types of systems engineering assessments in FY 2014:

1. Program Support Assessments (PSA) – DASD(SE) leads PSAs on ACAT ID and ACAT IAM programs. DASD(SE)-led teams, including support from other OSD organizations, meet with the program office and, as appropriate, the prime contractor's engineering staffs. PSAs address either the program's technical planning and management approaches or the program's progress demonstrated during an acquisition phase and plans to mitigate technical risks and issues. PSAs inform OIPT and DAB leadership decisions. The reviews are conducted in advance of acquisition milestones to inform program planning and resolve issues before a milestone decision. Focused Reviews are requested by the Service, program, or OSD leadership. When possible, reviews are conducted in conjunction with Military Department-level reviews. In FY 2014, DASD(SE) conducted 15 PSAs, 3 of which were conducted as Focused Reviews. Two of

the Focused Reviews assessed software, and one was conducted in conjunction with a program's Government Readiness Review.

2. Systems Engineering Technical Reviews (SETR) – SETRs are reviews programs conduct as part of their technical execution. DASD(SE) participates in MDAP and MAIS SETRs including Preliminary Design Reviews (PDR) and Critical Design Reviews (CDR). DASD(SE) conducts assessments of the PDRs and CDRs, which are formally reported to the USD(AT&L). These PDR and CDR assessments provide an independent appraisal of the quality and completeness of the program's technical maturity and readiness to proceed to the next phase of development. In the case of the PDR, the DASD(SE) assessment informs the Milestone Decision Authority's 10 U.S.C. 2366b certification activities. DASD(SE) participates in other SETRs as required across the program life cycle, such as System Requirements Reviews, System Functional Reviews, System Verification Reviews, Functional Configuration Audits, Production Readiness Reviews, Test Readiness Reviews, and technical In-Process Reviews. In FY 2014, DASD(SE) completed seven PDR assessments and four CDR assessments. In all, DASD(SE) participated in 114 SETRs for 49 programs.
3. Nunn-McCurdy Certification Reviews and Critical Change Reviews (CCR) – DASD(SE) typically assesses program management, risk management, and systems engineering processes to support the USD(AT&L) in certifying that the management structure of the program is adequate to manage and control costs. As with PSAs, DASD(SE) uses the DAPS methodology for Nunn-McCurdy certification reviews and CCRs. DASD(SE) supported two Nunn-McCurdy reviews and three CCRs in FY 2014.
4. Non-Advocate Reviews (NAR) – Non-Advocate Reviews typically are requested by OSD leadership, the Service, or the program. In FY 2014, DASD(SE) conducted one Non-Advocate Review and assessed areas of reliability, software, and schedule.
5. Request for Proposal (RFP) Peer Reviews – DASD(SE) supports the Director, DPAP as a team member during formal pre-award Peer Reviews for contracts with an estimated value of $1 billion or more. Formal pre-award Peer Reviews are conducted in three phases: (1) prior to issuance of the solicitation; (2) prior to request for final proposal revisions; and (3) prior to contract award. DASD(SE) supported four formal RFP Peer Reviews in FY 2014 to ensure the proposals adequately reflected systems engineering rigor and equities.

Table 2-4 indicates the number of major systems engineering assessments DASD(SE) performed in support of MDAPs and MAIS programs in FY 2014.

Table 2-4. FY 2014 DASD(SE) Systems Engineering Assessment Summary

Major Program	PSAs/ Focused Reviews	Non-Advocate Reviews	PDR Assessments	CDR Assessments	NM/ CCRs	DPAP RFP Peer Reviews
MDAP/ Pre-MDAP	13		6	1	2	4
MAIS	2	1	1	3	3	
Total	**15**	**1**	**7**	**4**	**5**	**4**

Figure 2-2 shows the number of assessments DASD(SE) completed in FY 2014 by domain area and Military Department. Figure 2-3 shows the number by acquisition phase.

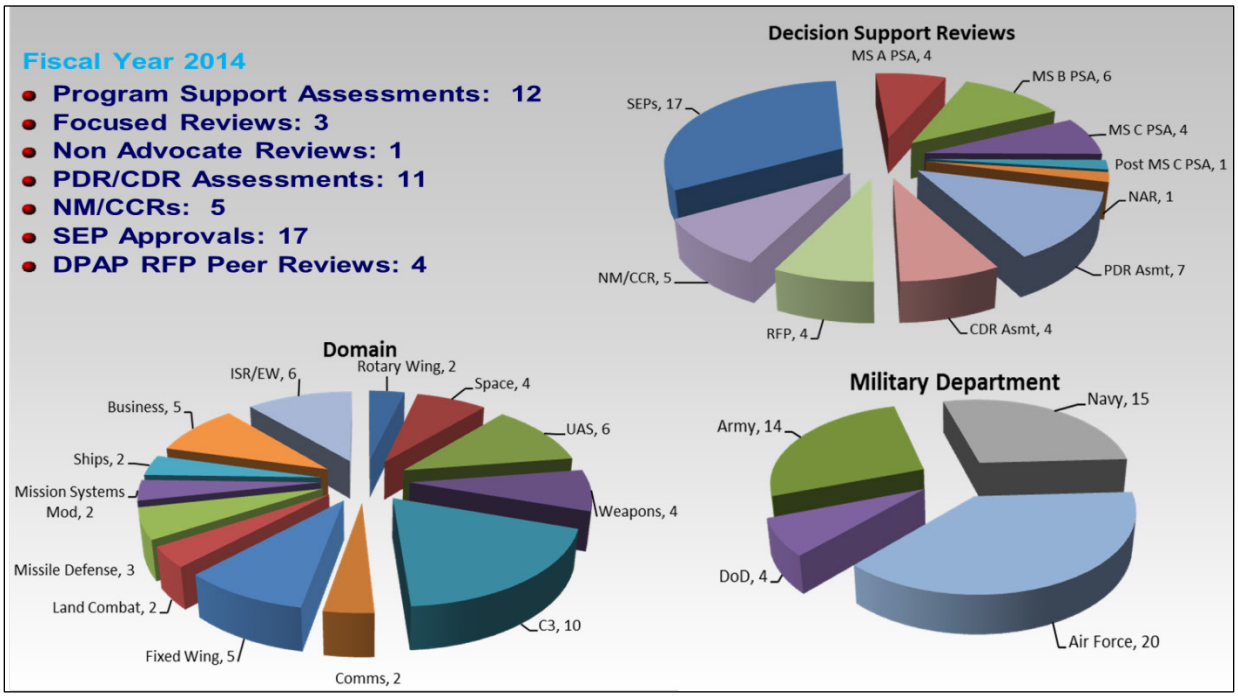

Figure 2-2. FY 2014 DASD(SE) Assessments by Domain and Military Department

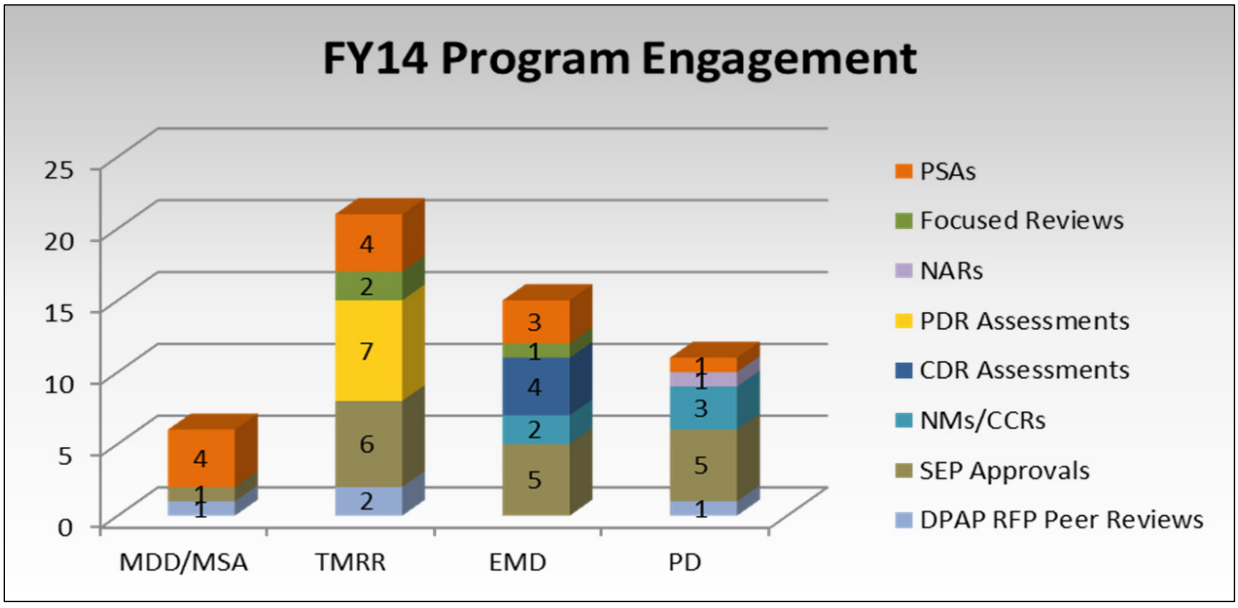

Figure 2-3. FY 2014 DASD(SE) Assessments by Acquisition Phase

2.2.4.1 Defense Acquisition Program Support (DAPS) Methodology

DASD(SE) developed and employs the DAPS methodology to assess program planning and execution during PSAs and other technical reviews. First published in October 2004, the methodology is now in working version 3.02. DASD(SE) revises the document to align with current policy and plans to revise the methodology in FY 2015 to address updates to DoDI 5000.02.

The DAPS methodology provides a robust listing of programmatic and technical areas, sub-areas, factors, and assessment criteria, developed to be both broad in scope and sufficiently detailed to be applicable to programs of all types. DASD(SE) derived the methodology from numerous sources in the defense acquisition community to reflect the knowledge and acquisition experience from both Government and industry. For each assessment, DASD(SE) adapts the methodology to a program's current development phase and conditions.

DASD(SE) uses the DAPS methodology to structure the scope and focus of assessment areas to ensure a consistent approach across programs and to ensure sufficient depth of review in relevant areas. Review teams analyze program documentation and conduct site visits to program offices and contractor facilities for interviews and discussion. PSA teams identify program strengths, weaknesses, risks, and issues, while assessing root causes as the basis for findings and recommendations. DASD(SE) briefs and adjudicates findings and recommendations with the program managers before finalizing the report, which is then provided to the program office, briefed internally within DASD(SE), and summarized at the OIPT. DASD(SE) captures relevant non-attributed results in a database for systemic analysis (see 2.2.5) to inform the assessment process and future DoD policy and guidance.

DASD(SE) developed an automated DAPS tool to facilitate review preparation and enable consistency in team assessments and reporting. DASD(SE) has completed the beta version verification of the tool on two PSAs and is using the approved version of the tool for all PSAs. DASD(SE) will continue to improve this tool in FY 2015.

2.2.4.2 Schedule Risk Assessment

DASD(SE) assesses a program's IMS (Integrated Master Schedule) and supporting processes to evaluate the quality, feasibility, and execution of the program schedule. Throughout the acquisition life cycle, DASD(SE) conducts recurring 14-point schedule assessments to inform recommendations to PMOs to enhance program planning, development, and execution processes. During program engagements, DASD(SE) performs in-depth schedule analysis to evaluate schedule processes, risks, and viability. DASD(SE) has extended the schedule focus to include schedule risk assessments, enabling the PMO to validate schedule concerns and implement early mitigation activities. Schedule assessments have resulted in improvements in the quality of schedules and in the PMOs' ability to use the IMS as a program management tool in making decisions.

2.2.4.3 Software Assessment

During program engagements, DASD(SE) assesses software acquisition and development and conducts quantitative software engineering analysis. DASD(SE) focuses on software early in the

acquisition life cycle to ensure the software requirements and functions trace to the operational context (e.g., Concept of Operations, mission threads, architecture) and to ensure programs conduct critical technical activities and manage software risk.

DASD(SE) uses acquirer, developer, and supplier software metrics to assess software performance and progress, schedule feasibility, and software maturity. DASD(SE) collects and tracks software metrics to enable benchmarking of programs' software schedule duration, performance, staffing, and quality across all DoD warfare domains. DASD(SE) compares planned program software development against DoD and industry trend lines and against its own historical performance to highlight statistical outliers and risk. DASD(SE) mentors programs on various software engineering concepts, including software acquisition and development planning; software estimation; Agile software development; performance measures; and monitoring software quality/maturity to inform software delivery risk to the user. Finally, DASD(SE) supports outreach activities to discuss DoD software challenges and lessons learned.

During FY 2014, through program engagements such as PSAs, Software Focused Reviews, and SETRs (e.g., PDRs/CDRs), DASD(SE) identified issues in the areas of:

- Agile software development
- Technical reviews for incremental software development
- Software staffing
- Software schedule planning and management
- Software metrics and related quantitative management
- Software integration and end-to-end performance
- Software requirements management
- Software maturity

As a result of the program engagements, DASD(SE) provided the following software engineering support to acquisition programs:

- Mentored and assisted program managers in developing software metrics and tracking plans.
- Assessed programs' software development schedule feasibility; assisted programs in establishing realistic schedules and in improving software build plans and release planning.
- Assessed programs' software maturity and risk at key milestones; assisted programs in forecasting expected defects and burn-down rate based on historical performance.
- Assessed programs' readiness for operational test events based on software maturity.

2.2.5 Systemic Root Cause Analysis

DASD(SE) performs SRCA of findings identified during PSAs, Focused Reviews, and Nunn-McCurdy reviews. Through SRCA, DASD(SE) identifies opportunities to improve acquisition performance through updates in policy, education, and effective systems engineering practices.

The FY 2014 SRCA results inform systems engineering-related areas including the DAG, Schedule Risk Assessments, the DAPS methodology, SEP guidance, reliability, metrics and benchmarking, and the Risk Management Guide for DoD Acquisition. DASD(SE) has analyzed the systemic findings with respect to domains, Service, Program Executive Office (PEO), prime contractor, acquisition phase, and specialty area (e.g., human capital, schedule, software) to identify trends and allow for focused and tailored feedback.

2.2.6 Defense Acquisition Executive Summary Reporting

USD(AT&L) requires quarterly DAES assessments of MDAP and MAIS program performance. Approximately one-third of the programs are reviewed each month of each quarter. The DAES assessments are documented in the OSD Defense Acquisition Management Information Retrieval (DAMIR) repository each month.

DASD(SE) assesses programs in five areas: Program Schedule, System Performance, Management, Interoperability/Information Security, and Production. This equates to approximately 440 assessments each quarter. The exact number of assessments fluctuates as programs are continually added or removed from the reporting list, and some areas within specific programs are exempt from reporting. In FY 2014, DASD(SE) performed 1,705 assessments. OSD offices with oversight in designated DAES assessment areas recommend programs for a more detailed DAES review by USD(AT&L). DASD(SE) participated in the DAES review of 35 (24 MDAP and 11 MAIS) programs in FY 2014.

2.3 Workforce

DASD(SE) is the Functional Leader for the ENG (Engineering) and PQM (Production, Quality, and Manufacturing) acquisition workforce career fields and continues to ensure the Department's acquisition engineering workforce is trained, certified, and qualified to meet the Department's complex engineering requirements. As the Functional Leader, DASD(SE) provides career field advocacy, oversight, and guidance to the defense acquisition workforce personnel responsible for providing systems engineering, production, manufacturing, and quality expertise. In FY 2014, DASD(SE) led and supported workforce development initiatives to improve the professionalism and technical excellence of the acquisition engineering workforce.

2.3.1 DAWIA Career Fields

DASD(SE) oversees the DAU courses for the ENG and PQM career fields, ensuring the certification standards are appropriate, technically accurate, and consistent with current policy and guidance.

DAU Curriculum. DASD(SE) collaborated with DAU to ensure the technical currency of the ENG and PQM curriculum. This year, DASD(SE) updated the curriculums to reflect changes resulting from the interim DoDI 5000.02, the updated DAG Chapter 4, the updated ENG and PQM competency models, and Better Buying Power initiatives. During this curriculum update, the "SYS" courses also will be renamed with an "ENG" nomenclature, to reflect the FY 2013 renaming of the Systems Planning, Research, Development, and Engineering (SPRDE) career field to ENG. The

updated ENG courses will be fully deployed in FY 2015. DAU started updating the PQM courses and will deploy them in FY 2015/FY 2016. The affected ENG and PQM courses are as follows:

- ENG 102, "Fundamentals of Systems Engineering," replacing SYS 101
- ENG 204, "Applied Systems Engineering in Defense Acquisition, Part I," replacing SYS 202
- ENG 205, "Applied Systems Engineering in Defense Acquisition, Part II," replacing SYS 203
- ENG 301, "Leadership in Engineering Defense Systems," replacing SYS 302
- PQM 101, "Production, Quality, and Manufacturing Fundamentals"
- PQM 201, "Intermediate Production, Quality, and Manufacturing"
- PQM 301, "Advanced Production, Quality, and Manufacturing"

In addition, DASD(SE) supports the development of specialty engineering training specific to acquisition workforce members working in R&M engineering and program protection planning.

DASD(SE) is engaging with DAU in the following efforts:

After conducting an analysis of the R&M learning objectives within the Engineering functional area, DASD(SE) determined the engineering community needed additional R&M engineering courseware to address the requisite competencies. DAU, with technical support from the office of DASD(SE), began updating CLE 301, "R&M Engineering," and developing two new courses. The first new course will guide students through the development process for a RAM-C Rationale Report. A second new course, "Advanced R&M Topics," is intended to provide R&M practitioners with in-depth training on specific R&M areas such as R&M planning, design support, monitoring, technical reviews, and test and evaluation.

Under the sponsorship of DASD(SE), DAU also began developing two new courses on program protection. ENG 160, "Program Protection Planning Awareness," will be a distance learning course for the acquisition workforce to provide them with knowledge of system security engineering principles and policies. The course will provide program protection awareness training on threats, vulnerabilities, risks, cost-benefit risk trade-offs, and required mitigations for DoD systems. It will also address supply chain risk management and the need for acquisition program protection documents such as the PPP, Cybersecurity Strategy, and Anti-Tamper Plan.

ENG 260, "Program Protection Planning for Practitioners," will provide system security engineering workforce members with an opportunity to learn and apply protection planning processes through guided exercises. Course exercises will be based on fictional but realistic acquisition programs with several integrated systems. Students will carry out program protection planning for the protection of CPI and mission-critical functions. Students will identify, prevent, and respond to program protection threats and vulnerabilities across the acquisition life cycle. The course will provide preferred practices and steps for integrating program protection with security specialties, including cybersecurity, hardware assurance, software assurance, and anti-tamper.

2.3.2 Acquisition Workforce Initiatives

The ENG acquisition workforce continues to face the challenge that a large portion will be eligible to retire within 10 years; as of the end of FY 2014, 48.4 percent of the ENG acquisition workforce fall into this category. Furthermore, the ENG acquisition workforce in the mid-career range, which would be replacing this outgoing systems engineering and analyst experience, contains the smallest percentage of this workforce. To address this challenge, in FY 2014 DASD(SE) supported workforce development initiatives to build the capabilities and capacity of the ENG acquisition workforce.

In support of Better Buying Power initiatives, DASD(SE) collaborated with other acquisition career field functional leaders to develop and deploy a KLP (Key Leadership Position) qualification process. The DASD(SE) focus is to create a pool of candidates to potentially serve as Chief Engineers/Lead Systems Engineers (CE/LSE) on MDAPs and MAIS programs. In support of the KLP qualification process, DASD(SE) updated the CE/LSE competency-based functional-specific requirements to supplement the common cross-functional requirements issued by USD(AT&L). These functional-specific requirements are unique to the demands of a CE/LSE and provide depth to the cross-functional requirements. Personnel will be qualified through a joint board of Component functional executives called a Qualification Board.

DASD(SE) directed the SERC (Systems Engineering Research Center), as part of its Human Capital Portfolio, to conduct research to develop and improve the Department's engineering workforce. The SERC conducted several projects in FY 2014:

- The Helix project is a multiyear longitudinal study designed to understand the systems engineering workforce to best leverage engineering talent.
- The Experience Accelerator project is investigating whether simulation technology can be used to effectively compress the learning time of a systems engineer as compared with learning naturally obtained on the job.
- The Systems Engineering Technical Leadership project is formulating three courses to provide technical leadership insights at the systems, business, and enterprise levels.
- The SEEK project began in the summer of 2014 and aims to support DAU instruction by developing case studies that capture systems engineering and acquisition lessons learned.

DASD(SE) will continue to advance these workforce development initiatives and explore new initiatives in collaboration with the Military Departments to maintain the capacity, capability, and competence of the Department's engineering workforce.

3 DASD(SE) ASSESSMENTS OF MILITARY DEPARTMENTS

3.1 Assessment Overview

DASD(SE) requested that each Military Department (Army, Navy, and Air Force) submit a systems engineering self-assessment to be included in this Systems Engineering Annual Report to Congress. DASD(SE) asked each Department to describe its overall systems engineering strategy, to include priorities, milestones and measures of success. The Military Departments were also asked to provide an update of FY 2014 progress and FY 2015 plans to improve their organization's systems engineering capability, in accordance with the reporting requirements in Pub. L. 111-23, Title I, section 102(b), as amended by Pub. L. 111-383, Title VIII, section 813(a):

> The service acquisition executive of each military department and each Defense Agency with responsibility for a major defense acquisition program shall develop and implement plans to ensure the military department or Defense Agency concerned has provided appropriate resources for…
>
> > (B) Development planning and systems engineering organizations with adequate numbers of trained personnel in order to—
> >
> > > (i) support key requirements, acquisition, and budget decisions made for each major defense acquisition program prior to Milestone A approval and Milestone B approval through a rigorous systems analysis and systems engineering process;
> >
> > > (ii) include a robust program for improving reliability, availability, maintainability, and sustainability as an integral part of design and development within the systems engineering master plan for each major defense acquisition program; and
> >
> > > (iii) identify systems engineering requirements, including reliability, availability, maintainability, and lifecycle management and sustainability requirements, during the Joint Capabilities Integration Development System process, and incorporate such systems engineering requirements into contract requirements for each major defense acquisition program.

The Military Departments were asked to describe workforce development initiatives for their systems engineering workforce and were asked to provide a discussion of additional authorities or resources needed to attract, develop, retain, and reward systems engineers. Due to continued interest from Congress in the size and capability of the systems engineering workforce, the Military Departments' reporting includes civilian and military personnel, and contracted systems engineering support.

The Departments of the Army, Navy, and Air Force systems engineering self-assessments are provided in their entirety in Appendices A though C, respectively. DASD(SE) used the self-assessments and met with the systems engineering leadership of each Military Department to review

their organizations and capabilities and to identify needed changes or improvements to their organizations' capabilities and policies in accordance with 10 U.S.C. 139(b).

3.2 Systems Engineering Strategy

The Military Departments implemented changes to organizations, policies, and practices to improve systems engineering in FY 2014. They demonstrated progress in meeting Department priorities and fulfilling strategic objectives and milestones, highlighting systems engineering contributions to achieving affordable programs, and improving program oversight.

The Department of the Army's System of Systems Engineering and Integration (SoSE&I) Directorate under the ASA(ALT), provided overarching management and oversight authority for SoS engineering policies and processes. The SoSE&I Directorate executed Army-level systems engineering in support of the acquisition process with emphasis on SoS engineering and integration, cross-cutting capabilities (CCC), cyber defense, SoS-focused test and evaluation, and SoS capability fielding. The SoSE&I Directorate made several significant accomplishments in FY 2014, including the signed Common Operating Environment (COE) Execute Order, which assigned roles and responsibilities for executing COE tasks, directed the annual publication of the COE Integrated Systems Engineering Plan, and provided an Integrated Master Schedule. In addition, the Army PEOs successfully implemented affordability efforts with certain programs, resulting in estimated savings of up to $40 million over 5 years. For instance, PEO Simulation, Training and Instrumentation (STRI) reduced the cost of producing and sustaining two independent simulators by using common architectures and components for each training device, which also demonstrated improved resource allocation, interoperability, acquisition cycle time, and synchronized training methodologies.

The Deputy Assistant Secretary of the Navy for Research, Development, Test and Evaluation (DASN(RDT&E)) continued to govern Naval Systems Command (SYSCOM) systems engineering processes and established standard systems engineering processes across the Naval SYSCOMs in FY 2014. The Navy's Systems Engineering Streamlining Initiative reduced and eliminated redundant and non-value-added Department of the Navy-required systems engineering-related technical plans and activities where possible. For instance, the Navy delegated its Service approval of the SEPs to the Naval SYSCOMs, consistent with Secretary of the Navy Instruction 5400.15 "Department of the Navy Research and Development, Acquisition, Associated Life-Cycle Management, and Logistics Responsibilities and Accountability," which assigned technical authority to the SYSCOMs. The Navy achieved further progress in systems engineering-related policy by updating and publishing the Engineering and Technical Authority policy and obtaining Naval SYSCOM concurrences for the Technical Standards policy. In addition, the Navy made the integration of critical specialty engineering analyses a key systems engineering focus area to identify and assess risk across programs and formulate common mitigation strategies.

In FY 2014, the Air Force formally designated the Deputy Assistant Secretary of the Air Force (Science, Technology, and Engineering) (SAF/AQR) as the Air Force Chief Engineer and Technical Authority; this was accomplished through an Assistant Secretary of the Air Force for Acquisition (SAF/AQ) memo to the Air Force PEOs that was integrated into the Headquarters Air Force Mission Directive 1-10 and Air Force Instruction (AFI) 63-101/20-101, Integrated Life Cycle Management. The Air Force also established a PEO Lead Systems Engineer Roundtable to periodically discuss

issues of interest, with the first two meetings focused on the Air Force Engineering Enterprise, technical authority, and other items. In FY 2014, the Secretary of the Air Force and the Chief of Staff of the Air Force approved the 10-year Air Force Engineering Enterprise Strategic Plan for 2014-2024, which provides the strategic vision and governance structure for the entire Air Force Engineering Enterprise. In addition, SAF/AQ established "Own the Technical Baseline" (OTB) as a priority to inform program decision making by having the appropriate knowledge of the technical baseline with the appropriate level of technical expertise.

DASD(SE) recommends the Military Departments continue improving their systems engineering capabilities by emphasizing systems engineering standard practices as codified in policy and guidance. The interim DoDI 5000.02 emphasizes embedding systems engineering in program planning and execution to support the entire system life cycle. A FY 2015 challenge for the Military Departments will be their ability to execute strategies for improving technical capabilities in the current resource-constrained environment.

3.3 Development Planning and Early Systems Engineering

In FY 2014, the Military Departments implemented development planning and early systems engineering, and several of their acquisition organizations actively participated in the DASD(SE)-chaired Development Planning Working Group. They were proactive in collaborating in the working group to develop a process description for integrating science and technology efforts with associated Warfighter/combat developer and acquisition community activities.

The Army's SoSE&I organization continued to expand its engagements with PEO/PM early program activities. In a step toward an enterprise systems engineering practice, RDECOM is developing a systems engineering trade-off analysis methodology that enables the research and development community to assess a large set of alternatives across competing objectives of performance, life cycle costs, and development schedules. The emerging methodology is called the Decision Centric Systems Engineering, formerly the Decision Model Based Systems Engineering. The Army's PEO/PM efforts to develop and implement a set of bottom-up initiatives (e.g., Soldier Modernization Process, Independent Assessment Teams, etc.) should continue to progress to a more robust, enterprise-level development planning capability.

In FY 2014, the Navy continued transforming its Naval Systems Engineering Guidebook (NSEG) from a limited, hard copy format to an online interactive guide, improving it as a resource for systems engineers. DASN(RDT&E) and the Naval Systems Engineering Stakeholders Group collaborated during the launch of the online NSEG to better align it with early systems engineering activities and critical specialty engineering policy and guidance.

The Air Force continued its efforts to streamline its systems engineering policy and updated Air Force Policy Directive (AFPD) 16-10, Modeling and Simulation. Early technical planning is paying off in several areas, such as spectrum certification. Of particular note in FY 2014 are Air Force efficiencies identified through Cost versus Capability Analysis (CCA) on several pilot programs. The Air Force successfully used the CCA process both before an ICD is validated and continually in the MSA phase to identify affordable and viable military concepts and to estimate the life cycle costs

and operational effectiveness of potential concepts. These successes have led to the decision to institutionalize the CCA practice throughout the Air Force.

DASD(SE) recommends the Military Departments continue their progress in implementing rigorous systems engineering during the early acquisition phases. For instance, programs may consider using their organic Government technical staff to conduct early design, development, and specification work to create the solid technical foundation needed to further develop and acquire a materiel capability.

3.4 Reliability and Maintainability

DTM 11-003, "Reliability Analysis, Planning, Tracking, and Reporting," was incorporated into the issuance of the interim DoDI 5000.02 in November 2013. The DoDI requires each Military Department to formulate a comprehensive R&M program for all MDAPs, which includes mandatory engineering activities as well as key systems engineering planning for R&M. In FY 2014, the Military Departments, through acquisition policy, training, and workforce development activities, continued to build on the progress made in revitalizing R&M engineering.

The Army continues active engagement with the R&M communities within the Service and the DoD. This includes continuing to host an R&M Working Group that includes senior participants across the Army to conduct R&M assessments of Army MDAPs and collect lessons learned. In addition, the Army established a Reliability Systemic Working Group that supports the T&E Efficiencies Task Force. In the area of workforce development, the Army continues to leverage the Specialty Engineering Education and Training program (SE2T), which provides training on reliability, quality, production, manufacturing, and T&E. The Army Center for Reliability Growth continues to support Army R&M engineering activities in the areas of policy, guidance, standards, methods, tools, and training. The Army also continued developing the Army R&M policy, AR 702-3, which has been submitted for publication.

The Navy continues to require programs at all ACAT levels to document their R&M engineering planning in their SEPs. DASN(RDT&E) R&M engineering staff worked with individual SYSCOMs on R&M activities such as supporting the DAES reliability growth reporting. In addition, the Navy serves as the preparing activity for most of the R&M DIDs (Data Item Descriptions) and is collaborating with OSD and other Services to update the DIDs. For training needs, several legacy R&M courses have been updated and continue to be deployed to SYSCOMs and Warfare Centers. DASN(RDT&E) R&M is working with Naval programs that were established before the issuance of the DTM 11-003 to ensure an effective failure reporting, analysis, and corrective action system (FRACAS) process is in place.

The Air Force continues to implement R&M policy and guidance. With the issuance of the interim DoDI 5000.02, the Air Force is updating its internal R&M policies such as AFI21-118, "Improving Air and Space Equipment Reliability and Maintainability," and AFI 63-101/20-101, "Integrated Life Cycle Management." Coupled with the policy update, the AF is also working to convert the Air Force RAM Guidebook into an Air Force Pamphlet. In addition, the Air Force Life Cycle Management Center (AFLCMC) continues to integrate R&M expertise across the Department through its R&M Working Group, which provides a collaborative community of practice for R&M

leadership in the Air Force. To improve the R&M performance of Air Force acquisition programs, AFLCMC initiated an annual R&M Programs Health Assessment aimed at providing insight on the health of a program's processes, products, and expertise. At the practitioner level, AFLCMC has created Individual Development Plans to ensure that R&M trainees receive the appropriate specialized education needed to support R&M requirements for Air Force acquisition programs. Finally, the Air Force has implemented a Certification and Accreditation process for a standard suite of software tools for R&M engineering.

DASD(SE) recognizes the steps that each Military Department has taken to reenergize the R&M engineering discipline. Each Military Department continues to make strides in creating a network of policies, practices, and tools to ensure R&M is considered upfront. DASD(SE) also recognizes that the Military Departments must continue to engage strategically to ensure a workforce with adequate capacity and capability will be in place to meet future acquisition demands.

3.5 Systems Engineering in JCIDS

During FY 2014, the Army made progress in establishing closer coordination among Army communities involved with the JCIDS development process, overcoming challenges the Army identified last year in applying systems engineering talent to JCIDS activities before Milestone A. The SoSE&I organization established the Army Integrated Requirements Framework process to provide a proof of concept to conduct analysis, provide findings regarding the commonality of requirements across requirements documents, and describe a proposed Agile Requirements Management Process to enable execution of SoS requirements. Ultimately this should allow the Army to influence structure and development of requirements to match its strategies and SoS objectives.

In FY 2014, the Department of the Navy SYSCOM systems engineers placed more emphasis on architectures and mission engineering in order to provide the necessary technical expertise to requirements developers early in the acquisition process. For example, NAVAIR created a Mission Engineering and Analysis Department and an Enterprise Team to implement Integration and Interoperability as an organizational element within the SYSCOM. NAVAIR believes an improved mission-level understanding of systems integration design issues will facilitate the delivery of Integrated Warfighting Capability at reduced cost.

The Air Force is continuing to strengthen its early systems engineering influence in JCIDS. For instance, it revised AFI 10-601, "Operational Capability Requirements Development," which ties the Concept Characterization and Technical Description documents to AoA study planning. In FY 2014 SAF/AQR used a Pre-planning Team to review requirements documents for affordability and technical feasibility in support of the Air Force Requirements Review Group. SAF/AQR also sponsored the National Research Council's Air Force Studies Board at the National Academy of Sciences to conduct an independent review and assessment of the Air Force's approach and execution of development planning. (This report, "Development Planning: A Strategic Approach to Future Air Force Capabilities," was released in FY 2015.)

The interim DoDI 5000.02 issued in early FY 2014 encourages closer coordination among JCIDS, systems engineering, and contract actions. DASD(SE) recommends continued effort by the Military Departments to support the JCIDS process using their applied systems engineering talent.

3.6 Military Department-Identified Areas of Progress and Improvement

The Military Departments provided evidence of their progress against the areas of improvement from their FY 2013 self-assessment and new areas where they chose to report their department's improved systems engineering capability. They identified and provided plans for addressing FY 2015 priority areas to improve the systems engineering and development planning capability of their organization.

The Army's FY 2014 focus areas for progress and improvement were the System of Systems Engineering Management Plan (SoSEMP), Always On-On Demand (AO-OD), systems engineering capability optimization, and other processes and tools for SoS. In FY 2014, the SoSEMP, which documents the SoS engineering process and takes a product-centric approach by defining the output of each SoS engineering process, was further refined and distributed for review. AO-OD was integrated with the Joint Staff J6 Bold Quest 14.2 event, conducting an On-Demand Environment Network and Net-Centric Systems Event 2014, which demonstrated substantial cost savings, cost avoidance, and value-added possibilities, as the sheer size of the scenario would have been prohibitively expensive otherwise. As part of the systems engineering capability optimization, the Army performed the Network Capability Review (NCR) to support resourcing decisions within the Mission Command Portfolio where NCR analysis determined a "good enough" tactical architecture that will influence the specific configurations of future capability sets.

The Navy accomplished several major milestones in systems engineering streamlining and improvement in FY 2014. DASN(RDT&E) established the SE CONNECTS forum, a continuous communication forum among DASN(RDT&E), programs, systems engineers, and Naval Warfare and Systems Center engineering to address new requirements, policy, guidance, and best practices. Updates to the SETR checklist for several critical specialty engineering areas were published on the Navy Systems Engineering Resource Center site for easy access and use by programs and systems engineers. The Navy contributed to the development of DoD, Naval, systems engineering, and configuration management military addenda for industrial systems engineering standards and guidance.

The Air Force identified several areas of progress and improvement in FY 2014, including corrosion, human systems integration (HSI), standardization, and ESOH. The Air Force released the new Corrosion Strategic Plan to better align with the DoD corrosion strategy and to provide a roadmap for continued success. In FY 2014, an additional nine high-performance team action plans for HSI were completed, the AFLCMC established and filled a special advisor for HSI, and SAF/AQ published Air Force Pamphlet 63-128 "Guide to Integrated Life Cycle Management" which includes a new chapter on HSI. The Air Force continued to lead the three joint Service working groups developing non-government standards for systems engineering, technical reviews and audits, and manufacturing management. As part of ESOH efforts, the Air Force approved a Space and Missile Systems Center (SMC) instruction for space debris mitigation and reporting, and developed a compliance roadmap briefing to achieve full compliance with the National Space policy by 2020.

DASD(SE) commends the Military Departments on their continuing efforts to address planned areas for improvement. The challenge for FY 2015 will be to sustain and complete efforts with constrained resources.

3.7 Workforce Initiatives

3.7.1 Military Department Workforce Initiatives

The Army, Navy, and Air Force have remained focused on improving their systems engineering and development planning workforces in FY 2014. Each Military Department has continued the use of the Defense Acquisition Workforce Development Fund (DAWDF) (10 U.S.C. 1705) as well as the implementation of tools and methods such as competency models, internal training courses and programs, and partnerships with universities to grow and enhance the systems engineering workforce. This section provides a summary of the efforts taken by the Military Departments in FY 2014 and a look forward into FY 2015.

In FY 2014, the Army focused on workforce development efforts to support its acquisition systems engineering workforce. One such effort was the Army Materiel Command's establishment of a proponency office to facilitate improved communication with the systems engineering workforce regarding the Army's engineering workforce development and utilization strategy. The Army also focused on providing educational and training opportunities to develop the capabilities and capacity of its systems engineering workforce. In partnership with DAU, the Army has expanded its SE2T (Specialty Engineering Education and Training) program by adding courses tailored to rebuild competencies in key specialty engineering areas. Furthermore, the Army has maintained relationships with a consortium of universities and entered its final year of partnership with the Naval Postgraduate School (NPS). The Army continues to provide multiple rotational/developmental assignments for the systems engineering workforce members to gain operational experience in multiple organizations, and broaden their breadth of knowledge.

A wide range of Army PEO/PM efforts support recruitment, development, and retention of a qualified and certified acquisition workforce. For example, PEO STRI took advantage of the Acquisition Academy (A2) program to screen and recruit qualified candidates; to date, A2 has successfully recruited 23 high-performing new engineering graduates and is experiencing an 83 percent retention rate for systems engineering positions. PEO Aviation partnered with the Aviation and Missile Research, Development, and Engineering Center (AMRDEC) Systems Engineering Division to rotate and transition engineering support to ensure matrixed systems engineers gain exposure and proficiency across the product life cycle. In addition, PEO Aviation, PM Aviation Systems continued the "Building the SE Bench" succession planning program, by using Chief Engineers to mentor junior engineers.

The Navy remains focused on rebuilding its acquisition workforce. In FY 2014, the Navy continued to support implementation of the USD(AT&L)'s KLP policy and oversee the SYSCOMs' identification of a cadre of employees qualified for future KLP opportunities. In addition, to prepare its technical workforce for leadership roles, DASN(RDT&E) sponsored students to participate in the Joint Executive Engineering Management distance learning master's degree program offered by the

NPS and the Massachusetts Institute of Technology's Educational Consortium for Product Development Leadership in the 21st Century.

To support its larger systems engineering acquisition workforce, the Navy partnered with NPS and a consortium of universities to offer programs for those seeking degrees as well as those looking to increase their job-specific knowledge. The NPS Master of Science in Systems Engineering program continued to provide advanced technical degrees for the Navy's technical workforce. NPS also offered a Lead Systems Integrator (LSI) certificate to prepare engineers to assume positions as LSIs. In FY 2014, the Navy partnered with DAU to begin development of a "Critical Thinking for Technical Leaders" course and also continued development of its Systems Engineering Career Competency Model, which highlights an aggregate of the core technical and general knowledge, skills, and abilities for systems engineers, to strengthen the technical workforce.

In FY 2014, the Air Force focused on recruitment, development, and retention initiatives to support its acquisition workforce. The Air Force expanded its use of social media as part of branding and enterprise recruiting strategies for acquiring talent. In addition, the Air Force used DAWDF funds to support targeted retention incentives, civilian tuition assistance, and professional education courses at the Air Force Institute of Technology. Under the oversight of the Engineering Enterprise Strategic Plan working group, the Air Force developed a systems engineering skills taxonomy aligned with its draft Engineering Enterprise Strategic Plan Roadmap. The taxonomy was developed for the engineering enterprise across the Air Force Materiel Command and Air Force Space Command.

The Air Force also focused on recruiting and developing its systems engineering workforce. Based on an Air Force science, technology, engineering, and mathematics (STEM) workforce study completed in 2013, the Air Force emphasized hiring entry-level employees by supporting student hire programs and expanding the application of Acquisition Personnel Demonstration Program policies to a larger number of Air Force organizations. As a result, the Air Force found noticeable improvements in the age distribution of the workforce under 40 years old. In addition, the Air Force released Bright Horizons 2.0, an update to the SAF/AQ strategy for attracting and maintaining employees for the STEM workforce.

3.7.2 Systems Engineering Workforce Resourcing

The Army has been able to make effective use of DAWDF to recruit, hire, train, develop, and retain its acquisition workforce. The Navy reported that its budget is sufficient to support planned programs, but it is losing systems engineering experience due to retirement. To mitigate the challenges of losing retiring senior systems engineers, the Navy's individual SYSCOMs are streamlining processes, implementing workforce development tools, and mentoring systems engineers. The Air Force reports that the long-term impacts of FY 2014 financial constraints are inconclusive at this time; however, it believes stringent budget constraints may affect both succession planning and retention. The Air Force is addressing these challenges through use of science, mathematics, and research transformation (SMART) programs and continued use of DAWDF to support workforce replenishment and knowledge transfer.

3.7.3 Total DoD Systems Engineering Workforce

Table 3-1 shows workforce data for each Military Department and DASD(SE), including the total number of Government (civilian and military) acquisition-coded personnel in the ENG career field for FY 2005 through FY 2014 and the planned growth of the personnel from FY 2015 through FY 2019. The total number of ENG personnel is projected to be 37,321 by the end of FY 2019, a decline of 181 since the end of FY 2013. Overall, the total ENG acquisition workforce in the Military Departments decreased by 0.6 percent between FY 2013 and FY 2014.

The Army acquisition workforce assigned to ENG positions decreased from 9,374 in FY 2013 to 8,986 in FY 2014, a reduction of 388. The Army attributes this decrease to budgetary impacts and reports that its entire acquisition workforce is experiencing a similar trend. ENG positions in the Army are projected to decrease to 8,698 in FY 2015 and to 8,696 in FY 2016. Army ENG position levels are projected to remain level thereafter into FY 2019.

The Navy acquisition workforce assigned to ENG positions increased from 19,589 in FY 2013 to 19,797 in FY 2014, an addition of 208, and this growth is projected to continue into FY 2015 due to SYSCOM priorities and available funding. However, from FY 2016 to FY 2019, the Navy projects a steady decline to 19,679 ENG personnel by the end of FY 2019. The Navy identified that this decline in numbers is influenced by the challenges of hiring freezes and allocation of workforce reductions. In previous reports, the Navy submissions projected higher ENG personnel numbers into FY 2019.

The Air Force acquisition workforce assigned to ENG positions decreased from 8,518 in FY 2013 to 8,474 in FY 2014, a reduction of 44. The Air Force projects a continued decline into FY 2019, resulting in 8,203 ENG personnel by the end of FY 2019. The Air Force attributes this decline to the allocation of modest workforce reductions and reallocation of authorizations. In previous reports, the Air Force submissions projected constant ENG personnel numbers into FY 2019.

Table 3-1. Systems Engineering Workforce in the DoD
Reported by Military Department Systems Engineers and DASD(SE)

Total Number of Civilian and Military Acquisition-ENG Personnel									
Fiscal Year	Year Ending	US Army		US Navy[1]		US Air Force		DASD(SE)	
FY05	30-Sep-05	11,138		16,886		6,505		13	
FY06	30-Sep-06	11,964		16,688		6,237		14	
FY07	30-Sep-07	11,050		16,804		6,162		13	
FY08	30-Sep-08	10,769		16,576		6,429		14	
FY09	30-Sep-09	10,208		18,085		7,197		13	
FY10	30-Sep-10	10,647		19,270		7,625		14	
FY11	30-Sep-11	10,071		19,325		8,514		23	
FY12	30-Sep-12	9,812		19,498		8,649		23	
FY13	30-Sep-13	9,374		19,589		8,518		21	
FY14	30-Sep-14	8,986[2]		19,797		8,475[3]		22	
		Planned Growth	Projected End Strength	Planned Growth	Projected End Strength	Planned Growth	Projected End Strength	Planned Growth	Projected End Strength
FY15	30-Sep-15	-288	8,698	323	20,120	180	8,690	0	22
FY16	30-Sep-16	-2	8,696	-81	20,039	-48	8,642	0	22
FY17	30-Sep-17	0	8,696	-111	19,928	-92	8,550	0	22
FY18	30-Sep-18	0	8,696	-199	19,729	-88	8,462	0	22
FY19	30-Sep-19	0	8,696	-50	19,679	-17	8,445	0	22

Table 3-2 summarizes the contracted systems engineering support delivered to the Military Departments during FY 2013. This data was reported to Congress by DoD in an effort to improve visibility into and accountability of contracted services in accordance with 10 U.S.C. 2330a. The DoD Inventory of Contracts for Services reflects input from the Military Departments.[4]

[1] U.S. Navy numbers reflect Department of Navy, including both U.S. Navy and U.S. Marine Corps.
U.S. Navy ENG personnel reflect employees on board at end of each fiscal year, including DAWDF-funded employees. Source: Director, Acquisition Career Management (DACM) Management Information System (MIS).
U.S. Navy planned growth for FY15 is calculated here as the difference between projected end strength for FY15 and ENG personnel for FY14, which includes a small decrease from PB14 FY14 workforce requirements. The remaining difference is made of small changes between program, budget, and execution cycles, and any personnel vacancies at FY14 year-end.
U.S. Navy planned growth for FY16-19 is the difference in projected end strength from the previous fiscal year.
U.S. Navy projected end strength reflects workforce requirements plus planned DAWDF-funded workforce.
Sources: President's Budget FY15 Exhibit 23 and Department of Navy DAWDF Hiring Plan."
[2] U.S. Army FY14 to 2019 total acquisition-ENG personnel numbers reported differ from October 2014 PB-23 Exhibit submission because the PB-23 reported numbers for the ENG and the S&T Manager acquisition career fields combine, whereas the reported value above has been updated to include only the ENG career field.
[3] U.S. Air Force planned growth and projected end strength numbers are based on FY16 PB-23 Acquisition and Technology Workforce as of December 2014.
[4] Source: Defense Procurement and Acquisition Policy (DPAP) website http://www.acq.osd.mil/dpap/cpic/cp/acquisition_of_services_policy.html.

The data was extracted from the inventory database using the following Product Service Codes[5, 6] to denote systems engineering effort.

- R414 (Support-Professional: Systems Engineering Services)
- R421 (Support-Professional: Technical Assistance)
- R425 (Support-Professional: Engineering/Technical)

Table 3-2. Contracted Systems Engineering Support to the Military Departments as Reported by DoD to Congress

Total Number of Non-Government Systems Engineering Support (FTE)				
Fiscal Year	**Year Ending**	**US Army**	**US Navy**	**US Air Force**
FY12	30-Sep-12	13,033	16,416	10,547
FY13	30-Sep-13	16,130	16,738	10,186

This summary reflects the latest information available as of publication of this annual report; FY 2014 contracted services data will not be provided to Congress until mid-2015 in accordance with the requirements of 10 U.S.C 235 and 2330a.

These numbers are based on product service codes and do not provide position-specific information such as acquisition job functions that might confirm that these full-time equivalents (FTE) reflect high-value systems engineering support. These numbers also may represent positions supporting research and development, test and evaluation, or other areas. In addition, selection of product service codes occurs locally at the individual contract level and may result in differing interpretation of contract work content across the Military Departments and activities. Although contractors are encouraged to parse contract task orders to reflect multiple functions (i.e., product service codes), this requirement is enforced at the local contracting activity and program level.

These numbers represent the best available approximation of the actual contracted systems engineering support level of effort. At this time, DASD(SE) does not have an estimate of the projected contracted systems engineering support.

[5] Source: U.S. General Services Administration Office of Government-wide Policy, Federal Procurement Data System Product and Service Codes Manual, August 2011 Edition (Effective Date: October 1, 2011), pp. 103, 217.
[6] Both R414 and R421 were end-dated and merged into PSC R425; legacy data retained effective October 2011.

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4 DASD(SE) PROGRAM ASSESSMENTS

The following sections include detailed assessments of 46 MDAPs, MAIS programs, and special interest programs that involved significant systems engineering activity in FY 2014. The assessments are organized by Military Department (Army, Navy, and Air Force) followed by DoD (joint) programs. Assessments are as of 4th quarter FY 2014.

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4.1 DASD(SE) Assessments of Army Programs

Assessments are as of 4th quarter FY 2014. This section includes summaries on the following 11 programs:

- Common Infrared Countermeasure (CIRCM)
- Excalibur M982E1 Precision Engagement Projectiles
- Ground Combat Vehicle (GCV)
- Guided Multiple Launch Rocket System–Alternative Warhead (GMLRS-AW)
- Integrated Fire Protection Capability, Increment 2–Intercept (IFPC Inc 2-I)
- Integrated Personnel and Pay System–Army, Increment I (IPPS-A Inc I)
- Improved Turbine Engine Program (ITEP)
- Joint Tactical Radio System Handheld, Manpack, and Small Form Fit (JTRS HMS)
- PATRIOT Advanced Capability-3 Missile Segment Enhancement (PAC-3 MSE)
- Paladin Integrated Management (PIM)
- Warfighter Information Network–Tactical, Increment 2 (WIN-T Inc 2)

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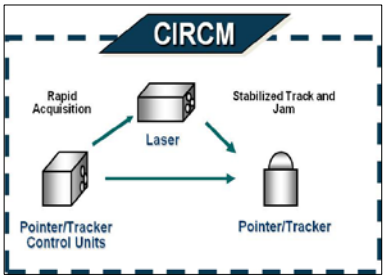
Common Infrared Countermeasure (CIRCM)



CIRCM Concept

Northrop Grumman Design

BAE Systems Design

Prime Contractor: Northrop Grumman; BAE Systems (competition)

Executive Summary: The CIRCM system replaces the Advanced Threat Infrared Countermeasure (ATIRCM) Quick Reaction Capability with a more reliable, lighter weight, and upgradable countermeasure system capable of meeting tri-Service rotary-wing and small fixed-wing requirements. CIRCM is a pre-MS B, ACAT ID program and has released an RFP to award the Engineering and Manufacturing Development (EMD) contract. CIRCM enhances the host aircraft's ability to survive, maneuver, and engage enemy forces in all environments, supporting joint force mission objectives. In FY 2014, DASD(SE) participated in a Defense Exportability Features feasibility study of both vendors and the Development RFP Release Point DAB. The Preliminary Design Review (PDR) assessments confirmed both contractor designs are beyond a PDR level of maturity and the program is ready to begin EMD at MS B in the 3rd quarter FY 2015.

Mission and System Description: CIRCM is an Army program to develop critical survivability against current and future infrared threats. Integrated in a host aircraft, the CIRCM provides the ability to prevent/mitigate adverse effects of missile attacks. CIRCM provides the sole acquisition of future laser-based countermeasure systems for all rotary-wing, tilt-rotor, and small fixed-wing aircraft across the DoD. CIRCM will be integrated with a passive missile warning system, an improved countermeasures dispenser, and advanced expendables. The use of a Modular Open Systems Approach (MOSA) provides flexibility to adapt to evolving technology and threats.

Systems Engineering Activities

- **Systems Engineering Plan (SEP)** – DASD(SE) approved the CIRCM SEP in December 2011 to support MS A. The program is fulfilling the objectives of the SEP without waivers or deviations. The Army is updating the SEP to support MS B in 3rd quarter FY 2015.
- **Requirements** – The JROC approved the CDD in May 2014. The System Performance Specification is traceable to the requirements of the CIRCM CDD and its predecessor, ATIRCM. CIRCM is required to be a lighter and more reliable system than ATIRCM.
- **Life Cycle Management** – The program is implementing USD(AT&L) Better Buying Power initiatives by carrying two contractors through MS B, and the program conducted an economic analysis to determine the possibility of continuing the competition beyond MS B. The program is using MOSA design to keep key elements of the pointer-tracker, laser, and processor separate to allow competitive selection during future upgrades.
- **Program Protection Plan (PPP)** – DASD(SE) reviewed the draft PPP in April 2014, and the program office updated the PPP to include appropriate language in the EMD RFP statement

Data as of 4th quarter FY 2014.

of work. The program is executing the processes documented in the draft PPP. The PPP will be revised to support MS B.

Assessments

- **DASD(SE) Assessments** – DASD(SE) performed separate PDR assessments for the two contractors competing during the Technology Maturation and Risk Reduction (TMRR) phase. DASD(SE) assessed the program as having a high likelihood of accomplishing its intended mission with no remedial action necessary to achieve the performance requirements in the APB. The program demonstrated an advanced level of maturity for a system at PDR. The contractors have delivered 100 percent of the design drawings, and both contractors delivered post-PDR hardware to the Government for further testing for score. DASD(SE) participated in a CIRCM Economic Analysis Assessment directed by USD(AT&L) to provide decision makers with the most effective CIRCM Acquisition Strategy.
  - In FY 2015, DASD(SE) will conduct a Program Support Assessment and provide recommendations to support the MS B decision in FY 2015.
- **Risk Assessment** – CIRCM is executing the risk management program documented in the approved SEP. Both contractors conducted trade studies in the areas of laser and pointer/tracker technology to reduce technical risk. The program is managing risks associated with Defense Exportability Features, system, and integration weight.
- **Performance** – The program has three KPPs and three KSAs. The CIRCM program is on track to meet the KPPs and KSAs, as well as the draft Technical Performance Measures (TPM) documented in the SEP, by the FRP decision. The TPMs in the SEP are specific enough to provide meaningful tracking through system development and will be tailored to the specific design selected. Both contractors have exceeded the expected level of design for this stage in the program and have provided five complete sets each of post-PDR prototypes to the Government for upcoming System Integration Laboratory testing.
- **Schedule** – The program completed a Development RFP Release Point DAB in June 2014. MS A occurred in 2012, and MS B is scheduled for 3rd quarter FY 2015. The program is on track to meet established schedule thresholds.
- **Reliability** – The program is executing a reliability growth plan, and system reliability is on track to meet requirements by the FRP decision. The PDR assessed results of more than 1,800 hours of system-level accelerated life testing. Both contractors made corrections through hardware, software/firmware, or process improvements. Post-PDR prototypes were used in a Government-conducted reliability demonstration test in FY 2014.
- **Software** – The program has a Software Development Plan and has met all software milestones. Both contractor software builds exceed the TMRR phase criteria at PDR.
- **Manufacturing** – The program is on track with manufacturing requirements appropriate to the program's current phase. Manufacturing risks are not expected since each contractor has experience and existing production lines for similar components and technologies.
- **Integration** – Two contractors are competing for a single award at MS B. Both contractor designs, as assessed at PDR, address integration of the CIRCM system with the existing and planned upgrade to the missile warning systems.

Conclusion: The CIRCM program remains in source selection and is on track for a MS B in FY 2015 and the down-selection to one competitor. The PDR assessments confirmed both contractor designs are beyond a PDR level of maturity and the program is ready to begin the EMD phase.

Data as of 4th quarter FY 2014.

Excalibur M982E1 Precision Engagement Projectiles

Prime Contractor: Raytheon Missile Systems

Executive Summary: Excalibur is a 155-millimeter cannon-delivered precision artillery projectile. Excalibur is an Army ACAT IC program in the Production and Deployment (P&D) phase and achieved FRP in June 2014. In FY 2014, DASD(SE) participated in a Physical Configuration Audit (PCA) executive review. Excalibur Increments (Inc) Ia-2 and Ib are on track and meeting all program KPPs.

Mission and System Description: The Excalibur artillery projectile is fired by U.S. forces using the M777A2 Lightweight 155mm howitzer (LW155) and the M109A6 (Paladin) howitzer. The M109A7 Paladin Integrated Management howitzer will also fire the Excalibur projectile when it is fielded. Excalibur provides improved fire support through greatly increased accuracy. The GPS and inertial measurement unit guided Excalibur has a requirement for 10-meter accuracy at all ranges and offers a significant reduction in collateral damage over conventional projectiles. The Army developed and fielded Excalibur Inc Ia-1 in response to an urgent need request in support of Operation Iraqi Freedom. Inc Ia-2 extends Inc Ia-1's range of 24 kilometers to 35 kilometers. Inc Ib provides increased range, improved reliability, and decrease in cost.

Systems Engineering Activities

- **Systems Engineering Plan (SEP)** – DASD(SE) approved the SEP in March 2013. The program is fulfilling the objectives of the SEP without waivers or deviations.
- **Requirements** – The JROC approved the CPD in November 2012. Key program requirements are reasonable and stable. Requirements flow from the System Performance Specification to the major system-subsystem specification to the component specifications.
- **Life Cycle Management** – Excalibur is projected to improve logistic sustainability by decreasing the number of rounds necessary to defeat targets over conventional projectiles. Inc Ib improves upon this with increased reliability.
- **Program Protection Plan (PPP)** – The Army Acquisition Executive approved the PPP in June 2014 in support of the FRP decision review. The program is executing the processes documented in the approved PPP.

Assessments

- **DASD(SE) Assessments** – The program conducted verification events and a PCA Executive Review in March 2014. The review included First Article Inspection results, Product and Process Verifications of the subassemblies, a comprehensive risk assessment, and a review of program management, design, manufacturing, quality, and subcontractor quality. The program demonstrated that the Excalibur Inc Ib production configuration matched the product baseline before the FRP decision review.
    - DASD(SE) conducted quarterly DAES assessments in FY 2014 in the areas of schedule, performance, management, interoperability, and production.

Data as of 4th quarter FY 2014.

  - In FY 2015 DASD(SE) plans to assess the Inc Ib program's ability to sustain its reliability performance as it conducts lot acceptance testing through production.
- **Risk Assessment** – The program is executing to the risk management process documented in the SEP. The program is on track with risk mitigation activities.
- **Performance** – The Inc Ia projectile is fielded and has four KPPs: accuracy, reliability, effectiveness, and net-ready. The Inc Ib projectile has those KPPs, with an increase in the reliability KPP, plus a KPP for range. Both increments are meeting their KPP thresholds. The program is managing a risk for cold weather performance over long ranges.
- **Schedule** – The program completed an FRP decision review in June 2014, 6 months ahead of APB schedule threshold. The program met all December 2012 APB thresholds and is on track to meet the thresholds established in the June 2014 production APB. The program achieved Initial Operational Capability (IOC) in July 2014, ahead of its January 2015 APB schedule threshold. The program conducted Systems Engineering Technical Reviews according to the schedule reflected in the approved SEP.
- **Reliability** – Inc Ia achieved 101 percent of its threshold reliability requirement. The Inc Ib system achieved 104 percent of its threshold reliability requirement in the February 2014 IOT&E. Inc Ib demonstrated an aggregate 104 percent of the reliability threshold requirement after completing IOT&E and the first two lot acceptance tests.
- **Software** – The program approved release of operational flight software in March 2014 to support FRP. There are no high-priority trouble reports. The program verified the production software through integration, performance, formal qualification, and flight testing. The software has been stable with no changes since the verification of a final design change to the base in 4th quarter FY 2012.
- **Manufacturing** – The Excalibur Inc Ia-2 program's firm-fixed-price contract was a $543 million P&D effort. The final lot, the last 346 of 3,357 total Inc Ia-2 projectiles, completed the Excalibur Inc Ia-2 FY 2010 production contract. The program stopped Inc Ib production in March 2014 to determine the root cause of an issue with the inadvertent magnetizing of the projectile's warhead fuze retainer plate. No rework was required, but the vendor changed the warhead packing process. Production resumed in April 2014. Excalibur Inc Ib passed Lot 3 acceptance testing and delivered 288 projectiles to the Government at the end of August 2014.
- **Integration** – The Inc Ib program met the required levels of certifications for the June 2014 FRP decision review. The program has memoranda of agreement and Interface Control Documents in place with key supporting programs. The Excalibur projectile has external interfaces with the howitzer, the propellant, the fuze setter, fire control software, and Global Positioning System. Integration efforts for Inc Ib are on track. The program received its Authority to Operate in June 2014. The program received its System Safety certification in April 2014. The Excalibur projectile has incorporated the best available Insensitive Munitions (IM) technologies in order to make the item much less sensitive than standard munitions. These mitigations have greatly reduced the severity of reactions across many of the IM threats, including passing scores for fast cook-off and sympathetic reaction. In addition, the program has an approved Electromagnetic Environmental Effects limitation.

Conclusion: Excalibur Inc Ia-2 is fielded and meets all program KPPs. Inc 1b completed FRP decision review in FY 2014 and is meeting all program KPPs.

Data as of 4th quarter FY 2014.

Ground Combat Vehicle (GCV)

Prime Contractor: General Dynamics Land Systems; BAE Systems (competition)

Executive Summary: GCV is an incremental approach to acquire a modern combat vehicle. The Army focused the first increment on acquiring an infantry fighting vehicle (IFV) to replace the Bradley IFV. The GCV IFV program achieved MS A in 4th quarter FY 2011. DASD(SE) participated in the program's Preliminary Design Reviews (PDR) and conducted a Software Focused Review in FY 2014, in addition to other related activities. Based on affordability constraints, and knowledge gained during technical reviews and risk reduction efforts, DoD decided not to conduct a MS B decision in FY 2014. The Army is minimally continuing Technology Maturation and Risk Reduction (TMRR) to preserve critical engineering capabilities in the industrial base and to address critical technology integration in coordination with the Science and Technology community. The Army is focusing efforts toward a future fighting vehicle in FY 2019 or later.

Mission and System Description: The GCV IFV was intended to support joint forces across the full range of military operations in a wide range of terrain and environments. It was intended to replace the Bradley M2A3 IFV in the Armored Brigade Combat Team and to provide mobile reconfigurable armored protection against a variety of threats. It included the potential for later enhancements to survivability and lethality for future threats and was intended to provide the infantry squad highly mobile and protected transport to decisive battlefield locations. It was intended to provide both destructive fires against threat armored vehicles and direct fire support for the squad during dismounted assaults.

Systems Engineering Activities

- **Systems Engineering Plan (SEP)** – DASD(SE) approved the TMRR SEP in March 2011 to support MS A. The program did not update the MS A SEP to account for program restructuring in FY 2013 but executed processes documented in the approved SEP. The program was on track to achieve SEP objectives for TMRR. There are no approved waivers or deviations to the SEP.
- **Requirements** – The JROC approved the GCV Initial Capabilities Document in December 2010. The Army used a draft CDD at MS A to guide requirements for system development. Some major changes from knowledge gained in the TMRR phase necessitated a program restructure in FY 2013 to align the performance specification to the revised draft CDD and align the PDRs to the updated specification. Final changes to the CDD from JROC staffing were ready to proceed for JROC approval when DoD curtailed TMRR phase activities.
- **Life Cycle Management** – The program actively tracked projected system life cycle costs in the TMRR phase to support USD(AT&L) Better Buying Power initiatives. Both TMRR phase vendors had an average unit manufacturing cost requirement to meet, while managing Technical Performance Measures for mean time to repair, operations and support cost, and energy efficiency. The PDR confirmed the vendors' design activities included sustainability and maintainability considerations balanced with affordability, as well as open system architecture.
- **Program Protection Plan (PPP)** – GCV did not have an approved PPP, but both TMRR phase contractors developed Program Protection Implementation Plans based on a draft PPP.

Data as of 4th quarter FY 2014.

Assessments

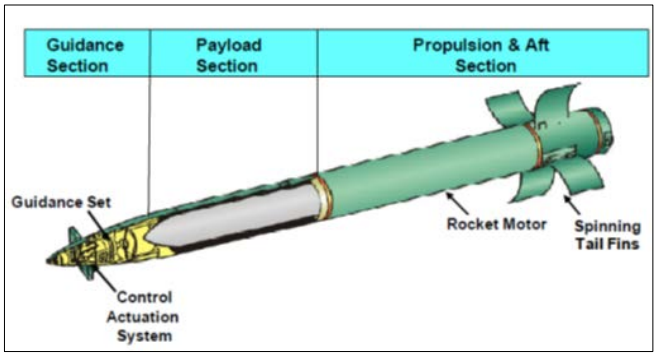
- **DASD(SE) Assessments** – The program conducted PDRs and DASD(SE) conducted a Software Focused Review in FY 2014. DASD(SE) assessed allocated baselines as incomplete at the PDR. The program conducted follow-on technical reviews, completing allocated baselines. Major findings from the Software Focused Review were risks in software requirements baseline, software process maturity, and forecast software schedule. The program manager concurred with the risks, establishing a baseline to inform software reuse and a program restart.
- **Risk Assessment** – The program restructure in FY 2013 reduced overall program risk by extending the TMRR phase by 6 months and the overall program schedule by 18 months. Both contractors added risk reduction assets such as automotive and turret to the TMRR phase to reduce integration risks in mobility and lethality. These activities had the potential to reduce overall program risk; however, risks still remained in reliability growth, primary armament integration, and software.
- **Performance** – The program was on track to meet its nine proposed KPPs with some identified risk. Risk reduction efforts in lethality and mobility improved the likelihood of meeting threshold requirements, but risk remains with lethality and mobility KPP performance and the reliability KSA until development and testing of a full-up system prototype.
- **Schedule** – The program completed a MS A DAB in July 2011. The program had planned for MS B in 3rd quarter FY 2014 after a FY 2013 program restructure added 6 months to the TMRR phase. Both TMRR contracts closed in June 2014 after DoD reduced funding for FY 2015 and beyond; the program did not conduct a MS B DAB. The program projected the first production IFV delivery for testing 18 months later than the original plan before funding reductions.
- **Reliability** – Each contractor provided reliability projections at PDR that indicated the program's reliability requirements and design approach were feasible. Each contractor's predictions exceeded the CDD reliability requirement as well as the developmental goal established in the performance specification for MS B. To compensate for any uncertainty in the predictions, each contractor's allocations preserved margin from the CDD requirements to reduce the risk for compliance.
- **Software** – Both competing contractors reported progress on source lines of code developed during the TMRR phase and associated problem reports. DASD(SE) conducted an analysis of software development and forecast the program would be at least 5 months over the planned schedule for the Engineering and Manufacturing Development phase unless each contractor made adjustments to improve efficiency or reduce scope. Both contractors addressed DASD(SE)-identified software safety criticality concerns from FY 2013, which DASD(SE) verified with the PDR and Program Management Reviews in FY 2014.
- **Manufacturing** – The program was on track with manufacturing requirements appropriate to the program's current phase at the PDR. Both contractors had manufacturing maturation plans to achieve acceptable readiness levels in 2014, with minimal production risk.
- **Integration** – Both contractors completed integration of an automotive test rig to reduce GCV design and integration risk with engine, drivetrain, and suspension. Each completed development and integration of other subsystem assets consistent with each vendor's unique risks. The contractors demonstrated each of the risk reduction assets and satisfied Government acceptance for transfer to Army research and development agencies for use in technology enhancement efforts for future vehicle development. The GCV program managed external dependencies with other programs and had memoranda of agreement with the external programs.

Conclusion: The GCV program completed its initial TMRR phase contracts, awarded follow-on contracts to minimally preserve the industrial base, and is transitioning assets to Army research and development activities for ongoing combat vehicle TMRR efforts toward a future fighting vehicle.

Data as of 4th quarter FY 2014.

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

Prime Contractor: Lockheed Martin, Missiles and Fire Control



Executive Summary: GMLRS-AW is designed to replace GMLRS-Dual-Purpose Improved Conventional Munitions (DPICM), service the same target set at comparable range, and eliminate the probability of Unexploded Ordnance (UXO). GMLRS-AW is an Army ACAT IC program in the Engineering and Manufacturing Development (EMD) phase. The program completed MS B and entered EMD in February 2012. In FY 2014, the program conducted an Acquisition Working Integrated Product Team (WIPT) meeting, among other engagements. The program is on track achieve its planned MS C/FRP in FY 2015.

Mission and System Description: GMLRS provides Field Artillery units with medium- to long-range fires while supporting operational level forces. GMLRS-AW, the third increment of GMLRS, is a precision strike artillery rocket system to attack area and imprecisely located targets in all-weather environments. Targets include counterfire, air defense, command and control, and other high-payoff targets at all depths of the tactical battlefield. The rocket uses a solid propellant and is fired from the M270A1 Multiple Launch Rocket System and the M142 High Mobility Artillery Rocket System mobile launch vehicles. The rocket's Inertial Measuring Unit (IMU) with Global Positioning System (GPS) assistance guides the rocket to a specific point and delivers effects on a target. GMLRS-AW attacks the same target sets as the DPICM rocket but eliminates the risk of unexploded ordnance to satisfy DoD policy.

Systems Engineering Activities

- **Systems Engineering Plan (SEP)** – DASD(SE) approved the SEP in November 2011. The program is fulfilling the objectives of the SEP without waivers or deviations. The program is updating the SEP for the planned FY 2015 combined MS C/FRP decision review.
- **Requirements** – The JROC approved the CDD in November 2011. Program requirements are reasonable and stable. CDD requirements trace to subsystem performance specifications. The initial product baseline is established and consists of product drawings, item specifications, special inspection equipment, and special tooling. The Army is revalidating the CDD, as opposed to providing a CPD, with the JROC for the 2015 MS C/FRP because the system demonstrated threshold CDD KPP performance with no planned changes.
- **Life Cycle Management** – The program office combined the FRP decision with the MS C decision, planned for March 2015, because the vast majority of GMLRS-AW rocket production processes are common with the GMLRS-Unitary rocket. This program change accelerated Initial Operational Capability by 6 months and resulted in less testing required to support the program. The program is leveraging GMLRS-Unitary hardware commonality to reduce required testing and a shared production line to eliminate the need for a formal LRIP phase.
- **Program Protection Plan (PPP)** – PEO Missiles and Space approved the program's abbreviated PPP in July 2011. The program is developing a PPP to support the FY 2015 GMLRS-AW MS C/FRP. The program is executing the processes documented in the abbreviated PPP.

Data as of 4th quarter FY 2014.

Assessments

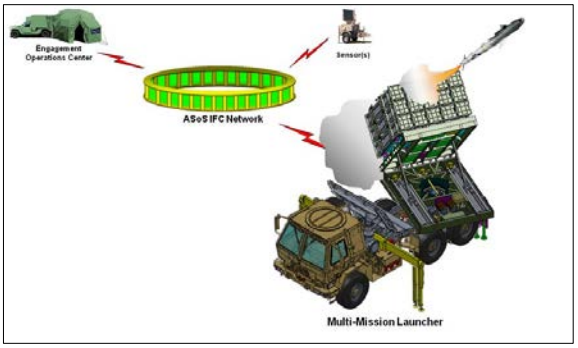
- **DASD(SE) Assessments** – DASD(SE) prepared four quarterly DAES assessments for the GMLRS program in FY 2014, addressing schedule, performance, management, interoperability, and production. The program provided updated SE activity data to support assessments and conducted an integrated Army and OSD product team meeting.
  - The program recommended removing Cold Regions Test Center (CRTC) testing from the GMLRS-AW plan because of the similarities between it and previous GMLRS increments and because the program conducted cold-conditioning testing with AW. DASD(SE) recommended documenting changes to the product baseline since the 2007 GMLRS-Unitary CRTC flight test to support the analysis for omitting the CRTC testing. The program is executing this recommendation.
  - In FY 2015 DASD(SE) plans to participate in the system-level Manufacturing Readiness Assessment for FRP.
- **Risk Assessment** – The program is executing the risk management processes documented in the SEP. The program is on track to retire a risk regarding timely completion of the Physical Configuration Audit (PCA) in early FY 2015.
- **Performance** – The GMLRS-AW program has four KPPs. The program is on track to meet the KPPs, the KSA, and the Technical Performance Measures documented in the SEP by the FRP decision.
- **Schedule** – The program completed a MS B decision review in February 2012. The program is on track to meet the thresholds established in the APB approved in February 2012. The program is currently planning a combined MS C/FRP decision review in 2nd quarter FY 2015 and is on track to meet its APB schedule threshold for MS C of September 2015. The program conducted Systems Engineering Technical Reviews in the time frames reflected in the approved SEP.
- **Reliability** – The program is on track to meet the planned reliability requirement by FRP. The program office's July 2014 scoring conference for the developmental/operational test (DT/OT) flight test series resulted in a reliability point estimate of 100 percent (94 percent lower confidence bound), exceeding the planned reliability of 91.3 percent.
- **Software** – Rocket software design and size are stable. The program identified and resolved a launcher and fire control software schedule risk. The schedule risk would have impacted the safety release to start June 2014 DT/OT. The program has completed development and verification of the operational flight software. The program software has no open software trouble reports. There are no issues with rocket or launcher software.
- **Manufacturing** – GMLRS-AW is executing the manufacturing guidance in its SEP. The contractor shipped GMLRS-AW rockets for IOT&E in August 2014, 10 days ahead of plan. The program completed all 15 planned Production Line Verifications (PLV) for the warhead. The rocket line PLV concluded in June 2014 as planned. The program projects completing the warhead PCA action items in early FY 2015.
- **Integration** – The GMLRS-AW mechanical and electrical interfaces with the rocket are the same as those for the GMLRS-Unitary rocket already in production. All GMLRS-AW hardware and software interfaces are defined by Interface Control Documents. The alternative warhead was designed to fit within the fixed dimensions of the GMLRS rocket's warhead space. The AW program currently meets two of six Insensitive Munitions (IM) requirements. The Army projects cutting IM-compliant motors into production in FY 2017. The program is executing plans with external technical organizations and programs as outlined in the approved SEP and is on track to complete all necessary memoranda of agreement ahead of the FY 2015 MS C/FRP.

Conclusion: The GMLRS-AW program is on track to achieve MS C/FRP in FY 2015.

Data as of 4th quarter FY 2014.

Indirect Fire Protection Capability, Increment 2–Intercept (IFPC Inc 2-I)

Prime Contractor: To be determined



Executive Summary: IFPC Inc 2-I intends to provide a mobile protection capability to defend critical assets within fixed and semi-fixed locations against unmanned aircraft systems (UAS); cruise missiles (CM); and rockets, artillery, and mortars (RAM). The program is a pre-MDAP in the Technology Maturation and Risk Reduction (TMRR) phase. The program achieved MS A in March 2014. In FY 2014, DASD(SE) conducted an independent fire chain analysis for the candidate interceptor to support the MS A decision and participated in an alternate interceptor study. DASD(SE) also participated in the initial TMRR phase design reviews culminating in a System Functional Review (SFR) in September 2014. The IFPC Inc 2-I program is on track to execute the TMRR phase of development.

Mission and System Description: IFPC Inc 2-I intends to acquire, track, engage, and defeat UAS, CM, and RAM. The system will provide 360-degree protection and will simultaneously engage threats arriving from different azimuths. The program is using a block acquisition approach. Block 1 will consist of one or more interceptors, development of technical fire control and a Multi-Mission Launcher (MML) with an open architecture that will allow for a variety of missiles, and a Sentinel radar software upgrade to support the counter UAS and CM missions. Block 2 will develop interceptors, sensors, and technical fire control to support the counter-RAM mission. The IFPC Inc 2-I system will use the Army Integrated Air and Missile Defense (IAMD) command and control open systems architecture.

Systems Engineering Activities

- **Systems Engineering Plan (SEP)** – DASD(SE) approved the IFPC Inc 2-I SEP in April 2014 to support MS A. The program is fulfilling the objectives of the SEP without waivers or deviations; however, follow-on actions to improve planning details in the approved SEP remain open. The program will update the SEP in FY 2015 to support the MS B in FY 2016 .
- **Requirements** – The IFPC Inc 2-I requirements are based on the Initial Capabilities Document for Integrated Unit, Base, and Installation Protection Detect, Assess, and Defend, approved in October 2009. The Army has developed a CDD for approval in 2015. The program requirements are reasonable and stable (with the exception of the reliability requirement), and the program has established traceability between the draft CDD and the IFPC Inc 2-I System Performance Specification. The program held a System Requirements Review (SRR) in September 2014.
- **Life Cycle Management** – IFPC Inc 2-I intends to leverage the existing support infrastructure including the life cycle processes for existing interceptor missiles. The program plans to conduct a business case analysis to refine the sustainment approach for the planned FY 2016 MS B.
- **Program Protection Plan (PPP)** – USD(AT&L) approved the Technology Development phase PPP in December 2013. A PPP update will be required to support the MS B in FY 2016.

Data as of 4th quarter FY 2014.

Assessments

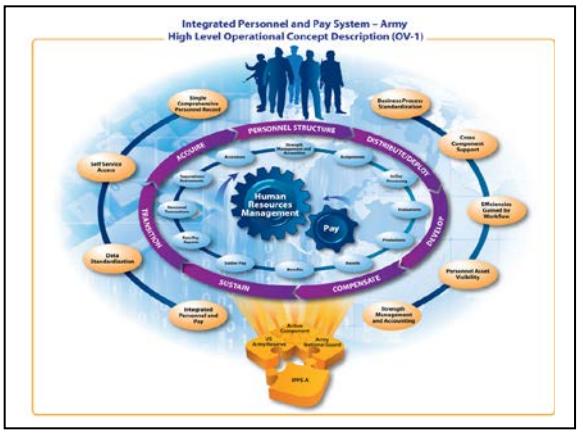
- **DASD(SE) Assessments** – DASD(SE) conducted an independent fire chain analysis to establish the capability of the selected reference interceptor (AIM-9X Block 2) for the counter-CM and counter-UAS missions. The analysis quantified the capability and supported the MS A decision. USD(AT&L) directed an alternate interceptor study at MS A, and DASD(SE) worked with the program to ensure the study emphasized the open architecture capabilities of the MML and supported the Block 2 requirements. DASD(SE) participated in the program's FY 2014 design reviews including an MML Initial Design Review, the SRR, and the SFR to support the FY 2015 PDR assessment. DASD(SE) also will support the technical meetings leading up to the Preliminary Design Review in 2015.
- **Risk Assessment** – The program is executing its risk management program documented in the Risk Management Plan and SEP. The program is working to mitigate risks in the reliability, system timing allocation, and component delivery schedule areas.
- **Performance** – The analyses presented by the program at the SRR indicate the design will meet the eight KPPs and three KSAs with the exception that the program is requesting the user reassess the reliability KSA. The program also presented its analysis that the Technical Performance Measures established in the SEP are being met, with the exception of MML reliability.
- **Schedule** – The program achieved MS A in March 2014 and conducted the SRR and SFR in September 2014. The program is on track to execute all the Systems Engineering Technical Reviews as established in the SEP.
- **Reliability** – The program has a released RAM-C Rationale Report, estimated ownership costs, and a draft CDD with sustainment requirements (operational availability and materiel availability) and a reliability KSA. Since the October 2013 DAB, the program has determined that the MML cannot meet the reliability requirement with the planned program funding (GFE subsystem redesign would be required). DASD(SE) will work with the program to develop a reliability growth plan prior to MS B.
- **Software** – The program has implemented an Agile software development process. The program plans two engineering builds and two formal builds to support the pre-MS B engineering demonstration. The program estimates approximately 300,000 equivalent source lines of code are needed. Four builds are planned following MS B.
- **Manufacturing** – The program is developing the initial prototype MMLs at the Aviation and Missile Research, Development and Engineering Center (AMRDEC) to support the engineering demonstration. The program is conducting a cost-benefit analysis on Engineering and Manufacturing Development and Production to support MS B. The program will leverage the existing production capability for the AIM-9X Block 2 as the reference interceptor missile for IFPC Inc 2-I Block 1 and plans no changes to the AIM-9X Block 2 to support the IFPC Inc 2-I system.
- **Integration** – IFPC Inc 2-I leverages the existing AIM-9X Block 2 missile for the interceptor and the Army IAMD program for command and control. DASD(SE) worked with both programs to ensure the IFPC Inc 2-I integration and performance requirements will be met. The program has designed the MML for an open architecture to allow the incorporation of future missiles into the baseline to support Block 2 requirements and beyond. The program included candidate missiles in the alternate interceptor study with different interface standards to refine the open architecture features of the system.

Conclusion: The IFPC Inc 2-I program is on track to execute the TMRR phase of development.

Data as of 4th quarter FY 2014.

Integrated Personnel and Pay System–Army, Increment I (IPPS-A Inc I)

Prime Contractor: EDC Consulting



Executive Summary: IPPS-A is a Web-based human resource system that provides integrated personnel and pay capabilities and comprehensive human resource records for all Soldiers in each Army Component. When completed, IPPS-A is projected to be the largest implementation of the PeopleSoft Human Capital Management commercial-off-the-shelf (COTS) package in the world, with approximately 1.1 million personnel. The program is an ACAT IAM in the Development and Fielding phase, deployed in three waves. DASD(SE) participated in the Critical Design Review (CDR) in November 2013 with an assessment identifying design deficiencies that required correction prior to software implementation. The program achieved MS C in February 2014 and Full Deployment Decision (FDD) in April 2014. The program is on track to achieve Full Deployment in 2nd quarter FY 2015.

Mission and System Description: IPPS-A is a MAIS program that promotes and maintains effective military personnel management. It ensures accurate and timely military personnel data and delivery of benefits are provided to all Soldiers. In contrast to custom-developed legacy systems, IPPS-A uses the PeopleSoft Human Capital Management COTS package to provide personnel and pay capabilities. IPPS-A is expected to reduce errors and will become the authoritative and comprehensive source of Army personnel and pay information. The program will provide an integrated, multi-component personnel and pay system that streamlines human resources, enhances the efficiency and accuracy of personnel and pay procedures, and supports Soldiers and their families. The tool will be available 24 hours a day and will be accessible to Soldiers, human resource professionals, combatant commanders, personnel and pay managers, and other authorized users throughout the Army.

Systems Engineering Activities

- **Systems Engineering Plan (SEP)** – DASD(SE) approved the MS C SEP in August 2014. The program is fulfilling the objectives of the SEP without waivers or deviations and is supporting the fielding of IPPS-A Inc I.
- **Requirements** – DASD(SE) assesses the program will meet identified requirements. Initially the JROC approved the CDD in July 2010 for Defense Integrated Military Human Resource System (DIMHRS). Army redefined the requirements, which were approved in March 2011 by Army G-1. The KPPs approved by the IPPS-A Configuration Steering Board in 2013 are net-ready, data accuracy, and availability. IPPS-A uses Detailed Functional Configuration Design Documents, Detailed Technical Design Documents, and Interface Design Documents for requirements decomposition. Stakeholders provided specifications concurrence at technical reviews (i.e., System Requirements and Functional Reviews). Stakeholders traced requirements from originating source through final disposition. Verification of requirements is performed using progressive testing techniques.

Data as of 4th quarter FY 2014.

- **Life Cycle Management** – IPPS-A uses COTS products extensively. To reduce costs, the IPPS-A PMO evaluates techniques and alternatives that encompass requirements, design, analysis, and review activities to drive effective performance and cost results, reduce development-cycle time, and improve supportability. In addition, the program ensures protection of personally identifiable information as part of system security, essential in a human capital management system.
- **Program Protection Plan (PPP)** – The program is executing the processes documented in the April 2014 USD(AT&L)-approved PPP.

Assessments

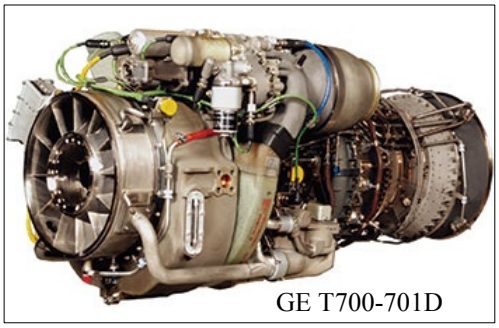
- **DASD(SE) Assessments** – DASD(SE) led a system-level CDR assessment in November 2013. DASD(SE) found this CDR was incomplete due to design deficiencies (i.e., gaps). The IPPS-A Inc I program office performed an audit to validate design deficiencies and then directed the system integrator to take corrective action to complete the design by April 30, 2014, in time for FDD. The program completed the design by April 30, enabling the program office to proceed with software implementation and receive its FDD.
- **Risk Assessment** – The CDR assessment identified risks in design deficiencies. IPPS-A Inc I is executing its risk management program documented in the SEP and is mitigating risks associated with requirements growth, missing data, and lack of skilled PMO personnel.
- **Performance** – IPPS-A Inc I has met all three KPPs for Wave 1. The program is on track to demonstrate all KPPs and Technical Performance Metrics by the Wave 3 Release Deployment Decision in 1st quarter FY 2015.
- **Schedule** –The program completed a MS C DAB in February 2014 and FDD in April 2014. It is on track to deploy the final wave in 1st quarter FY 2015.
- **Reliability** – IPPS-A reliability requirements are measured as mean time between outages. In addition, IPPS-A has a requirement for system availability. The Operational Assessment was not long enough to measure availability. The Configuration Steering Board approved partial deferment of the availability requirement to Inc II MS C/Limited Fielding Decision.
- **Software** – IPPS-A Inc I is a MAIS program building the foundational database to be used by the PeopleSoft COTS software application. The IPPS-A software quality profile is tracked through monitoring system problem reports over time. The program is on track to complete the Inc I Wave 3 database and fulfill the Full Deployment exit criteria.
- **Deployment** – IPPS-A Inc I Waves 1 and 2 have been deployed successfully. The program is on track for deployment of Wave 3 in 1st quarter FY 2015.
- **Integration** – Memoranda of agreement have been established with the external programs as identified in the SEP. IPPS-A Inc I completed data integration, establishing interfaces and the underlying processes required to populate both foundation and Soldier data tables within the PeopleSoft database for Waves 1 and 2.

Conclusion: IPPS-A Inc I successfully deployed Waves 1 and 2 as a result of its commitment to correcting the design deficiencies identified by DASD(SE) in the CDR. The program is on track to achieve Full Deployment in 2nd quarter FY 2015.

Data as of 4th quarter FY 2014.

Improved Turbine Engine Program (ITEP)

Prime Contractor: To be determined


GE T700-701D

Executive Summary: The Improved Turbine Engine (ITE) is a new 3,000 shaft horsepower (SHP) turboshaft engine that will replace current 2,000 SHP GE T700-701D engines in Army H-60 and AH-64 helicopters. The ITE will comply with the size constraints of the current engine at similar weight and will provide significant fuel savings, increased range and endurance, and a power enhancement. The program is pursuing an alternate Acquisition Strategy (AS) and expects to be designated an ACAT ID program with MS B in FY 2018. DASD(SE) completed a Program Support Assessment in March 2014 and provided technical input to the Analysis of Alternatives (AoA) Study Advisory Group meetings and the final AoA Report. The program has successfully leveraged prior science and technology (S&T) efforts and concluded a thorough AoA. The program is developing a revised AS that best enables them to address technical and integration challenges within available resources.

Mission and System Description: The ITE will incorporate technology advances to bridge capability gaps identified in the Operational Energy Initial Capabilities Document and the Army Aviation Capabilities-Based Assessment. It will meet operational requirements worldwide with improved fuel efficiency. The program will build on the Army's Advanced Affordable Turbine Engine (AATE) S&T effort to demonstrate full-scale engines that will reduce fuel consumption, maintenance costs, and production costs while increasing SHP and engine design life.

Systems Engineering Activities

- **Systems Engineering Plan (SEP)** – The program office submitted a draft SEP expecting to enter acquisition at MS A. The program is revising its AS to enter at MS B, and the SEP will be updated to support that milestone. No waivers or deviations are expected.
- **Requirements** – The Army is preparing a draft CDD with draft KPPs and KSAs. The program has mapped planned requirements into a Specification Development Document and a System Requirements Document and has incorporated comments from the Army's airworthiness certification organization. The program also has developed a draft Performance Work Statement that maps to the requirements and specification documents.
- **Life Cycle Management** – The program objectives include significant reductions in production costs, maintenance costs, and fuel consumption, as well as increased engine design life. The basis for comparison is the currently fielded engine. The program and the AoA study team quantified the expected reductions in life cycle costs by analyzing the performance demonstrated by the AATE engines and the improvements that can realistically be expected from the ITE.
- **Program Protection Plan (PPP)** – The program submitted a Component-approved PPP in April 2014 in anticipation of a MS A. The program is revising its AS to enter at MS B, which requires an update to the PPP.

Data as of 4th quarter FY 2014.

Assessments

- **DASD(SE) Assessments** – DASD(SE) conducted a Program Support Assessment in March 2014; participated in the final OSD Study Advisory Group meetings in May 2014; and participated in weekly AoA Report reviews in March, April, May, and June 2014.
  - The program implemented recommendations in the areas of aircraft integration, schedule, and staffing to reduce risk and is incorporating systems engineering equities into program activities.
  - In FY 2015 DASD(SE) plans to assist with MS B SEP development and to conduct regular Systems Engineering Working Integrated Product Team meetings.
- **Risk Assessment** – The program has conducted technology, manufacturing, and integration readiness assessments and has used the results to develop program risks. The program has mitigation plans to address risks related to new technologies and ITE integration into the H-60 and AH-64 platforms. The program is using AATE demonstrations to quantify cost, schedule, and performance risks, develop off-ramps, and assess program implications.
- **Performance** – ITEP leveraged AATE to establish realistic performance thresholds to be included in the draft CDD. S&T efforts validated new technologies and materials for the ITE. The program intends to award a Preliminary Design Review (PDR) contract that will assess performance improvements and the ability to achieve the program requirements prior to entering Engineering and Manufacturing Development (EMD).
- **Schedule** – The study team completed the AoA in September 2014. The program is revising its AS and is seeking an Acquisition Decision Memorandum to enter EMD at MS B in FY 2018. The revised AS includes a competitive approach to complete PDR prior to the MS B.
- **Reliability** – The ITEP reliability program is documented in the draft SEP, the AS, and the RAM-C Rationale Report. The program developed a reliability growth planning curve for mean time between essential maintenance actions that directly influences the operational availability.
- **Software** – The ITE will incorporate a software-intensive full-authority digital engine control (FADEC) that will be developed by the contractor(s). The program is developing a strategy for data rights and protection of the FADEC software and hardware.
- **Manufacturing** – The program is pre-source selection. The program and AoA study team conducted an early manufacturing risk assessment at the AoA Risk Workshop and discussed manufacturing trades during the trades study. Primary candidate contractors are proposing new technologies that present some manufacturing risk. The program is developing off-ramps and analyzing the implications of realizing the identified risks.
- **Integration** – The program has a close working relationship with H-60 and AH-64 stakeholders. Aircraft modifications will be required to achieve the full benefit of the new engines, and integration will remain a systems engineering watch item as ITE development moves forward.

Conclusion: ITEP has successfully leveraged prior S&T efforts and concluded a thorough AoA. The program is developing a revised AS that best enables them to address technical and integration challenges within available resources.

Data as of 4th quarter FY 2014.

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

Prime Contractor: General Dynamics C4 Systems

Executive Summary: JTRS HMS provides a family of tactical radios for mounted, dismounted, and specialized use. The program is an ACAT ID, achieved MS C in May 2011, and is in LRIP for Rifleman Radio (RR) and Manpack (MP) Radio. In FY 2014, the program conducted verification activities and participated in the Mobile User Objective System (MUOS) Operations Integration Working Group (OIWG). The USD(AT&L) approved an updated Acquisition Strategy (AS) in May 2014 and conducted a DAES review in August 2014, among other reviews. The program reported a significant Nunn-McCurdy schedule and cost breach in FY 2014. As reported in the December 2014 Selected Acquisition Report (SAR), the program has updated the procurement strategy and no longer reflects a Nunn-McCurdy cost breach.

Mission and Description: JTRS HMS develops software-defined radios to meet communications requirements for Soldiers and small platforms. JTRS HMS consists of multiple form factors, including the RR and MP Radio for Soldier use and Small Form Factor radios for integration into other systems. These radios host a selection of software-defined waveforms including the Soldier Radio Waveform (SRW), Ultra High Frequency Satellite Communications Military, Single Channel Ground to Air Radio System (SINCGARS), and MUOS.

Systems Engineering Activities

- **Systems Engineering Plan (SEP)** – DASD(SE) approved the SEP in May 2011 to support MS C and the Production and Deployment phase. The program's SEP has no waivers or deviations, and the program is planning no update. However, the program is not meeting the objectives of the SEP for the Reliability, Availability, and Developmental/Growth Testing program because the MP Radio has difficulty meeting performance requirements.
- **Requirements** – The JROC approved CPDs for both the RR (April 2011) and MP Radio (May 2012). The Army updated the RR CPD in March 2013 to add a net-ready KPP requirement for Secret and below encryption. During FY 2014, the Army issued a draft Performance Requirements Document (PRD) for the RR FRP solicitation that traces to the CPD. The program has stable requirements, but OSD directed the program to review both operational and technical requirements prior to releasing the MP Radio RFP.
- **Life Cycle Management** – The program developed hardware and software interfaces to control costs throughout the product life cycle. The Army added the Secret and below encryption requirement to RR to reduce the need for a separate form factor for its Nett Warrior program.
- **Program Protection Plan (PPP)** – USD(AT&L) approved the MS C PPP in August 2012. The program is executing the processes documented in the approved PPP.

Assessments

- **DASD(SE) Assessments** – DASD(SE) conducted quarterly DAES assessments in FY 2014 and participated in both the August 2014 DAES review and the MUOS OIWG in FY 2014.
  - Due to MP Radio performance issues, ASD(A) directed the program to review user and system performance requirements and consider updating them before releasing an RFP.

Data as of 4th quarter FY 2014.

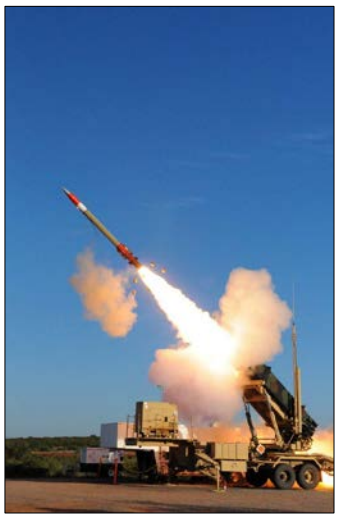
  - DASD(SE) conducted quarterly DAES assessments in the areas of schedule, performance, management, interoperability, and production.
  - In FY 2015, DASD(SE) projects supporting risk mitigation activities for the release of FRP RFPs for RR and MP Radio, and for MUOS verification.
- **Risk Assessment** – The program is executing the risk management process documented in the SEP. The program did not fully demonstrate MP Radio threshold requirements for reliability during LRIP and is researching failure definition criteria to ensure accurate capture of system reliability failures in future tests. LRIP deliveries are on schedule, and the program plans to address performance upgrades, risks, and issues through FRP competitions.
- **Performance** – RR met all four KPPs and all five KSAs prior to the CPD update that changed the net-ready KPP threshold by adding Secret encryption. The MP Radio met three of its four KPPs in FY 2014, achieving 90 percent of its sustainment KPP. The MP Radio is meeting one of three KSAs. Overall reliability KSA findings at Follow-on Operational Test and Evaluation (FOT&E) were 78 percent of threshold, and the Army-identified MP Radio suitability issues including battery life, weight, communication range, and excessive heat, rating the MP Radio not survivable. SRW and SINCGARS waveform KSA range was met at Government Development Test but not at FOT&E under all conditions. The program manager has taken actions to address performance and reliability issues through environmental stress screening and resolution of open deficiencies. Call completion rates (CCR) for the MP Radio using the MUOS waveform were less than the 88 percent target, and root causes are under investigation.
- **Schedule** – The program reported an FRP threshold schedule breach exceeding 4 years for MP Radio and RR. Decisions contributing to the breach include changing the AS for FRP radios to a full and open competition, modifying the procurement schedule, and adjusting RR requirements. The May 2014 AS change updated the FRP dates for RR (to February 2017) and MP Radio (to July 2017). In the September 2014 SAR, the program projects schedule breaches for FOT&E for MP Radio with MUOS, and MP Radio fielding with MUOS, primarily due to changes in the Navy MUOS schedule. The program prepared an updated APB and Program Deviation Report to reflect these delays.
- **Reliability** – RR met reliability performance requirements. The MP Radio currently is not meeting the availability KPP or the reliability KSA. During FOT&E, the MP Radio met 90 percent of its sustainment KPP operational availability threshold of 0.96. FOT&E scoring data indicate the point estimate for mean time between essential function failure is 78 percent of the reliability KSA threshold of 477 hours. These are improvements over prior results.
- **Software** – Software for RR is in sustainment. MP Radio development is complete, and the program is focusing on waveform performance by conducting functional testing of the MUOS waveform software to determine root causes of the poor CCR performance.
- **Manufacturing** – MP Radio and RR LRIP production are ahead of plan and supporting Army fielding requirements. As of August 2014, the Government procured 19,327 LRIP RRs and 5,326 LRIP MP Radios. RR has delivered all radios ahead of schedule; MP Radio has delivered 74 percent of planned LRIP radios and is ahead of its delivery schedule.
- **Integration** – MP Radio and RR interoperability certifications are on track to meet threshold user requirements. MUOS integration with MP Radio is not on schedule and negatively impacts the waveform KSA.

Conclusion: The program had a significant Nunn-McCurdy cost and schedule breach in FY 2014. The program is making LRIP deliveries on schedule and plans to address performance upgrades, risks, and issues through FRP competitions. As reported in the December 2014 SAR, the program has updated the procurement strategy and no longer reflects a Nunn-McCurdy cost breach.

Data as of 4th quarter FY 2014.

PATRIOT Advanced Capability-3 Missile Segment Enhancement (PAC-3 MSE)

Prime Contractor: Lockheed Martin, Missiles and Fire Control



Executive Summary: PAC-3 MSE is the next-generation missile in the PATRIOT family to counter the evolving ballistic missile threat. PAC-3 MSE is an ACAT ID program in the Production and Deployment phase. The program achieved MS C in March 2014. In FY 2014, DASD(SE) conducted a Program Support Assessment (PSA) in support of the MS C decision. The program is on track to meet the missile-specific requirements necessary to support the integrated PATRIOT system.

Mission and System Description: The mission of the PATRIOT system is to protect forces and selected geopolitical assets from missile attack, aerial attack, and surveillance. PATRIOT provides protection against theater ballistic missiles and air threats to critical assets in the Corps and the Echelon Above Corps (EAC) areas. The PAC-3 MSE missile represents the next-generation PATRIOT missile, significantly extending the PATRIOT system capability in terms of interceptor altitude, range, propulsion, lethality, agility, guidance software, and Insensitive Munitions (IM) improvements.

Systems Engineering Activities

- **Systems Engineering Plan (SEP)** – DASD(SE) approved the SEP in January 2014. The program is fulfilling the objectives of the SEP without waivers or deviations. The program has proven processes for developing and delivering PATRIOT missiles.
- **Requirements** – The JROC approved the PATRIOT Increment (Inc) 2 CPD in January 2013, which defined the PATRIOT system requirements and performance associated with production and fielding of the PAC-3 MSE missile and other PATRIOT system improvements. The program has decomposed and allocated PAC-3 MSE specific requirements from the CPD into a PAC-3 MSE missile specification. PAC-3 MSE requires further PATRIOT system upgrades by the FRP decision to ensure the PAC-3 system meets full CPD requirements. The requirements are reasonable and stable, and the program office has configuration control of the product baseline.
- **Life Cycle Management** – The PAC-3 MSE program is executing Better Buying Power initiatives to control costs throughout the product life cycle, achieving savings by combining missile production quantities with increased Foreign Military Sales (FMS) quantities. The program completed a production facilitization contract to increase the missile production rate (240 missiles per year) and to support the PATRIOT family synergy and cost-effectiveness with other PATRIOT missile variants.
- **Program Protection Plan (PPP)** – The program prepared a draft Production and Deployment PPP during 1st quarter FY 2014 to support MS C. The PPP lacked key content addressing supply chain risk management. The MS C Acquisition Decision Memorandum (ADM) directed the program office to incorporate supply chain risk management analysis. The program office expects to submit the PPP for approval in FY 2015.

Data as of 4th quarter FY 2014.

Assessments

- **DASD(SE) Assessments** – DASD(SE) conducted a PSA in FY 2013-2014 on the PAC-3 MSE program to support the January 2014 MS C LRIP decision. The PSA found the program (1) has proven processes for developing and delivering PAC-3 MSE missiles; (2) is capable of meeting the LRIP manufacturing requirements; (3) is dependent on other PATRIOT system upgrades, including PATRIOT system Post Deployment Build-8 with a radar digital processor update, to achieve the full benefit of PAC-3 MSE and meet the PAC-3 MSE performance baseline; and (4) has risk of limited reliability growth at FRP. The program accepted the PSA recommendations, and the MS C ADM documented the recommendations to conduct the System Verification Review (SVR) and establish minimum reliability criteria for FRP.
- **Risk Assessment** – The program is executing its risk management program documented in the Risk Management Plan and SEP and is successfully mitigating the technical risks. The program successfully mitigated a supplier quality management risk and is executing plans to retire the battery supplier viability risk in FY 2015.
- **Performance** – The program is on track to demonstrate the KPPs by FRP. The SVR is required prior to FRP to certify that the MSE missile and the PATRIOT system fulfill the PAC-3 Inc 2 CPD requirements.
- **Schedule** – The program completed a MS C DAB in January 2014. The PAC-3 MSE did not meet the March 2012 First Unit Equipped (FUE) APB threshold due to qualification delays with the Ignition Safety Device (ISD) and Solid Rocket Motor, as well as an ISD flight failure requiring redesign and repeat testing. At the January 2014 MS C DAB, the program presented a revised schedule with FUE planned for 4th quarter FY 2015 (42 months late). A revised Production APB is due following PAC-3 MSE FY 2014 LRIP contract definitization.
- **Reliability** – The program demonstrated performance and sufficient reliability to enter LRIP, but with limited flight tests to establish reliability confidence. Reliability confidence is expected to grow through additional successful flight tests. The program will need to achieve a high success rate in the limited number of additional flight test opportunities prior to FRP to demonstrate the FRP minimum reliability criteria established in the MS C ADM.
- **Software** – The program completed software development for PAC-3 MSE. The final PAC-3 MSE integrated hardware/software configuration was validated at the MSE 7-5 successful flight intercept in 2013.
- **Manufacturing** – The program is on track with manufacturing for the Production and Deployment LRIP phase. The program established production metrics supporting the SEP. The FY 2013 Production Readiness Assessment identified manageable risks in supplier viability and supplier quality.
- **Integration** – PATRIOT requires system upgrades to achieve the full benefit of PAC-3 MSE and meet the PAC-3 MSE performance baseline in the Inc 2 CPD KPPs. The PATRIOT system is moving to a componentized approach, including PAC-3 MSE capability, for integration onto the Army Integrated Air and Missile Defense Battle Command System.

Conclusion: The PAC-3 MSE program is on track to meet the missile-specific requirements necessary to support the integrated PATRIOT system.

Data as of 4th quarter FY 2014.

Paladin Integrated Management (PIM)

Prime Contractor: BAE Systems, Ground Systems Division

Executive Summary: The PIM program consists of two individual platforms: the Self-Propelled Howitzer (SPH) and the Carrier, Ammunition, Tracked (CAT). The PIM upgrades the Army's current fleet of SPHs and CATs to address system platform limitations, sustainment challenges, and obsolescence issues. PIM provides increased force protection, survivability, mobility, growth margin, and commonality. The program is an ACAT ID and is in the LRIP phase. The program achieved MS C in October 2013. In FY 2014, the program conducted two software subsystem Critical Design Reviews (CDR) and monthly risk review board meetings, among other engagements. The program continues to manage multiple concurrent LRIP activities but remains on track for FRP.

Mission and System Description: PIM provides the primary indirect fire support for full spectrum operations. PIM is planned to be employed as part of a fires battalion in the Armored Brigade Combat Team (ABCT) and the fires brigades. The SPH is an aluminum-armored, full-tracked 155-millimeter cannon. The CAT supplies the SPH with ammunition. Both the SPH and CAT incorporate a newly designed hull, a modified Bradley fighting vehicle (BFV) power train and suspension system, the future BFV track, a modernized 600-volt electrical system, and a microclimatic conditioning system. The SPH includes an automated fire control system.

Systems Engineering Activities

- **Systems Engineering Plan (SEP)** – DASD(SE) approved the SEP in October 2013. The program is fulfilling the objectives of the SEP without waivers or deviations. The program is executing the processes documented in the approved SEP.
- **Requirements** – The JROC approved the M109 Family of Vehicles (PIM) CPD in December 2011. The CPD contains 10 KPPs and 8 KSAs for the PIM platforms. The CPD requirements are reasonable and stable. The CPD requirements trace to the performance specifications.
- **Life Cycle Management** – The program is executing Better Buying Power should-cost production initiatives through efficiencies in LRIP, software maintenance, and system technical support. The program is planning for a reliability incentive to enhance affordability during deployment and cost incentives in the FRP contract.
- **Program Protection Plan (PPP)** – USD(AT&L) approved the PPP in September 2013 in support of MS C. The program is executing the processes documented in the approved PPP.

Assessments

- **DASD(SE) Assessments** – The program conducted two software subsystem CDRs, one for the platform diagnostics software and one for the maintenance device. The program met entrance and exit criteria for the diagnostics software subsystem CDR progress to schedule. The maintenance device software subsystem CDR revealed that the development effort was slightly behind plan but had a reasonable expectation of recovering to support events leading to First Production Delivery.

Data as of 4th quarter FY 2014.

  - The program intensified software tracking management to address lagging maintenance device software development.
  - DASD(SE) conducted quarterly DAES assessments in FY 2014 in the areas of schedule, performance, management, interoperability, and production.
  - DASD(SE) supported the OUSD(AT&L) DAES review of the program in August 2014.
  - In FY 2015 DASD(SE) plans to monitor the program's Physical Configuration Audit activities, which started in September 2014 and are planned to conclude in 4th quarter FY 2015.
- **Risk Assessment** – The program is executing the Risk Management Plan documented in the SEP. The program is mitigating risks and issues related to the elements of net-ready, software, implementation of planned LRIP design, logistics demonstration, and technical manual review.
- **Performance** – Verification results indicate that PIM meets 4 of 10 KPPs and 7 of 8 KSAs and is on track to meet the force protection and survivability KPPs by FRP. The program is mitigating risks to the net-ready (information assurance and JTRS radio integration) and rate of fire KPPs. Data after FRP is required to verify the two availability KPPs and the ownership cost KSA.
- **Schedule** – The program completed a MS C DAB in October 2013. The program met all March 2012 APB schedule thresholds. The program is managing risks and issues to meet thresholds established in the March 2014 APB, focusing on the critical path to the December 2016 IOT&E APB threshold. The program is on track to meet the Systems Engineering Technical Reviews in the SEP.
- **Reliability** – The SPH and CAT are on track to meet the reliability threshold requirements. During November 2013 development testing, the SPH demonstrated 128 percent of its planned reliability growth requirement for mean time between system abort, and the CAT demonstrated 162 percent of its planned reliability in the same test.
- **Software** – The program completed development qualification testing and started Formal Qualification Testing. The program conducted subsystem CDRs for the system diagnostics software and for the external software diagnostics device. These subsystem CDRs established a diagnostics software product baseline that satisfies performance specification requirements. The program accepted feedback resulting in improved design options, identification of metrics to improve software development practices, and nearly returning to plan.
- **Manufacturing** – Transition to production is on track. The builder transferred the Elgin, Oklahoma, integration facility to the prime contractor in 2014 as scheduled. The program is executing the manufacturing guidance in the approved SEP and manufacturing plan. The program is mitigating risks concerning availability of Final Drive Stiffeners and delays in First Article Tests for line-replaceable units. The first five platforms delivered will be facility test vehicles because the Final Drive Stiffeners were not manufactured to standard.
- **Integration** – The program is on track to complete all required memoranda of agreement as outlined in the SEP within required timelines. The program is executing integration and testing plans with external technical organizations and programs as outlined in the approved SEP. The program is managing risks related to information assurance and integration of JTRS-based radios. The SPH is experiencing compatibility issues with the primer and the propellant, as are the M109A6 and the M777 howitzers, when firing maximum charges. The program is working with PEO Ammunition to achieve a long-term solution.

Conclusion: The program continues to manage multiple concurrent LRIP activities but remains on track for FRP.

Data as of 4th quarter FY 2014.

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

Prime Contractor: General Dynamics C4 Systems (GDC4S)

Source: PM WIN-T

Executive Summary: WIN-T is the Army's high-speed and high-capacity communications network. WIN-T Inc 2 adds mobility to the tactical network, enabling mission command on-the-move, and provides the Warfighter with satellite and terrestrial communications. The program is an ACAT ID, achieved Initial Operational Capability in August 2013, and is executing LRIP. Reliability, maintainability, and complexity issues identified during May 2013 Follow-on Operational Test and Evaluation (FOT&E) precluded an FRP decision in September 2013. The September 2013 LRIP decision required the program to demonstrate resolution of these issues at another FOT&E (scheduled for 1st quarter FY 2015). In FY 2014, the program developed corrective actions, conducting logistics and user demonstrations and other verification activities. Risk reduction activities were ongoing at the end of FY 2014.

Mission and System Description: WIN-T Inc 2 provides mobile tactical network communications from maneuver companies, battalions, brigade combat teams, and divisions to the operational portion of the Global Information Grid. It supports limited collaboration and mission planning and enables distribution of information via voice, data, and real-time video over ground-to-ground and ground-to-satellite communications. It capitalizes on mature commercial off-the-shelf (COTS)/Government off-the-shelf technologies. WIN-T Inc 2 includes several configuration items, including Tactical Communication Nodes (TCN), Points of Presence (PoP), Soldier Network Extensions (SNE), Vehicle Wireless Packages (VWP), Network Operations and Security Centers (NOSC), and Tactical Relay-Towers (TR-T).

Systems Engineering Activities

- **Systems Engineering Plan (SEP)** – DASD(SE) approved the WIN-T Inc 2 Production and Deployment phase SEP in August 2009 to support MS C. The program plans no updates. The program is fulfilling the objectives of the SEP without waivers or deviations.
- **Requirements** – The JROC approved the WIN-T Inc 2 CPD in November 2008. In addition to approving relief from the force protection KPP, the JROC and Army have since adjusted requirements through knowledge gained during LRIP verification. At the Configuration Steering Board in September 2014, the Army directed TRADOC to review the SNE reliability requirement to align with updated operational employment data and utilization rates in order to reduce FOT&E risk. The program has an adequate trace of CPD requirements to the performance specification. The September 2013 LRIP decision directed the program to update the Army Cost Position and APB; subsequent directives by USD(AT&L) provided clarification to align the documents with revisions in quantities, schedule, and performance parameters by 1st quarter FY 2015.
- **Life Cycle Management** – The program is promoting competition by providing Army standard and COTS products to GDC4S as Government-furnished equipment through competitive awards. The program's goal is to reduce the WIN-T Inc 2 total program baseline by $362 million. The program has initiated efforts to control costs throughout the product life cycle by implementing

Data as of 4th quarter FY 2014.

regional contractor field services and by imposing a 5-year hardware refresh cycle, which provide projected savings of $608 million and $47 million, respectively.

- **Program Protection Plan (PPP)** – USD(AT&L) approved the WIN-T Inc 2 PPP in October 2012 in support of the FRP DAB. The program is executing the processes documented in the approved PPP.

Assessments

- **DASD(SE) Assessments** – DASD(SE) conducted DAES quarterly assessments in the areas of schedule, performance, management, interoperability, and production during FY 2014 and assessed reliability growth plans, corrective actions, and verification results to support the 1st quarter FY 2015 FOT&E. The program demonstrated improvements through FY 2014, though with less than 80 percent confidence in outcomes for PoP and SNE reliability. Reliability thresholds remain at risk going into FOT&E. DASD(SE) is planning a Program Support Assessment in accordance with DoDI 5000.02 to support the FRP decision review scheduled in FY 2015.
- **Risk Assessment** – The program's Risk Management Plan is current, but management of reliability risks has failed to produce expected mitigation needed for confidence in FOT&E success and the Army had to consider reducing the SNE reliability KSA metric.
- **Performance** – The program met all four KPP and two of four KSA requirements. Corrective actions for the two remaining KSAs (operational availability (Ao) and mean time to repair (MTTR)) show improvements, but evaluation of post-FOT&E test data indicates reliability thresholds remain at risk for PoP and SNE.
- **Schedule** – The program did not receive an FRP decision as scheduled in September 2013 due to reliability, maintainability, and complexity problems and missed the March 2014 APB FRP schedule threshold. To resolve this breach, USD(AT&L) directed the program to plan the FRP decision for 3rd quarter FY 2015 and submit a revised APB for approval in 1st quarter FY 2015.
- **Reliability** – Due to reliability and maintainability shortfalls, the program did not demonstrate the Ao and MTTR KSAs during the May 2013 FOT&E. The program developed and tested maintenance-related corrective actions and a reliability growth plan. The corrective actions for MTTR are executing to schedule, while Ao corrective actions for PoP and SNE are not meeting requirements with confidence.
- **Software** – WIN-T Inc 2 software sustainment efforts are on track as reflected in software metrics, increased reliability, and reduced task complexity.
- **Manufacturing** – The program has fielding challenges from production breaks due to reliability and complexity shortfalls. The program cannot procure configuration items until successful completion of FOT&E in 1st quarter FY 2015, followed by an Acquisition Decision Memorandum to authorize additional procurements. The production break will affect unit fielding currently planned in 3rd quarter FY 2016. Manufacturing processes are stable with no reliability root causes assessed to manufacturing. The program achieved FRP rates during LRIP.
- **Integration** – The program executed mitigating activities including integration with Stryker and Joint Light Tactical Vehicle design white papers. These activities reduced risks, though production verification testing did not provide evidence to support complete integration with the Stryker platform. The Army will assess Stryker integration during FOT&E.

Conclusion: The program made progress in reducing complexity, reliability, and maintainability risks. However, reliability and integration risk remains and carries into FOT&E.

Data as of 4th quarter FY 2014.

4.2 DASD(SE) Assessments of Navy Programs

Assessments are as of 4th quarter FY 2014. This section includes summaries on the following 17 programs:

- Air and Missile Defense Radar (AMDR)
- Consolidated Afloat Networks and Enterprise Services (CANES)
- CH-53K Heavy Lift Replacement Helicopter
- CVN 78 GERALD R. FORD Class Nuclear Aircraft Carrier
- DDG 51 ARLEIGH BURKE Class Guided Missile Destroyer
- Joint Precision Approach and Landing System, Increment 1A (JPALS Inc 1A)
- Littoral Combat Ship (LCS)
- MQ-4C Triton Unmanned Aircraft System (UAS)
- MQ-8 Fire Scout Unmanned Aircraft System (UAS)
- Mobile User Objective System (MUOS)
- Next Generation Enterprise Network, Increment 1 (NGEN Inc 1)
- OHIO Class Submarine Replacement (OHIO Replacement)
- P-8A Poseidon
- Remote Minehunting System (RMS)
- Ship-to-Shore Connector Amphibious Craft (SSC)
- Unmanned Carrier-Launched Airborne Surveillance and Strike (UCLASS)
- VH-92A Presidential Helicopter Fleet Replacement

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Air and Missile Defense Radar (AMDR)

Prime Contractor: Raytheon, Integrated Defense Systems

Executive Summary: AMDR is the Navy's next-generation radar system addressing ballistic missile defense (BMD) and air defense (AD) capability gaps identified in the Maritime Air and Missile Defense of Joint Forces Initial Capabilities Document (MAMDJF ICD). AMDR is an ACAT ID program in the Engineering and Manufacturing Development (EMD) phase. The program achieved MS B in October 2013. In FY 2014, DASD(SE) participated in the program technical meetings leading up to the Software Baseline Review and the System Delta Preliminary Design Review (PDR) in August 2014. The AMDR program is on track with EMD activities with software-driven schedule risk. The program will carry integration risk until systems engineering of the host combat system has matured.

Mission and System Description: AMDR will provide simultaneous sensor support of BMD and AD missions with ancillary support of surface warfare and anti-submarine warfare missions. The AMDR suite consists of an S-band radar (AMDR-S), an X-band radar, and a Radar Suite Controller (RSC). AMDR-S is a new development-phased array radar providing improved sensitivity for long-range detection and engagement of advanced threats. Initial ship sets will use the AN/SPQ-9B X-band radar currently in production. The RSC provides S- and X-band radar resource management and interface to the Aegis Combat System (CS).

Systems Engineering Activities

- **Systems Engineering Plan (SEP)** – DASD(SE) approved the AMDR SEP in March 2013 to support MS B. The program is fulfilling the objectives of the SEP without waivers or deviations. Raytheon is using an Agile software development process, and DASD(SE) supported the program to modify the SEP to align the technical reviews with the Agile development process.
- **Requirements** – The JROC approved the AMDR CDD in May 2013. The requirements are reasonable and stable. The CDD requirements are traceable to the AMDR top-level requirements, and the contractor traced the AMDR top-level requirements to their system specifications and configuration item specifications.
- **Life Cycle Management** – AMDR will be supported by the same Navy logistics infrastructure network that provides product support to current fleet radars and DDG 51 Class ships. The AMDR design includes key features to improve ease of maintenance and reduce sustainment costs and power efficiency requirements to reduce power consumption based on operations.
- **Program Protection Plan (PPP)** – USD(AT&L) approved the PPP in March 2013 to support the FY 2013 MS B. The program is continuing development of an updated PPP to support the FY 2015 Critical Design Review (CDR).

Assessments

- **DASD(SE) Assessments** – DASD(SE) participated in the Hardware Delta PDR and System Delta PDR in FY 2014 and initiated a System PDR assessment. The PDR design has

Data as of 4th quarter FY 2014.

incorporated lessons learned from the Technology Demonstration (TD) phase including performance, reliability, and producibility improvements.
  - DASD(SE) participated in the Software Baseline Review in August 2014 to establish the software baseline for the PDR assessment.
  - DASD(SE) participated in the Software Build Review (SBR) 1 in September 2014 to support the CDR assessment.
  - In FY 2015 DASD(SE) plans to complete the PDR assessment after the program closes the System Delta PDR critical actions. DASD(SE) also will participate in the Hardware CDR, the System CDR, SBR 2, and Developmental Testing (DT-2) Test Readiness Review.
- **Risk Assessment** – The program is executing its risk management program documented in the Risk Management Plan and SEP. The program is working to mitigate risks in the ship integration, ballistic missile discrimination, spectrum allocation, and software development areas.
- **Performance** – The design and performance analysis presented by the contractor during the System Delta PDR indicate that the six KPPs and nine KSAs will be achieved during the EMD phase. At each Systems Engineering Technical Review, the contractor also presented their analysis that the current system design meets the Technical Performance Measures established in the SEP.
- **Schedule** – The program achieved MS B in October 2013, conducted the System Delta PDR in August 2014, and is on track to meet the thresholds established in the October 2013 APB with risk to schedule margins to complete MS C. The program is executing all Systems Engineering Technical Reviews per the revised SEP.
- **Reliability** – The program is on track to meet the reliability requirements in the AMDR CDD. The program based the reliability growth curve on mean time between failure of line-replaceable units. DASD(SE) is working with the program to mature the reliability growth curve and to address embedded software reliability.
- **Software** –The contractor estimated a software size of 481,000 effective source lines of code delivered in four builds over a 32-month software development timeline, using Agile software development principles, within a 48-month period of performance for EMD. DASD(SE) parametric analysis shows that the contractor will need to perform well above average productivity rates to complete this amount of software development within cost and schedule. This presents schedule risk for delivering fully functional software builds to support the DT-3 event planned to inform the MS C decision.
- **Manufacturing** – The program is on track with manufacturing requirements appropriate for this phase of the program. The contractor is delivering components for the hardware integration test facility. The contractor has incorporated lessons learned from the TD phase prototype into the CDR designs to support the manufacturing effort for the EMD system and is predicting to meet the planned production yield rates.
- **Integration** – DASD(SE) previously identified risk in the integration of the AMDR, ship, and CS. The program is coordinating with associated program offices and leading CS interface and Radar Ship Integration Working Groups per the approved SEP. The program has identified risk with the AMDR to CS interface development schedule to support the software development and has developed a mitigation plan. The initial shipboard functional arrangement has been defined. The program has limited margin on allocated weight and is closely tracking design changes. The program is working with other stakeholders to support demonstration of the AMDR to CS interfaces to support the planned FY 2017 LRIP decision.

Conclusion: The AMDR program is on track with EMD activities with software-driven schedule risk. The program will carry integration risk until the systems engineering of the host combat system has matured.

Data as of 4th quarter FY 2014.

Consolidated Afloat Networks and Enterprise Services (CANES)

Prime Contractor: Northrop Grumman Information Systems, Defense Systems Division

Executive Summary: CANES is an information technology system that provides secure network services for Navy ships and maritime operations centers. The program is a Navy ACAT IAM in the Production and Deployment phase and is fielding Limited Deployment (LD) systems. The program achieved MS C in FY 2013. In FY 2014, DASD(SE) participated in a MAIS Critical Change Review (CCR) and a DAES review to assess the program's progress toward the Full Deployment Decision (FDD). From these reviews, the USD(AT&L) approved a new APB and fielding plan based on incremental performance assessments. DASD(SE) participated in a Peer Review of the production RFP, which led to a contract award in August 2014 and which is now under protest. DASD(SE) continues to participate in the program's system engineering and technical review events to track development and fielding of ship systems and the next software baseline.

Mission and System Description: CANES consolidates existing afloat networks and provides a Common Computing Environment (CCE) that supports network operations in the tactical domain. The CCE architecture scales in configuration to support Navy ships (unit-level, force-level, and submarines) and maritime operations centers. Force-level systems are integrated with Afloat Core Services software to support a service-oriented architecture environment for hosted applications. CANES operates across multiple security enclaves and will increase reliability, security, and interoperability with other applications and services while reducing logistics costs.

Systems Engineering Activities

- **Systems Engineering Plan (SEP)** – DASD(SE) approved the SEP in August 2014. The program is fulfilling the objectives of the SEP without waivers or deviations. The program is executing systems engineering activities, including an expanded set of metrics, to develop and field ship systems and the next software baseline.
- **Requirements** – The JROC approved the CDD in October 2008 to support MS B. In October 2012, the Office of the Chief of Naval Operations confirmed requirements were reasonable and stable to support MS C in December 2012. The CDD informs the architecture, functional, and item specifications for the system architecture and configuration item structure, which are part of the Technical Data Package in the production RFP. As part of the MAIS CCR, the Vice Chairman of the Joint Chiefs of Staff signed JROC Memorandum 022-14, which validated all KPPs and designated the CANES program essential to national security.
- **Life Cycle Management** – Under the USD(AT&L) Better Buying Power initiative for controlling costs throughout the life cycle, the program is continuing its competitive contracting strategy to reduce costs by $230 million over the FYDP. The program also offers additional potential savings to other programs by providing the network infrastructure that hosts their applications.
- **Program Protection Plan (PPP)** – USD(AT&L) approved the PPP in June 2014. The program plans to update the PPP for the FDD in FY 2015.

Data as of 4th quarter FY 2014.

Assessments

- **DASD(SE) Assessments** – DASD(SE) participated in a MAIS CCR, a DAES review, and a Phase II/III Peer Review of the CANES production RFP. The CCR and the DAES review resulted from the program's breach of the FDD date, which occurred primarily because of changes to ship availability schedules. Key findings included the misalignment between performance assessments and fielding decisions, and long installation times in initial ships. The program revised its fielding plan to be contingent on favorable performance assessments and has reduced installation times. Findings from the Peer Review included recommendations to strengthen source selection criteria to reduce the risk of losing a protest. Navy awarded the contract in August 2014; the contract is now under protest.
- **Risk Assessment** – The program is executing its Risk Management Plan, including convening monthly Risk Review Boards to identify, analyze, and mitigate program risks. The program uses an enterprise risk management tool to standardize risk assessment and reporting consistent with Navy policy and is working to mitigate risks in the integration and schedule areas.
- **Performance** – The program is on track to demonstrate compliance of unit-level systems with the program's three KPPs upon completion of Initial Operational Test and Evaluation (IOT&E), expected in early FY 2015. The program plans to demonstrate full compliance of force-level systems with the 3 KPPs, 69 KSAs, and 10 Technical Performance Measures by Follow-on Operational Test and Evaluation (FOT&E) later in FY 2015.
- **Schedule** – The program is executing the fielding plan approved at the DAES review in May 2014. With the production award of August 2014 under protest, the program may incur a delay in fielding additional systems if the protest is not resolved by December 2014. The program is on track to achieve the initial CANES system for submarines in late FY 2015 and the next software baseline in early FY 2016. The program's CCR APB was approved in June 2014.
- **Reliability** – The program is on track to meet the hardware reliability requirement by the FDD. CANES exceeded the mean time between failure threshold in FY 2012 and continues to exceed the threshold during the IOT&E. The program plans to continue collecting reliability data leading up to the FOT&E, consistent with the hardware reliability growth curve in the SEP.
- **Software** – The CANES software baseline is composed of commercial off-the-shelf (COTS) software components integrated with software scripts. The program tracks COTS software longevity times, product replacement counts, and software patch counts to assess software maturity and uses consumption metrics for processing, memory, and storage to track software size and performance. The program has fielded the current software baseline and is on track to develop and field the next software baseline in early FY 2016.
- **Deployment** – The program continues to field systems in accordance with the fielding plan approved at the DAES review in May 2014. The program has completed 10 installations and has 15 more in progress. However, if the protest of the production award extends past December 2014, there is potential for delay in fielding additional systems.
- **Integration** – The CANES system integrates COTS network components to provide a platform for hosted software applications to interoperate. The program has a production baseline and is fielding LD systems in operational ships. The program is currently integrating the submarine configuration and the next system software baseline, and uses Enterprise Problem Reports to track defects across the enterprise. The program is on track to field the submarine configuration in late FY 2015 and the next software baseline in early FY 2016.

Conclusion: The program is working to resolve a protest of the production award before December 2014 to allow for continued execution of the approved fielding plan leading up to the FDD in FY 2015. DASD(SE) continues to participate in the program's system engineering and technical review events to track development and fielding of ship systems and the next software baseline.

Data as of 4th quarter FY 2014.

CH-53K Heavy Lift Replacement Helicopter

Prime Contractor: Sikorsky Aircraft Corporation

Executive Summary: The CH-53K program will provide an improved U.S. Marine Corps heavy-lift capability. The CH-53K is a build-new, evolutionary update of the CH-53E design that meets Marine Air-Ground Task Force vertical heavy-lift requirements beyond 2025. The program is an ACAT ID in the System Development and Demonstration phase. The program achieved MS B in December 2005. DASD(SE) maintained continuous engagement with the program in FY 2014 by participating in a Ground Test Vehicle (GTV) Test Readiness Review (TRR) and a DAES review, among others. The program is addressing adverse test results through mitigation strategies and redesign, where needed, and minimizing schedule impact where practical.

Mission and System Description: The CH-53K will internally transport passengers, litters, cargo, and vehicles, and includes provisions for weaponry. For external lift of cargo, the CH-53K has three independent cargo hooks and is capable of lifting three times the capacity of the CH-53E under high/hot conditions. The aircraft is a dual-piloted, multi-engine helicopter, incorporating the latest vertical lift, survivability, and avionics technologies. It is equipped with a seven-bladed main rotor system, a four-bladed canted tail rotor, and three GE38-1B turboshaft engines.

Systems Engineering Activities

- **Systems Engineering Plan (SEP)** – DASD(SE) approved the SEP in December 2011. The program is fulfilling the objectives of the SEP without waivers or deviations. The program will update the SEP to support MS C in FY 2016.
- **Requirements** – The JROC approved the Operational Requirements Document (ORD) in November 2005. A CPD will be developed to support MS C and will reflect the program's capabilities roadmap. The program requirements are reasonable and stable, and the program has taken positive steps to prevent requirements growth. The ORD requirements are traced to the contractor system specification as verified at the Critical Design Review. The Capabilities IPT (CIPT), which meets monthly, serves as a Configuration Steering Board to adjudicate any identified mission-related issues or changes to program requirements.
- **Life Cycle Management –** Program Better Buying Power initiatives include implementing enhancements to risk and opportunity management by assigning a dollar amount to risk mitigation and opportunity achievements, establishing paths to support should-cost/affordability execution. The CH-53K design efforts have included an emphasis on design for maintainability and reliability that should lead to improvements in readiness and reductions in support cost. The Government awarded a contract in July 2014 to provide engines as Government-furnished equipment for the next four development aircraft at a projected life cycle savings in excess of $9.6 million. Three of the seven KPPs (reliability, logistics footprint, and sortie generation rate) are logistics based, reflecting the program's focus on the total life cycle affordability.
- **Program Protection Plan (PPP)** – DASD(SE) approved the PPP in December 2011 as an attachment to the SEP. The program is updating the PPP to support MS C.

Data as of 4th quarter FY 2014.

Assessments

- **DASD(SE) Assessments –** DASD(SE) conducted three Systems Engineering Working Integrated Product Team (SE WIPT) meetings and participated in a DAES review, the GTV TRR, a prime contractor program review, and monthly CIPT meetings to evaluate technical progress and risk. The SE WIPTs assessed subsystem qualification failures and associated mitigation plans and program impacts.
  - Subsystem qualification failures (transmission gears, tail rotor drive shaft, oil coolers, and electrical power supply) are being mitigated via design changes, requalification, and a prioritized retrofit schedule. Mitigation activities are planned to minimize impact to the production and flight test schedule.
  - In FY 2015 DASD(SE) will assess subsystem qualification, Engineering Development Model assembly, subcontractor technical performance, software release and verification activities, and full system testing (engines, rotors, hydraulics, electrical) of the GTV anchored to a test fixture and during early flight testing.
- **Risk Assessment** – The CH-53K program is executing the risk, issue, and opportunity management process documented in the SEP. The program is mitigating risks in the areas of subsystem qualification failures, a lack of manufacturing process maturity, and associated impacts to parts delivery necessary to support flight test. Technical risks remain manageable with appropriate mitigation strategies in place.
- **Performance** – The program has 7 KPPs and 24 Technical Performance Measures. The program predicts it will meet or exceed KPP performance levels by FRP. Engine performance exceeded specification shaft horsepower requirements by almost 10 percent in the test cell.
- **Schedule** – The program completed a MS B in December 2005, and MS C is scheduled for 4th quarter FY 2016. USD(AT&L) approved a revised Acquisition Strategy in 2012 and a revised APB in April 2013 after a series of breaches starting in 2009. The new APB schedule is at risk due to the unexpected volume of qualification test failures and manufacturing challenges.
- **Reliability** – The program is executing its approved reliability growth plan. Initial data collection has begun on the GTV and will continue in flight test. Current program analysis predicts reliability performance will exceed threshold requirements by the FRP decision.
- **Software** – The program has 7 million software lines of code, 64 percent reuse with 2 million lines of new development. Software requirements generation, development, verification, and validation processes are mature and are being executed according to the Software Development Plan. Installation of first flight software on the GTV provided early discovery of some flight critical issues, all of which have corrections that are on track for delivery in 2nd quarter FY 2015 to support first flight.
- **Manufacturing** – The four Engineering Development Models are on track to support the program schedule. The program has a strong focus on producibility, lean manufacturing, modeling, and modularization. The manufacturing deficiencies revealed during component-level qualification and verification activities may reduce initial flight test envelope and impact LRIP. The gearbox housing subcontractor continues to experience quality and throughput challenges.
- **Integration** – The program's use of mature technologies with defined interfaces and an aircraft System Integration Laboratory enabled the early integration and analysis of key subsystems. There are no known interoperability risks or issues.

Conclusion: The CH-53K program is on track to meet all technical requirements through its use of a robust set of metrics and technical processes to assess progress and focus management attention. The program is addressing adverse test results through mitigation strategies and redesign, where needed, and minimizing schedule impact where practical.

Data as of 4th quarter FY 2014.

CVN 78 GERALD R. FORD Class Nuclear Aircraft Carrier

Prime Contractor: Huntington Ingalls Industries

Executive Summary: CVN 78 is a Navy ACAT ID program, the lead ship of the FORD Class. The ship will be able to embark in excess of 75 aircraft, and its larger flight deck will enable more efficient aircraft movement and launching capability than its predecessor, the NIMITZ Class Carrier. The program achieved MS B in April 2004 and is currently in the Engineering and Manufacturing Development (EMD) phase (pre-MS C) with MS C scheduled for FY 2015. DASD(SE) participated in Reliability Growth working groups for the development of the Electromagnetic Aircraft Launch System (EMALS) and Advanced Arresting Gear (AAG). The program has addressed many schedule and production issues and is on track to meet its goal for ship delivery in 2nd quarter FY 2016.

Mission and System Description: CVN 78's mission is to provide credible, sustainable, independent forward presence during peacetime without access to land bases. The ship will operate as the cornerstone of a joint and/or allied maritime expeditionary force in response to any crisis and carry the war to the enemy through joint multi-mission offensive operations. The ship can operate and support aircraft in attacks on enemy forces ashore, afloat, or submerged, while remaining independent of forward-based land facilities. The new flight deck design and island relocation allows for more efficient aircraft movement, weapons loading, refueling, and aircraft spotting, which results in a 33 percent improvement in the aircraft sortie generation rate over previous class aircraft carrier demonstrated performance.

Systems Engineering Activities

- **Systems Engineering Plan (SEP)** – DASD(SE) approved the MS B SEP in January 2007. The program is executing the processes documented in the approved SEP and is fulfilling the objectives of the SEP without waivers or deviations. The program is updating the SEP for the CVN 78 program MS C/CVN 79 construction award DAB in FY 2015 and adding an annex to address reliability growth.
- **Requirements** – The JROC approved the Operational Requirements Document (ORD) in June 2007. The design requirements are reasonable, stable, and meet the ORD requirements for its projected operational environment.
- **Life Cycle Management** – The program improved internal management processes by establishing a new program office in 2012, PMS 379, that focuses solely on the procurement of follow-on hulls, CVN 79 and CVN 80. The program will continue to use a systems engineering approach to drive affordability into CVN 79 and CVN 80 by implementing lessons learned in CVN 78.
- **Program Protection Plan (PPP)** – The Program Management Office (PMO) developed and approved the PPP prior to 2008, when review and approval by the appropriate Milestone Decision Authority was codified in DoDI 5200.39. The program subsequently developed a Plan

Data as of 4th quarter FY 2014.

of Action and Milestones with an incremental approach to updating the document to support CVN 78 program MS C/CVN 79 construction award DAB in FY 2015, including an Acquisition Cyber Security appendix.

Assessments

- **DASD(SE) Assessments** – DASD(SE) participated in a Systems Engineering Working Integrated Product Team to review the SEP, PPP, and systems engineering practices. DASD(SE) also completed quarterly DAES assessments of the program schedule, performance, management, interoperability and production.
- **Risk Assessment** – The program is executing its risk management program as documented in the SEP. Mitigation activities address overall ship completion schedule risk and technical risks associated with EMALS, AAG, and the Dual Band Radar. Many risks associated with the first-time operation of these new systems and components have been retired with the light off and initial operation of the equipment.
- **Performance** – CVN 78 interior hull and integral space construction, supporting major systems, remain on track. The program is using its planned sequence of analyses, modeling, and simulation to verify meeting its 9 KPPs and 19 KSAs as documented in the SEP.
- **Schedule** – The program has completed MS B and is currently in the EMD phase, with MS C planned for FY 2015. The CVN 78 construction schedule was refined due to lead ship technology development, material procurement, and shipyard construction performance. The program is on track to deliver CVN 78 in 2nd quarter FY 2016 in accordance with the APB.
- **Reliability** – The program is developing an annex to the existing MS B SEP to address reliability growth curves, the development of a Reliability Growth Plan, and a failure reporting, analysis, and corrective action system for the EMALS and the AAG. Reliability, availability, and maintainability calculations will include systems with operational availability and reliability requirements as defined in the program's ORD.
- **Software** – The Ship Self-Defense System combat management system is in development for the CVN 78 class. The Combat System LAN configuration is in development to support the goal of open, modular, and interoperable combat management systems.
- **Manufacturing –** The program is on track with its manufacturing requirements for the present construction phase to deliver CVN 78 in the 2nd quarter FY 2016 in accordance with the current APB. Shipyard manufacturing capabilities and schedules are in line with program office plans. As of December 2014, overall ship construction is over 85 percent complete.
- **Integration –** The program is adhering to initial system integration strategies, documented in the SEP. The successful installation of a finalized AAG system and related flight deck test events onboard ship during the final construction phase and sea trials pose the greatest potential impact affecting post-delivery aircraft operations.

Conclusion: The CVN 78 program re-baselined its IMS and production schedule in March 2013, which shifted ship's launch to November 2013 and ship delivery to 2nd quarter of FY 2016. In transitioning from construction to test-centric efforts, the shipbuilder has commenced turnover of completed systems and compartments to the crew (over 34%; ahead of contractual requirements) and has begun retiring the backlog of incomplete work packages. The ship remains on track to deliver in 2nd quarter FY 2016.

Data as of 4th quarter FY 2014.

DDG 51 ARLEIGH BURKE Class Guided Missile Destroyer

Prime Contractors: General Dynamics, Bath Iron Works; Huntington Ingalls Industries

Executive Summary: DDG 51 is a Navy ACAT ID multi-mission destroyer in the Operations and Support phase. DASD(SE) participated in the Navy Flight III Total Ship Design Review, worked with the Technical Director in writing the program's first SEP (for Flight III), and helped align its Risk Management Plan with DoD guidance. PMS 400D is in the early stages of executing Flight III of the program.

Mission and System Description: The DDG 51 is a multi-mission guided missile destroyer designed to operate offensively and defensively, independently, or in carrier strike groups (CSG), expeditionary strike groups (ESG), and missile defense action groups in multi-threat environments that include air, surface, and subsurface threats. These ships will respond to low-intensity conflict/coastal and littoral offshore warfare (LIC/CALOW) scenarios as well as open ocean conflict providing power projection, forward national presence, and escort operations at sea.

Systems Engineering Activities

- **Systems Engineering Plan (SEP)** – DASD(SE) approved the SEP in May 2014. The program is executing the processes documented in the approved SEP and is fulfilling the objectives of the SEP without waivers or deviations. The program is maintaining strict configuration management in the incremental upgrades of the restarted Flight IIA production line and in the parallel effort to develop the Flight III Developmental Engineering Change Proposals (ECP). Flight III ship subsystem Preliminary Design Reviews (PDR) and Critical Design Reviews (CDR), and the Contract Design PDR, are scheduled for FY 2015, to be executed using the current SEP.
- **Requirements** – Forty-five Flight IIA ships have or will be built to the Operational Requirements Document (ORD) signed in April 1994. JROC approved the DDG 51 Flight III CDD in October 2014. The requirements for Flight III are reasonable and stable and are being executed to well-established configuration and risk management processes. The Flight III CDD requirements are traceable to the current technical baseline. The arrangements modeling, structural analysis, and distributed systems analyses represent a well-balanced ship design. Navy conducted a Total Ship Design Review in June 2014 and the System Functional Review in October 2014. The Flight III PDR is planned for 4th quarter FY 2015.
- **Life Cycle Management** – The program is taking advantage of the hull, mechanical, and electrical (HM&E) advances made by other ship acquisition programs by adapting the DDG 1000 electrical generation and distribution system and CVN 78 chilled water equipment, reducing the overall logistic footprint and training requirements. The new electromechanical anchor windlasses eliminate the excessive maintenance required by the previous hydraulic design. In addition, the program is working across product lines with Program Executive Office Integrated Warfare Systems (PEO IWS) to support the Modular Open Systems Approach. The program is executing strict configuration management to introduce these changes into a Flight III ship design

Data as of 4th quarter FY 2014.

that will be a natural follow-on to the evolving restarted Flight IIA design rather than adding the changes to a static image of the previously built Flight IIA ships. This approach provides controllable design and production changes. The design team expects to meet the Flight III annual energy KPP, the first of this class to have that requirement.

- **Program Protection Plan (PPP)** – The program does not have a PPP approved by the Milestone Decision Authority but is planning to conduct an overarching Program Protection Platform criticality analysis, which will prioritize the subsystems that will be in Flight III based on its missions. The criticality analysis will identify systems that require their own PPP.

Assessments

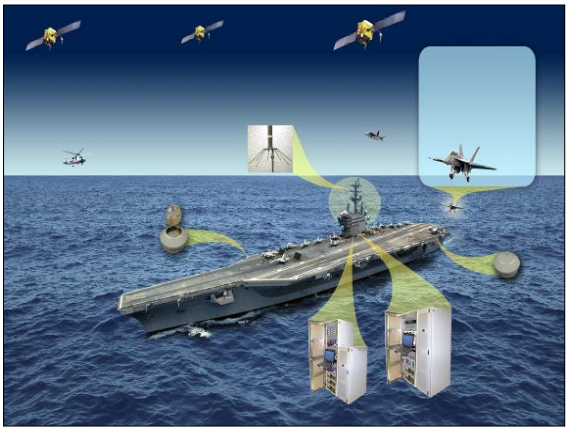
- **DASD(SE) Assessments** – DASD(SE) participated with PMS 400D and SEA 05D in conducting a Total Ship Design Review (TSDR) in June. The requirements are defined, verifiable, and traceable from the CDD to the technical design baseline. The program has documented and maintains configuration control for the functional baseline and its supporting analyses and is mitigating all known risks in accordance with the program's Risk Management Plan. The TSDR fulfilled the systems engineering function of the Navy's internal Gate 4 and Gate 5 reviews, executed before the June 2014 DAB to authorize release of the RFP to complete the Flight III ECP package. The System Functional Review, the electrical system PDR and CDR, and the Contract Design PDR are scheduled for FY 2015.
- **Risk Assessment** – The program is executing its risk management program, as documented in the current SEP and the program Risk Management Plan. The program is working to mitigate the risks associated with HM&E upgrades needed to support the Air and Missile Defense Radar (AMDR) space, weight, power, and cooling requirements and is leveraging AMDR verification activities to execute ship system performance assessments.
- **Performance** – The Flight IIA meets all assigned requirements. The Flight III program expects to meet all requirements by Initial Operational Test and Evaluation.
- **Schedule** – The program completed the Flight III ECP DAB in June 2014. The program met all May 2011 APB thresholds. The most recent APB milestone was Initial Operational Capability of the capability to launch Evolved SeaSparrow Missile in June 2004. The program is on track to meet the Flight III contract award DAB in FY 2016. The controlling factor is the development schedule for AMDR. If the appropriate level of technical detail is not available, the Flight III contract modification will be delayed until 2017.
- **Reliability** – Flight IIA is currently meeting all of its reliability requirements. The Navy is testing all Flight III newly designed and modified subsystems to ensure their designs support the ship's reliability KPP. The program office will establish a Flight III FRACAS (failure reporting, analysis, and corrective action system) for reliability.
- **Software** – Ship-specific software for DDG 51 is limited to its Engineering Control System, which is mature for Flight IIA. The DDG 51 program office is leveraging Flight IIA software for Flight III and from other programs that have provided modified hardware.
- **Manufacturing** – Both shipyard schedules reflect a loss of learning associated with the production gap; however, both yards are working toward recovering schedule and are expected to show improvement in FY 2015.
- **Integration** – The program's primary engineering effort for Flight III is integrating the AMDR and supporting HM&E systems. This program is completing the effort in conjunction with PEO IWS 1.0 and PEO IWS 2.0 and is on track to meet the current schedule.

Conclusion: The DDG 51 program continues to deliver ships consistent with the Flight IIA ORD and is expected to do so in accordance with the Flight III CDD.

Data as of 4th quarter FY 2014.

Joint Precision Approach and Landing System, Increment 1A (JPALS Inc 1A)

Prime Contractor: Raytheon, Network Centric Systems Division



Executive Summary: JPALS Inc 1A is an ACAT ID program in the Technology Maturation and Risk Reduction phase that will provide a Global Positioning System (GPS)-based precision approach and landing capability for JPALS-equipped manned aircraft at sea. The program experienced a critical Nunn-McCurdy (NM) breach and was recertified in June 2014; DASD(SE) confirmed the NM root cause was not technical and assessed that the technical plans and management processes are adequate to support the restructured program. Efforts to complete the development, trade studies, and risk reduction efforts are on track to begin in FY 2015.

Mission and System Description: The JPALS will safeguard the future precision approach and landing capability for any JPALS-equipped aircraft (e.g., F-35 Joint Strike Fighter and Unmanned Carrier-Launched Airborne Surveillance and Strike (UCLASS)) during operations at sea in virtually any weather condition. The restructured program will provide the continued development, integration, installation, and test of sea-based JPALS on all large-deck ships.

Systems Engineering Activities

- **Systems Engineering Plan (SEP)** – DASD(SE) approved the Inc 1A SEP in December 2007 to support the Inc 1A MS B in July 2008. The program reviewed, updated, and revalidated the SEP as part of the preparation for program Systems Engineering Technical Reviews. DASD(SE) provided comments to support a planned 2014 SEP revision. The program is fulfilling the objectives of the revised SEP without waivers or deviations. The next SEP update will support the FY 2016 MS B for the restructured JPALS program.
- **Requirements** – The JROC approved the Inc 1A CDD in March 2007 with four KPPs. The program requirements are reasonable and stable. The Inc 1A Test Readiness Review in FY 2013 established the traceability of requirements to system performance.
- **Life Cycle Management** – The Inc 1A Critical Design Review (CDR) included the life cycle support analysis as a design consideration and enabled design trade-offs. The initial product baseline is 80 percent commercial off-the-shelf with reduced manufacturing risk. The remaining 20 percent of the components and assemblies, including new and modified items, have completed designs and preliminary Manufacturing Readiness Assessments. The maintainability KSA, defined as mean corrective maintenance time, is on track to meet requirements.
- **Program Protection Plan (PPP)** – The JPALS program manager approved the Inc 1A PPP in October 2007. The next PPP update will support the FY 2016 MS B for the restructured JPALS program.

Assessments

- **DASD(SE) Assessments** – DASD(SE) supported a NM Review to assess the JPALS technical maturity and systems engineering processes. The DASD(SE) NM assessment confirmed the NM

Data as of 4th quarter FY 2014.

was not the result of deficiencies in engineering plans or execution. DASD(SE) concluded that the program systems engineering processes for risk management, configuration management, requirements, and verification are adequate to support the completion of the restructured program.
  - DASD(SE) assessed risk execution as excellent in five areas of implementation.
  - The program successfully leverages the 24 Technical Performance Measures (TPM) in the SEP to continually assess technical progress to plan.
  - FY 2015 DASD(SE) engagements are contingent on the replan of the program schedule.
- **Risk Assessment** – The program is executing its risk management program documented in the SEP. The program is working to mitigate risks in the F-35 certification, F-35/UCLASS schedule, and end-to-end verification areas.
- **Performance** – Based on a February 2014 Inc 1A System Verification Review (SVR)-like event, all four Inc 1A KPPs and five KSAs remain on track to complete Navy, Commander Operational Test and Evaluation Force Letter of Observation (LOO). The Inc 1A completed the shipboard portion of the Operational Assessment in December 2013. The contractor successfully completed a proof of concept demonstration of the auto-land capability with 70 hands-free precision approaches onboard CVN 71. This demonstration greatly reduced the risk for the auto-land capability for the restructured JPALS program.
- **Schedule** – Program execution is on track to begin in FY 2015. Technical planning for the JPALS program will include quarterly schedule risk assessments to identify high-risk areas, impacts, and opportunities for mitigation. The Integrated Master Schedule is pre-decisional.
- **Reliability** – The system reliability and maintainability criteria parameters are on track, with corresponding TPMs, to exceed the performance requirement. The JPALS operational reliability requirement, defined as mean time between operational mission failure, is projected to meet the threshold requirement.
- **Software** – The JPALS Inc 1A software is complete and implemented to support the LOO. Future software development for a follow-on program is pending the outcome of JPALS auto-land risk reduction and update to the CDD to support a FY 2016 MS B.
- **Manufacturing** – The Inc 1A program delivered all eight Engineering Development Module units and the four Air Vehicle Test Kit units on schedule. The NM Acquisition Decision Memorandum deferred the production phase on Inc 1A to align with the future acquisition of the auto-land capability for the F-35 and UCLASS.
- **Integration** – The Inc 1A program completed shipboard integration on CVN 77. The program reduced integration risk with the use of the duplicate string of shipboard infrastructure (equipment and network) in the landing system test facility and Patuxent River Naval Air Station. Derived requirements for F-35 and UCLASS integration are pending completion of the trade studies.

Conclusion: The JPALS risk reduction efforts to support the F-35 and UCLASS are on track to begin in FY 2015. DASD(SE) assesses the program plans and processes as adequate to support the JPALS program.

Data as of 4th quarter FY 2014.

Littoral Combat Ship (LCS)

Prime Contractors:

- Freedom Variant – Lockheed Martin/Marinette Marine (LCS 1 - 23 odd hulls)
- Independence Variant – General Dynamics/Austal USA (LCS 2, 4), Austal USA (LCS 6 - 24 even hulls)
- Mission Modules – Northrop Grumman Corporation, Integrated Systems

Executive Summary: LCS is a Navy ACAT ID high-speed combat vessel designed for littoral operations. The program is in LRIP. The LCS Mission Modules (LCS MM), a Navy ACAT IC program, provides Mission Package (MP) systems to give LCS its warfighting capability. DASD(SE) participated in an LCS in-depth technical review, focused on ship construction and MP integration status and risk. The LCS program has 12 ships under construction, four ships in pre-production, and continues to improve integration and effectiveness with installed MPs for the four ships previously delivered and in Fleet service. The LCS and LCS MM programs have formalized relationships and processes to manage a complex system of systems, thereby delivering required capabilities to the fleet. Installing the MPs presents unique challenges, but the program is managing risks and delivering quantities as planned.

Mission and System Description: LCS is a modular, focused-mission warship designed to meet Fleet requirements in the littoral region. LCS consists of two distinct ship designs: the monohull Freedom variant and the trimaran Independence variant. The LCS core systems provide for ship self-defense; navigation; command, control, communications, computers, and intelligence (C4I); and other warfare and ship control capabilities common to all mission areas. LCS MPs provide modular, interchangeable capability in one of three primary mission areas: mine countermeasures (MCM), surface warfare (SUW), and anti-submarine warfare (ASW). The LCS MM program procures and deploys the MMs that are embarked on the LCS platform to provide these capabilities along with the aircraft, crew, and support equipment that form the complete MP.

Systems Engineering Activities

- **Systems Engineering Plan (SEP)** – DASD(SE) approved the LCS MS B SEP in July 2010. The LCS MM program has a Service-approved SEP updated in June 2013 to support MS B. The programs are fulfilling the objectives of the SEPs without waivers or deviations.
- **Requirements** – The JROC validated the LCS Flight 0+ CDD dated June 2008, which contains requirements for both LCS and LCS MM. The requirements are reasonable and stable. The Navy is issuing phased CPDs that delineate requirements for each LCS MM phase. A joint LCS/LCS MM Interface Control Document provides detailed requirements to install and host the MPs.
- **Life Cycle Management** – The LCS program seeks to reduce overall life cycle costs. Increased automation enables reduced operational manning. The Navy increased the core crew to 50 sailors per hull to support unanticipated onboard maintenance demands and to ease crew fatigue. The Mission Package Support Facility (MPSF) provides configuration management, maintenance, and logistic support for the SUW, MCM, and ASW MMs. The MPSF collects

Data as of 4th quarter FY 2014.

maintenance and operational metrics to inform MM planning and upgrades. The Navy continues improving the process to swap and recertify MPs to minimize future life cycle costs.

- **Program Protection Plan (PPP)** – The LCS program developed a draft PPP for MS C and plans to develop an updated PPP for the FRP DAB review. ASN(RDA) DASN(RDT&E) approved the LCS MM PPP in June 2013.

Assessments

- **DASD(SE) Assessments** – DASD(SE) participated in an in-depth technical review for the combined LCS and LCS MM programs as directed by the USD(AT&L). The reviews allowed the program managers to provide a status update of the integrated LCS and MM program, and to discuss technical risks and issues as the program matures. The LCS production schedule is stabilizing at both shipyards, with increased confidence of future ship delivery. The MPs provide the focused warfighting capability on each ship. Post-delivery installation and integration of MPs on each ship have been a challenge but are expected to improve as more MPs are delivered.
  - DASD(SE) also participates in quarterly Mission Systems Ship Integration Team (MSSIT) meetings, which address and resolve interface issues between and within the LCS and MPs. The program plans to resolve most integration issues with the MCM MP to support the Initial Operational Capability of LCS 2 in FY 2015.
- **Risk Assessment** – LCS and LCS MM programs have identified technical risks in the areas of shock qualifications, watercraft handling, MP integration, and MCM performance. The programs are executing to the risk management plans summarized in their SEPs. Technical risks associated with the development of future MP increments, especially the long-range surface-to-surface missile module, pose integration challenges associated with inserting new capabilities into the MPs. PEO LCS established a joint working group with the LCS, LCS MM, and Remote Minehunting System program offices to identify and mitigate risks associated with MP integration. The programs have established mitigation plans to retire all MCM critical technical risks by FY 2017 in time to support MP verification and deployment.
- **Performance** – LCS has demonstrated five of 10 KPPs and all 7 KSAs. It is planning to demonstrate the remaining KPPs by FY 2018, as assets become available. The LCS MM program plans to incrementally achieve all threshold KPPs for MCM and SUW MPs, demonstrating full capability (all KPPs met) with MCM Increment 4 in FY 2020 and SUW MP Increment 3 in FY 2017. The Deep Volume Focused Minehunting KPP presents the greatest challenge for the MCM MP. The AN/AQS-20A towed sonar and the Airborne Laser Mine Detection System programs are executing preplanned product improvements to enhance their capabilities in the water column. The SUW MP is on track to meet performance requirements with addition of the long-range Surface-to-Surface Missile at Increment 3. The Navy is evaluating the desired capability to meet the extended range KSA in SUW MP Increment 4. The ASW MP prototype has demonstrated a high likelihood of meeting all four ASW MP KPPs.
- **Schedule** – To date, the LCS program has met all April 2011 APB threshold dates, with the exception of LCS 2 Initial Operational Test and Evaluation (IOT&E). The LCS 2 IOT&E will be delayed by 14 months due to availability of required assets. The LCS MM program has met all June 2013 APB threshold dates and is on track to meet remaining dates. LCS continues to experience shipyard delays due to manpower constraints and rework issues. However, the construction schedule at both shipyards is stabilizing as the issues are being addressed, which will allow more accurate ship delivery estimates.
- **Reliability** – The LCS program predicts materiel reliability to be 109 percent of the requirement. The program established a FRACAS (failure reporting, analysis, and corrective action system) to identify root causes and initiate corrective actions. The LCS MM program has a comprehensive

Data as of 4th quarter FY 2014.

reliability, availability, and maintainability modeling and analysis report for the MPs. The LCS MM program predicts that all three MP types will meet their availability and reliability requirements.

- **Software** – High-priority software defects exist for multiple LCS shipboard systems. The shipbuilder is resolving the issues within the construction contract and expects to retire the defects in 2015 to support the next scheduled builder's sea trials. The LCS MM SEP and the Software Management Plan provide metrics for all software developed under the MM program. Migration of the MP computing environment (MPCE) to a service-oriented architecture (SOA) is the largest software development effort. The SOA will provide a common software architecture baseline for all MCM, SUW, and ASW MP application software (MPAS). It will also facilitate LCS/LCS MM integration. The program will deliver the initial SOA increment with ASW MPAS in FY 2015, with additional software development in FY 2016 to support MPCE 2.0. The program will produce incremental software build cycles as MPs change and mature over the life of the program.
- **Manufacturing** – The award of the Block Buy contracts increased the build rate at each shipyard from one to two ships per year, which initially challenged the manufacturing capacity of the shipyards. Labor availability and production efficiency were major contributors to delivery delays at both shipyards. Each shipyard has since achieved significant increases in manpower. Facility upgrades, increased manning, and learning efficiencies have all contributed to stabilizing the front end of the LCS production cycle. The Navy plans to accept delivery of four ships per year. LCS MM is on track for timely delivery of MPs to support ship deployments.
- **Integration** – The major development efforts involve the integration of hardware and software for each MP on each ship. Future increments for each of the MCM and SUW MP add unique mission systems, to include watercraft and aircraft to each ship. The MSSIT, chartered by PEO(LCS), meets quarterly to resolve MM-to-LCS integration issues and risks. MP integration labs at Navy facilities in Panama City (FL), Dahlgren (VA), and Newport (RI) provide accredited and secure integration and test facilities to support individual MM development. Incorporating the new, yet-to-be-developed mission systems presents additional future integration risks.

Conclusion: The LCS program is in stable LRIP with 24 ships authorized. The LCS program has 12 ships under construction, four ships in pre-construction, and will deliver four ships this year, two of each variant. MP installations, which provide focused warfighting capability for each ship, present unique engineering and integration challenges. The program continues to improve MP integration and performance through the MSSIT, memoranda of understanding with key program offices, and joint working groups tasked with resolving design issues.

Data as of 4th quarter FY 2014.

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MQ-4C Triton Unmanned Aircraft System (UAS)

Prime Contractor: Northrop Grumman, Aerospace Systems

Executive Summary: The Triton will provide airborne persistent maritime intelligence, surveillance, and reconnaissance (ISR) to help maintain the Common Operational and Tactical Picture in the maritime battlespace. The program is an ACAT ID in the System Development and Demonstration (SDD) phase. The program achieved MS B in April 2008. DASD(SE) maintained continuous engagement with the program office in FY 2014 by participating in a program review DAB and a Flight Readiness Review (FRR) for return to flight, among others. The program is on track to meet an FY 2016 MS C. The program has demonstrated improved software development and safety certification processes and is mitigating risk in producibility of the V-tail and wing structures.

Mission and System Description: Triton will provide persistent maritime ISR data collection and dissemination as well as airborne communications relay capability to Combatant Commanders, Expeditionary Strike Group Commanders, Carrier Strike Group Commanders, and other designated U.S. and Joint Commanders. It will operate independently or with other assets to provide a more effective and supportable persistent maritime surveillance capability. Data collected will be transmitted to a variety of DoD intelligence activities and nodes. The aircraft provides 360-degree high-resolution, high-quality, digital synthetic aperture radar imagery; electro-optical/infrared imagery; and communications relay capability.

Systems Engineering Activities

- **Systems Engineering Plan (SEP)** – DASD(SE) approved the SEP in January 2008 to support MS B and the Engineering and Manufacturing Development phase. The program is fulfilling the objectives of the SEP without waivers or deviations. The program is revising the SEP to support a MS C in FY 2016.
- **Requirements** – The JROC approved the CDD in May 2007. The program's revised Acquisition Strategy has captured the emerging requirement to add some capability currently provided by the EP-3, through the use of engineering changes to the baseline program post Initial Operational Capability. Requirements are reasonable and stable. The CPD is under development for MS C and will capture the new EP-3 mission requirements. CDD requirements are traced to the contractor System Specification as verified at the Critical Design Review.
- **Life Cycle Management** – To achieve system affordability goals, the Navy has reduced the number of System Demonstration Test Articles (SDTA) from three to two and deferred a Main Operating Base Mission Control System. The program is incorporating Defense Exportability Features into the Triton design to facilitate Foreign Military Sales and reduce retrofit cost.
- **Program Protection Plan (PPP)** – USD(AT&L) approved the MS B PPP in March 2006. The program is updating the PPP to support MS C to include reassessing the critical program information, completing a new vulnerability assessment, and applying lessons learned from the Global Hawk program.

Data as of 4th quarter FY 2014.

Assessments

- **DASD(SE) Assessments** – DASD(SE) participated in a program review DAB, multiple Systems Engineering Working Integrated Product Team (SE WIPT) meetings, a NAVAIR in-process performance verification assessment, and a FRR for return to flight to evaluate technical progress and risk. The program has demonstrated improved software development and safety certification processes and is mitigating risk in producibility of the V-tail and wing structures.
  - The program implemented enhancements to its software processes, which have resulted in improved software quality and software security. The program refined the Integrated Master Schedule (IMS) to improve transparency and program execution visibility.
  - In FY 2015 DASD(SE) will conduct a Program Support Assessment and multiple SE WIPT meetings to assist the program in assessing and mitigating risk for entry into LRIP.
- **Risk Assessment** – The program is conducting risk management using the Risk Management Process as described in the SEP. The program is tracking risks in the areas of V-tail and wing manufacturing processes and radar maturation.
- **Performance** – The program has 7 KPPs, 2 KSAs, and 25 Technical Performance Measures. The program is on track to meet all KPP and KSA thresholds by the FRP decision. The program completed initial envelope expansion in March 2014. The first of three aircraft arrived at Naval Air Station Patuxent River in September 2014, demonstrating the system endurance and data link capabilities necessary to conduct further developmental testing activities.
- **Schedule** – The program is on track to meet the July 2014 revised APB schedule. The program conducted a Schedule Risk Assessment to validate the revised contract IMS. Ferry flight events to NAS Patuxent River slipped by almost 3 months, but there remains adequate margin to MS C.
- **Reliability** – The program is executing a reliability growth plan as documented in the SEP, and system reliability is projected to meet requirements. The program will begin reliability growth reporting in FY 2015, and current program analysis predicts reliability will meet threshold requirements by the FRP decision.
- **Software** – The program has approximately 2.5 million equivalent source lines of code. Software development issues led to the APB schedule breach for MS C. The program implemented a new Software Development Plan, adding correction of deficiency builds, defect prioritization, and additional safety certifications. The program has increased contractor software staffing and software auditing since February 2014. These program actions have resulted in improved software oversight and correction of defect turnaround times.
- **Manufacturing** – The program is on track to deliver the two SDTAs currently in production, but the wing supplier has process non-compliance and quality issues resulting in a high rejection rate, which may put the SDTA delivery schedule at risk. The program office and the prime contractor have implemented corrective actions to improve the supplier processes, policies, and training.
- **Integration** – The program has developed Interface Requirements Specifications between the Triton system and 12 segments/programs using an approved DoD Architectural Framework. The program will incorporate networked communications architecture in alignment with the Global Information Grid through the Distributed Common Ground/Surface System–Navy and Global Command and Control System–Maritime.

Conclusion: The program is on track for a MS C in FY 2016 and has demonstrated improved software development and safety certification processes. The program is mitigating risk in producibility of the V-tail and wing structures.

Data as of 4th quarter FY 2014.

MQ-8 Fire Scout Unmanned Aircraft System (UAS)

Prime Contractor: Northrop Grumman, Aerospace Systems

Executive Summary: Fire Scout is an ACAT ID program that underwent a critical Nunn-McCurdy breach certification and restructure in April 2014. The restructured Fire Scout (previously called VTUAV) UAS program resulted in two separate unmanned air vehicles (MQ-8B and MQ-8C) with the larger C model providing greater range, endurance, and payload capability. The Fire Scout system is composed of two to three unmanned air vehicles, a tactical control station, a launch and recovery system, a multi-mission payload, and communications data links. Additional capabilities, included as part of the restructure, are radar, weapons, and additional payloads. DASD(SE) led a technical assessment of the program to support the Nunn-McCurdy certification and program restructure. The DASD(SE) assessment identified several systems engineering issues in the areas of requirements, risk, schedule, and technical baseline management, which the program must address to improve program execution.

Mission and System Description: The MQ-8 Fire Scout is a rotary-wing vertical takeoff and landing, unmanned aircraft system providing intelligence, surveillance, reconnaissance, target acquisition, and communications relay capabilities supporting littoral operations. Commanders will use the system to collect and pass information and data to support a number of operational scenarios.

Systems Engineering Activities

- **Systems Engineering Plan (SEP)** – The program has a Navy-approved SEP, signed in January 2007. The approved SEP is no longer applicable to the restructured program. The program is updating the SEP to reflect the restructured program, as required by the Nunn-McCurdy certification, before the next program milestone. A review of the program's systems engineering processes identified several issues and corrective actions necessary to improve systems engineering discipline and program execution.
- **Requirements** – The JROC-approved 2007 Vertical Takeoff and Landing Tactical Unmanned Aerial Vehicle (VTUAV) CPD, modified in 2009, identifies the program requirements. The program is implementing additional requirements stemming from three Urgent Operational Needs statements via Rapid Deployment Capability (RDC) insertions. Executing to multiple requirements documents has led to requirements instability in the baseline development program. The Navy is updating the CPD to fully encompass the restructured program requirements, including the RDCs. The program does not have a single, comprehensive technical baseline that traces all requirements to a system specification, which increases integration complexity and risk. The program plans to conduct a technical review to trace the revised CPD requirements to a revised system specification and establish an overarching technical baseline.
- **Life Cycle Management** – The program is controlling cost by procuring major components and providing them as Government-furnished equipment. Improved system reliability, demonstrated during multiple Military User Assessments (MUA), should reduce total ownership cost.
- **Program Protection Plan (PPP)** – The program is developing a PPP for a FY 2015 MS C.

Data as of 4th quarter FY 2014.

Assessments

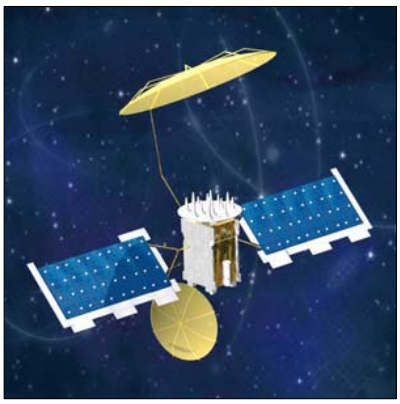
- **DASD(SE) Assessments** – DASD(SE) led an assessment to evaluate the program's systems engineering processes and technical risk in support of the Nunn-McCurdy certification. The assessment identified deficiencies in the areas of requirements, risk, schedule, and technical baseline management, stemming from the concurrent execution of the program of record and three RDCs. DASD(SE) provided recommendations for process improvement, which were included in the USD(AT&L) recertification memo.
  - In FY 2015 DASD(SE) plans to conduct a Program Support Assessment to support the program restructure and MS C.
- **Risk Assessment** – The program has been executing four separate risk management processes for the program of record and the three RDCs. The multiple risk processes limit the program's ability to analyze potential impacts and coordinate mitigation plans across the four development activities. The program plans to consolidate all risk management efforts into a single process as part of the program restructure. The program is mitigating risks in the area of software development and shipboard integration.
- **Performance** – The program has four KPPs identified in the 2007 VTUAV CPD. The program was able to demonstrate three of the four KPPs during the MUAs conducted in FY 2014. The remaining KPP, the automatic launch/recovery deck pitch requirement, is on track for demonstration by the FRP decision. An updated CPD, incorporating all requirements from the program of record and the three RDCs, may introduce additional requirements.
- **Schedule** – The program is executing four concurrent Integrated Master Schedules (IMS) for the program of record and the three RDCs. The four IMSs are not integrated, limiting the program's ability to assess interdependencies across the four development efforts. The program is integrating these separate IMSs into one coherent, system-of-systems IMS. The program breached the APB schedule in May 2012. The critical Nunn-McCurdy breach rescinded the 2007 MS C decision. The program plans to conduct a MS C decision in FY 2015.
- **Reliability** – Fire Scout demonstrated the reliability requirements during the September–October 2013 MUA. The MQ-8B system reliability and maintainability exceeded threshold requirements by 12 percent and 30 percent respectively.
- **Software** – Four concurrent software development efforts have created issues with the software development schedule, requirements stability, and software quality. The program is developing an integrated Software Development Plan that incorporates all aspects of the restructured program and addresses the software issues.
- **Manufacturing** – The MQ-8B production of 23 airframes is complete. The MQ-8C airframe LRIP is on track with six airframes delivered. The Navy plans to acquire 21 additional MQ-8C airframes at a rate of two per year. Procurement of the MQ-8C will not stress the contractor's production or modification lines.
- **Integration** – The program has not established a system-of-systems technical baseline. The program will conduct a technical review to establish a system-of-systems technical baseline that meets the requirements identified in the updated CPD. The program is mitigating risks with shipboard integration of the MQ-8C airframe.

Conclusion: The program must address issues with systems engineering processes in the areas of requirements, risk, schedule, and technical baseline management, stemming from the concurrent execution of the program of record and three RDCs. The approval of the revised CPD and the establishment of a system-of-systems technical baseline should improve future program stability and mitigate technical risk.

Data as of 4th quarter FY 2014.

Mobile User Objective System (MUOS)

Prime Contractor: Lockheed Martin Space Systems



Executive Summary: MUOS is a narrowband Military Satellite Communications (MILSATCOM) system that supports a worldwide, multi-Service population of mobile and fixed-site terminal users in the ultra-high frequency (UHF) band, providing increased communications capabilities to smaller terminals while still supporting interoperability to legacy terminals. MUOS is an ACAT ID program in the Production and Deployment phase. The program received Build Approval in 2008. In FY 2014, DASD(SE) conducted four DAES assessments and participated in two DAES reviews, which addressed an APB schedule breach and delays in the end-to-end (E2E) capability. The program is on track to meet all but the 3rd satellite Ready to Ship APB threshold milestones, but E2E capability lags behind satellite availability due to integration issues.

Mission and System Description: MUOS adapts a commercial third-generation (3G) Wideband Code Division Multiple Access (WCDMA) cellular technology with geosynchronous satellites to provide a new and more capable UHF MILSATCOM system. The constellation will provide greater than 10 times the system capacity of the current UHF Follow-On (UFO) constellation. MUOS includes the space segment, a ground system, and a new waveform for user terminals. The space segment is composed of a constellation of four geosynchronous satellites, plus one on-orbit spare. The ground system includes the ground transport, network management, satellite control, and associated infrastructure to both fly the satellites and manage user communications. Each MUOS satellite also carries a legacy payload similar to that flown on UFO F11. These payloads will continue to support legacy terminals while allowing for a gradual transition to the MUOS WCDMA waveform. The new WCDMA waveform is a Software Communications Architecture-compliant modulation technique. The first MUOS-capable terminal to use the MUOS WCDMA waveform is the Army's Handheld, Manpack, Small Form Fit (HMS) radio (AN/PRC-155).

Systems Engineering Activities

- **Systems Engineering Plan (SEP)** – DASD(SE) approved the MUOS SEP in August 2013. The SEP focuses on the systems engineering processes and plans for system verification, full deployment, operations, block upgrades, and sustainment. It also addresses the Navy's role for integrating E2E capability with MUOS-capable terminals. The program is fulfilling the objectives of the SEP without waivers or deviations.
- **Requirements** – The 2001 MUOS Operational Requirements Document and a 2003 JROC Memorandum provide the MUOS requirements. The MUOS Performance Specification represents the program office decomposition of these requirements. MUOS system requirements are reasonable and stable; however, E2E requirements, which include the user segment, do not formally exist. The program is using legacy E2E system performance as a performance goal.
- **Life Cycle Management** – The program continues to seek opportunities to reduce life cycle costs, such as low-risk test reductions in production satellites and effectively using prioritized affordability considerations in addressing information assurance shortfalls in the POM process.
- **Program Protection Plan (PPP)** – The program last revised the PPP in 2007.

Data as of 4th quarter FY 2014.

Assessments

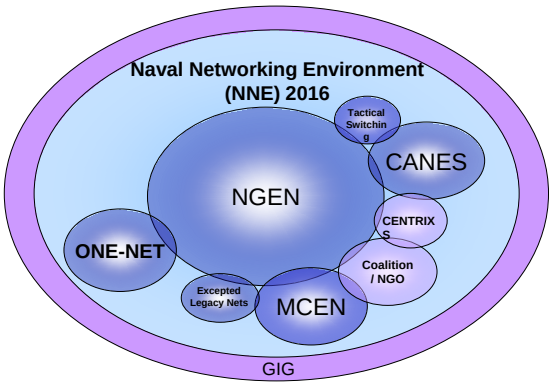
- **DASD(SE) Assessments** – DASD(SE) conducted four quarterly DAES assessments in FY 2014, in the areas of schedule, performance, management, interoperability, and production. DASD(SE) also supported two DAES reviews for the MUOS program, addressing the APB breach and integration issues. The program is managing risk and issues with the production and launch of the satellites, and E2E integration in coordination with Joint Tactical Networks (JTN) and Tactical Radio (TR) programs. In FY 2015 DASD(SE) plans to conduct quarterly DAES assessments.
- **Risk Assessment** – The program is executing its risk management programs as documented in the SEP and Risk Management Plan. At the August DAES review, the PM identified three program-level risks, related to launch vehicle funding, schedule margin, and performance.
- **Performance** – The program is on track to meet all seven KPPs and System Attributes by Full Operational Capability. System-level Technical Performance Measures reported at the August 8 Quarterly Program Review are at or above thresholds. The legacy payload meets performance requirements, and the new payload has passed preliminary on-orbit testing. Testing with the user terminal revealed shortfalls in E2E performance. The program is working with its partners to resolve the integration issues.
- **Schedule** – The program completed a Build Approval DAB in February 2008. Since then, the first two satellites have launched. A failure in thermal-vacuum testing on space vehicle (SV) 3 resulted in a 4-month deviation to the APB 3rd satellite Ready-to-Ship milestone. The launch sequence was reordered and SV 4 will be launched as the 3rd satellite. There is no anticipated cost increase since the satellite delivery is on a fixed-price incentive fee contract. The program is on track to meet the APB 4th and 5th satellite milestones. Formal verification of the WCDMA capability slipped 18 months when initial on-orbit testing revealed issues among the ground system, terminal, and waveform. The developers are pursuing a contractor integration/ Government characterization effort to improve communications reliability rates.
- **Reliability** – The program has no system-level reliability requirement. The program is meeting its key requirement, constellation availability.
- **Software** – The MUOS program has completed software design for both the space and ground segments, pending potential corrective actions arising out of final system testing.
- **Manufacturing** – The MUOS program is mature. System design and manufacturing are complete for the first three satellites, two of which are on orbit, and the ground system. Construction and equipment installation at three of the four ground sites is complete. The program effectively traced a test failure to a component manufacturing defect, which will delay the 3rd satellite. Reordering the satellite launch order holds the slip to 4 months.
- **Integration** – The program identified integration issues affecting WCDMA links during on-orbit verification activities. After further investigation, the PM assessed the call completion rate as insufficient to support further verification efforts. Working with the contractor, PM/JTN, and PM/TR, the program developed an 18-month recovery effort to complete integration of the ground system, waveform, and the terminal, as well as time to conduct operational E2E testing. The efforts are currently on track to the plan.

Conclusion: The MUOS program is technically mature and on track to meet APB thresholds, with the exception of 3rd satellite ready to ship date, which is delayed 4 months beyond the APB threshold. E2E WCDMA capability remains unavailable due to integration issues between the ground system, waveform, and the terminal. The program is working with the waveform and terminal programs to finish integration.

Data as of 4th quarter FY 2014.

Next Generation Enterprise Network, Increment 1 (NGEN Inc 1)

Prime Contractor: Hewlett-Packard Enterprise Services



Executive Summary: NGEN Inc 1 is the first increment of the acquisition program that is the follow-on to the Navy/Marine Corps Intranet (NMCI) Continuity of Services Contract (CoSC). The program conducted a third Government Readiness Review (GRR) and a combined Preliminary Design Review/Critical Design Review (PDR/CDR) in FY 2014. The program transitioned from the COSC to the NGEN contract on September 30. Despite delays caused by the contract protest in 2013, the NGEN Inc 1 program is on track to reach Full Transition Complete (FTC) by the end of 1st quarter 2015.

Mission and System Description: NGEN Inc 1 includes all services provided by the current NMCI provider as of September 30, 2010, and enables Government rather than contractor ownership of the physical infrastructure, Government command and control of the environment, and continued support of mandated cybersecurity activities. The transition to NGEN does not require any new development or deliver any new operational capability. NGEN Inc 1 forms the foundation for the Department of the Navy's future Naval Networking Environment, which will be interoperable with and leverage other DoD-provided net-centric enterprise services. The network provides service to 400,000 desktop and laptop computers for 800,000 Navy and Marine end users in more than 2,500 locations.

Systems Engineering Activities

- **Systems Engineering Plan (SEP)** – DASD(SE) approved the SEP in January 2013 to support MS C. The program plans no updates to the SEP. The program is fulfilling the objectives of the SEP without waivers or deviations.
- **Requirements** – The Chief of Naval Operations and the Commandant of the Marine Corps jointly approved the NGEN Inc 1 CPD in August 2012. The JROC waived approval of the CPD. The NGEN Inc 1 System Design Specification, Block 1, Inc 1 version 3.1, dated November 9, 2009, was an extension from the earlier NGEN Requirements Document version 1.5 that supported NMCI, and the NGEN Inc 1 CPD. The CPD has two KPPs. The program fully transitioned from NMCI to the NGEN contract as of September 30, 2014. The program is meeting or exceeding the KPPs.
- **Life Cycle Management** – The NGEN program structured the indefinite delivery/indefinite quantity contract to allow adjustment of service level to meet affordability requirements. The Navy minimized the cost of the program by using a lowest price technically acceptable source selection to incentivize lower cost and encourage the contractor to reduce manpower requirements. The Navy purchased Government Purpose Rights from the incumbent to facilitate this and future competitions.
- **Program Protection Plan (PPP)** – USD(AT&L) approved the NGEN Inc 1 PPP in October 2014 in conjunction with the Full Transition Decision. The program is fulfilling the objectives of the PPP.

Data as of 4th quarter FY 2014.

Assessments

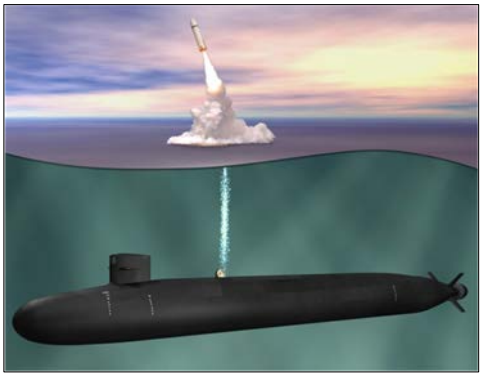
- **DASD(SE) Assessments** – In FY 2014 the program conducted the last of three Government Readiness Reviews that DASD(SE) assessed in a Focused Review. The program elected to conduct a combined PDR/CDR to recover schedule from the contract protest. One PDR/CDR action item remained open at the end of FY 2014: service provider delivery of the technical baselines for review by the Navy Technical Authority.
  - The program manager implemented recommendations related to system security engineering and supply chain risk management. Sufficient planning and risk mitigation efforts are included in the NGEN management and operational procedures. The NGEN program plans to continue with Systems Engineering Working Integrated Product Teams and other Systems Engineering Technical Review events through 4th quarter FY 2015.
  - In FY 2015 DASD(SE) plans to participate in the NGEN systems engineering activities and the Program Implementation Review.
- **Risk Assessment** – The program is executing to the risk management process documented in the SEP and the NGEN Risk Management Plan, and is mitigating risks in the technical and program management areas.
- **Performance** – The NGEN CPD has two KPPs and eight KSAs. The program is meeting or exceeding the KPPs and KSAs. Technical performance parameters derived from CPD requirements are embedded in contract Service-Level Requirements (SLR). The service provider is meeting the SLRs.
- **Schedule** – The NGEN MAIS Annual Report Original Estimate (MAR OE) for December 2013 baselined the program. The program is on track to meet schedule thresholds and performance assessments as reflected in the NGEN MAR OE. NGEN Inc 1 is a continuation of the services previously provided by the NMCI and NMCI Continuation of Services Contract (CoSC) contracts. The program achieved Initial Operational Capability and Full Operational Capability (FOC) under the initial NMCI contract. The program accelerated the NMCI CoSC to NGEN contract transition by 3 months to compensate for the time lost by the contract protest.
- **Reliability** – The network is operating at or above threshold levels for KPP 2, sustainability, which establishes availability requirements for user authorization and network availability. The network availability is at 99.87 percent, exceeding the requirement.
- **Software** – NGEN Inc 1 uses software operating on a commercial-off-the shelf (COTS) information technology infrastructure. Commercial tracking and management tools are used for Navy command and control. There is no new software development through FTC.
- **Deployment** – The NGEN program uses COTS equipment procured through DoD or Department of the Navy Basic Ordering Agreements. The NMCI/NGEN Inc 1 network has met FOC requirements and is fully deployed to meet the current user requirements.
- **Integration** – The primary integration task is the transition from the NMCI contractor-owned and operated system to the NGEN Government-owned operating model. The NGEN Inc 1 program architecture was baselined at the System Verification Review in November 2011. No new development is planned until beyond FTC. The service provider plans to complete delivery of design documentation by the end of 1st quarter FY 2015.

Conclusion: The Department of the Navy completed its transition of NMCI seats from the CoSC contract to the NGEN contract on September 30, 2014. The NGEN program is on track to achieve FTC in 1st quarter FY 2015.

Data as of 4th quarter FY 2014.

OHIO Class Submarine Replacement

Prime Contractor: General Dynamics, Electric Boat Division



Executive Summary: The OHIO Replacement program, a pre-MDAP, will design, build, and sustain a replacement for the OHIO Class Fleet Ballistic Missile Submarines (SSBN), which will retire at the rate of one per year beginning in 2027. In FY 2014 DASD(SE) participated in a USD(AT&L) DAB meeting, which focused on affordability, technology development, engineering, integration, and risk.

Mission and System Description: The OHIO Replacement program will design and construct a replacement for the OHIO Class SSBNs. The program goals are to provide an affordable platform capable of executing the strategic mission while remaining survivable through 2080. The mission is strategic deterrence through the integration and deployment of the TRIDENT II D5 LE Strategic Weapon System (SWS) on a new submarine class that satisfies the CDD attributes approved by the Chief of Naval Operations (CNO).

Systems Engineering Activities

- **Systems Engineering Plan (SEP)** – DASD(SE) approved the SEP in September 2010, to support MS A. An update is expected in FY 2015 to support the Development RFP Release Decision Point. The program is fulfilling the objectives of the SEP without waivers or deviations.
- **Requirements** – The program has a JROC-approved Initial Capabilities Document. The CNO approved the Service CDD in August 2012. The program plans to submit an updated OHIO-Class Replacement Submarine CDD to the JROC in March 2015 with approval planned in August 2015. The program has refined the requirements in the Technical Maturation and Risk Reduction (TMRR) phase and translated the requirements into NAVSEA Chief Engineer (SEA05) approved Ship Specifications, which were informed by cost trades, system concepts, and early stage component development. The program has requirements associated with survivability (stealth), availability, service life, and affordability.
- **Life Cycle Management** – The program is using a design, build, and sustain approach to systems engineering while monitoring Operations and Support should-cost estimates. Activities include design for affordability and reduction of total ownership cost initiatives. Major design initiatives include the elimination of a midlife refueling and the development of more reliable subsystems to increase operational availability between planned depot maintenance periods.
- **Program Protection Plan (PPP**) – The program is currently developing a PPP and is planning to submit it to support the Development RFP Release Decision Point review in FY 2016.

Assessment

- **DASD(SE) Assessments** – DASD(SE) supported a USD(AT&L) DAB in November 2013, which focused on technology development, engineering, integration, risk, and affordability. Design-for-affordability, design-for-supportability, and should-cost initiatives are on track and embedded in all research and development activities.

Data as of 4th quarter FY 2014.

- **Risk Assessment** – The program established a Risk Management Plan in March 2009 and continues to identify, track, and mitigate risks throughout all facets of the program. The status of program-level risks is reviewed regularly; these represent the most significant risks toward achieving operational requirements, schedule, sustainment, or affordability goals.
- **Performance** – The survivability (stealth), materiel availability, and SWS support KPPs are challenging requirements that drive unique HM&E ship design characteristics, technology development efforts, and infrastructure requirements. The program office is developing and maturing the ship design, executing technology development efforts and defining facilities required to construct and sustain the OHIO Replacement Class.
- **Schedule** – The program is in the TMRR phase and achieved MS A in January 2011. The program plans a Development RFP Release Decision Point and MS B decision review in FY 2016. The program plans to start lead ship construction in FY 2021.
- **Reliability** – In September 2014, the Navy issued a RAM-C Rationale Report that provides the rationale behind development of OHIO Replacement sustainment requirements (materiel availability, operational availability, materiel reliability, and operations and support cost) along with their underlying assumptions and feasibility assessment of achieving their threshold values. The RAM-C Rationale Report supports MS B in FY 2016 and the executive summary will be appended to the JROC CDD planned for approval in August 2015. Reliability block diagrams and failure mode effects analyses are being conducted to support both concept and detailed design.
- **Software** – The rehosting of SWS software represents the largest software-development effort in the program. Participating Acquisition Resource Managers (PARM) will be responsible for all Non-Propulsion Electronic Systems software.
- **Manufacturing** – The program is applying competitive prototyping to design and build the quad pack CMC. The missile tube quad pack and modular construction process will reduce the construction schedule and cost compared with the legacy OHIO Class submarine ship building processes. Targeting cost reduction as the primary benefit, the program is applying design-for-manufacturing initiatives to reduce touch labor hours associated with ship construction.
- **Integration** – Major Area Integration Teams (MAIT) are responsible for overarching technical oversight and integration. MAITs interface with Major Area Teams to resolve issues with spatial arrangements and integration of major ship subsystem modules. System integration is conducted across structural modules and between systems and subsystems. Program Executive Officer (Submarines) established responsibilities and agreements between the OHIO Replacement program and PARMs to ensure integration and operation of all non-propulsion systems. Two SWS shore test facilities are under construction to mitigate missile launch risk and SWS-OHIO Replacement integration risk. Both facilities are required to ensure the program achieves the SWS support KPP.

Conclusion: TMRR phase engineering and integration design activities focus on survivability, sustainment, SWS support, reduction of technical risk, and program affordability initiatives. The program is on track to provide a mature design at construction start in FY 2021.

Data as of 4th quarter FY 2014.

P-8A Poseidon

Prime Contractor: Boeing Defense, Space & Security

Executive Summary: The P-8A Poseidon is an ACAT ID program replacing the Navy's P-3C Orion. The P-8A is principally an anti-submarine warfare (ASW) and anti-surface warfare (ASuW) platform providing intelligence, surveillance, and reconnaissance (ISR) as a member of the Maritime Patrol and Reconnaissance Force (MPRF) family of systems. In FY 2014, DASD(SE) participated in several Program Management Reviews to track systems engineering efforts. The program resolved critical deficiencies, enabling an FRP decision, two operational squadron deployments, and a 2-month-early Initial Operational Capability (IOC). In 2015, Increment (Inc) 2 capabilities will begin fielding along with prototype development of the Inc 3 open architecture.

Mission and System Description: The P-8A is a military variant of the Boeing 737-800 configuration, with the addition of unique P-8A structures and systems. The primary roles of the P-8A are persistent armed ASW and ASuW and to serve as an ISR aircraft capable of broad-area, maritime, and littoral operations. The P-8A program evolutionary systems approach aligns incremental acquisition and development strategies with requirements. Inc 2 activities, providing improvements such as wide area ASW search and high-altitude ASW weapon capabilities, are under way and will integrate mature technologies via multiple Engineering Change Proposals (ECP). Inc 3 will deliver enhanced net-centric capabilities such as a net-enabled weapon via a new open architecture. The P-8A is a member of the MPRF family of systems, which includes the MQ-4C Triton, the EP-3, and the Tactical Operations Center.

Systems Engineering Activities

- **Systems Engineering Plan (SEP)** – DASD(SE) approved the SEP in October 2013 in support of the January 2014 FRP decision. The program is fulfilling the objectives of the SEP without waivers or deviations.
- **Requirements** – The JROC validated the P-8A CPD for Inc 1 in June 2009 and validated capabilities for Increments 2 and 3 in a June 2010 CDD. The P-8A program has seven stable KPPs, demonstrated in the 2014 Follow-on Operational Test and Evaluation (FOT&E).
- **Life Cycle Management** – The program continues to expand its Government-furnished equipment (GFE) strategy to reduce vendor pass-through costs, enabling achievement of below-threshold baseline cost procurement. The program initiated development of Anti-Tamper Plan templates for potential future Foreign Military Sales in support of a Defense Exportability Features pilot program. These templates will reduce the time and expense required to create country-specific features and will contribute to commonality.
- **Program Protection Plan (PPP)** – USD(AT&L) approved the PPP in November 2013 in support of the FRP decision. The program is implementing measures to protect critical program information and mitigate supply chain risks. The program continues to refine its criticality analysis in order to detect and mitigate any system vulnerabilities.

Data as of 4th quarter FY 2014.

Assessments

- **DASD(SE) Assessments** – DASD(SE) did not perform any formal assessments of the program in FY 2014. DASD(SE) did participate in Program Management Reviews and conducted quarterly DAES assessments in the areas of schedule, performance, management, interoperability, and production.
  - Systems and software engineering efforts enabled corrections to most deficiencies identified during the 2013 IOT&E. System performance improved in ISR sensor integration and imagery intelligence dissemination. The program continues to work to improve performance of Electronic Support Measures and Synthetic Aperture Radar subsystems.
  - In FY 2015, DASD(SE) plans to participate in Inc 3 systems engineering reviews as the program initiates prototype development of the applications-based architecture.
- **Risk Assessment** – The program continues to implement risk management processes in accordance with the updated SEP and the October 2009 Risk, Issue, and Opportunity Plan. The program is working to mitigate supplier, diminished manufacturing source, and acoustics software development risks.
- **Performance** – The system is exceeding fleet expectations and continues to meet all seven KPPs and three KSAs. The program met all of its Technical Performance Measures with the exception of ready alert status, which is approximately 25 seconds over its 1-hour requirement.
- **Schedule** – The program achieved IOC in November 2013, ahead of its January 2014 threshold date. The USD(AT&L) approved an FRP decision in January 2014. The program has now met all schedule APB thresholds. Inc 2 ECP activities are on schedule or within months of plan.
- **Reliability** – The program continues to meet established reliability requirements, demonstrating more than 250 percent of its logistics reliability requirement during the 2014 FOT&E. Software fixes and increased stability enabled the system to demonstrate improved mission reliability, achieving more than 130 percent of the requirement during FOT&E.
- **Software** – The program retained a sufficient number of development software engineers to fix software defects affecting Inc 1 performance. The current fleet baseline software, in support of the achieved IOC, contains Harpoon functionality and corrections to IOT&E deficiencies. As the software has matured, the resolution of software defects and resulting increased stability contributed to increased software maturity, reliability, and availability. The software to implement early Multi-Static Active Coherent (MAC) capability is on track for inclusion in the next software release, now scheduled for 1st quarter FY 2015.
- **Manufacturing** – The program continues to deliver LRIP aircraft on schedule and is on track to achieve FRP rates. Quality continues to improve as non-conformance reports found during the most recent six aircraft acceptance inspections have decreased 26 percent from the first 10 aircraft delivered. Scrap, rework, and repair costs also decreased 26 percent.
- **Integration** – The program completed the integration of the Harpoon missile capability in 2014. Inc 2 efforts to integrate and deploy MAC broad area search capabilities in 2015 are on track. The program intends to award a contract in 2015 to begin integration of the high-altitude ASW weapon capability as part of Inc 2 efforts. Sixteen of 17 certifications are complete with the final certification expected in early 2015.

Conclusion: Rigorous applications of systems engineering practices enabled resolution of critical deficiencies, an FRP decision, two operational squadron deployments, and a 2-month-early IOC. The program is on track to begin delivery of Inc 2 capabilities and to begin Inc 3 applications-based architecture prototype development in 2015.

Data as of 4th quarter FY 2014.

Remote Minehunting System (RMS)

Prime Contractor: Lockheed Martin, Undersea Systems

Executive Summary: The RMS consists of a semi-submersible Remote Multi-Mission Vehicle (RMMV) towing an AN/AQS-20A variable depth sonar (VDS) to detect, classify, localize, and identify mines in shallow and deep water. The RMMV program (ACAT ID) is in the Engineering and Manufacturing Development phase, focusing on RMMV reliability improvements. The AN/AQS-20A VDS program (ACAT II) is in the production phase and is focusing on preplanned production improvement. DASD(SE) assessed the program's readiness for MS C, verified the Technical Data Package (TDP), and conducted a Physical Configuration Audit (PCA). The program is on track to proceed to LRIP.

Mission and System Description: The RMS is a key component of the Littoral Combat Ship's (LCS) Mine Countermeasures (MCM) Mission Package. It enables LCS to prosecute a mine field while keeping LCS and the sailor at a safe standoff distance. The RMS integrates the RMMV and the AN/AQS-20A VDS. The RMMV is an unmanned, autonomous, semi-submersible, high endurance, low-visibility system that will be operated and maintained from LCS. The RMMV tows the AN/AQS-20A minehunting sonar system for detection, classification, and localization of mine-like contacts and identification of bottom mines. The RMMV provides propulsion, electrical power, communications, and navigation for itself and the VDS. LCS will conduct data processing, display, and recording, and will communicate tactical mine reconnaissance data to other Naval forces.

Systems Engineering Activities

- **Systems Engineering Plan (SEP)** – DASD(SE) approved the SEP in March 2014. The program is fulfilling the objectives of the SEP without waivers or deviations. The SEP supports MS C, scheduled for FY 2015.
- **Requirements** – The JROC approved the CPD in March 2014. Program requirements are reasonable and stable, and form the basis of the TDP intended for the procurement of future vehicles.
- **Life Cycle Management** – The SEP describes the sustainment KPPs and their integration into the design process. The program has implemented design changes to reduce life cycle costs by improving reliability and maintainability, mitigating obsolescence, and establishing build/sustain process controls.
- **Program Protection Plan (PPP)** – The program developed a draft PPP to support MS C. DASD(SE) reviewed the draft and provided comments.

Assessments

- **DASD(SE) Assessments** – DASD(SE) verified the TDP and PCA. The TDP and PCA accurately represented the system with all design changes identified. DASD(SE) confirmed the RMS program finalized both the TDP and PCA prior to RFP release for RMMV v6.0.
  - DASD(SE) monitored the reliability growth program through RMMV v4.2, which exceeded its minimum mean time between operational mission failures (MTBOMF) requirements

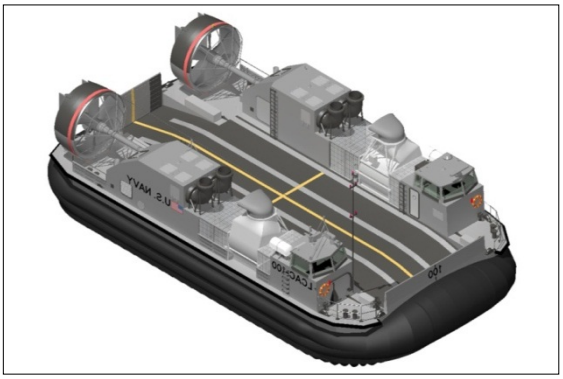
Data as of 4th quarter FY 2014.

demonstrated during contractor offshore testing. The program is implementing design modifications and improvements to the existing 10 vehicles to bring all configurations up to RMMV v6.0.
  - In FY 2015 DASD(SE) will assess the RMS program to identify risks and inform the USD(AT&L) of the program's readiness for MS C.
- **Risk Assessment** – The program is executing its risk management plan in accordance with the SEP. Current program risks include: RMS operational availability, long scope re-acquire and/or localization, tow cable corrosion, and integration with LCS Seaframe and Mission Modules. The PMO is addressing and mitigating risks.
- **Performance** – The RMMV v6.0 technical improvements along with the AN/AQS-20A preplanned product improvement put RMS on track to achieving all seven KPPs and three KSAs by IOT&E in FY 2015. The AN/AQS-20A preplanned product improvement will replace the forward look and side look sonar arrays to improve deep-volume mine detection and image classification to achieve the sustained area coverage rate KPP.
- **Schedule** – The PMO completed the reliability growth program with RMMV v4.2. The program completed design modifications and improvements to the TDP for implementation in RMMV v6.0 in FY 2014. The program released the RFP for 10 LRIP2 vehicles, which includes the v6.0 TDP in August 2014. RMS is on track to meet MS C planned for FY 2015. IOT&E planned in FY 2015 will use the RMS configured with the RMMV v6.0 and the AN/AQS-20A preplanned product improvement towed sensor product baseline design.
- **Reliability** – The program is on track to meet its reliability requirements. RMMV v4.2 exceeded the required 75 hours MTBOMF during offshore operations. The measured reliability is sufficient for the program to enter development test and operational test on the LCS.
- **Software** – The RMMV software executes vehicle control, towed sonar data processing, alert generation, VDS control, mission track execution and data communication to LCS. The PMO and contractor verified these functions. The LCS Mission Package Application Software provides shipboard control, processing, and display and is integrated as a functional segment of the LCS MCM Mission Package Computing Environment. The software development is on track/complete.
- **Manufacturing** – The program office identified root causes of manufacturing deficiencies at the contractor's facility, suggesting changes in the baseline design and improvements in process and quality control at the contractor's facility. The program incorporated these lessons learned into performance-based specifications and the TDP for the competitive procurement of LRIP 2 vehicles after MS C. The 10 existing LRIP 1 vehicles will be upgraded to the v6.0 baseline design.
- **Integration** – The program has reduced shipboard integration risks between the RMS, LCS Mission Modules and both LCS variants in the Launch, Handling, and Recovery System and in ship-craft communications. The program is on track to resolve integration issues prior to deployment of the MCM Mission Package.

Conclusion: The RMS program improved vehicle performance and reliability and is on track to complete MS C and proceed to LRIP 2 RMMV production.

Data as of 4th quarter FY 2014.

Ship-to-Shore Connector Amphibious Craft (SSC)



Prime Contractor: Textron Systems

Executive Summary: The SSC is a Navy ACAT IC modified replacement for the aging Landing Craft, Air Cushion (LCAC) and will operate from amphibious assault ships to transport joint forces engaged in operational maneuvers from the sea (OMFTS). SSC provides the capability to transport heavy equipment and combat-ready personnel over land, water, beach/surf zones, mud, and ice. The program is in the Engineering and Manufacturing Development phase. DASD(SE) participated in subsystem design reviews, software design reviews, hardware design reviews, and the craft system Critical Design Review (CDR) to assess design maturity and risk. The program is on track to begin fabrication activities in FY 2015.

Mission and System Description: The SSC will provide the transport of joint forces engaged in OMFTS. SSC provides the ability for the transfer of combat-ready personnel, tracked and wheeled vehicles, heavy equipment, and supplies to austere littoral access points ashore in various scenarios and environmental conditions. The SSC is the functional replacement with commonality to the existing LCAC with noted advances in performance, cargo capacity, lift, automation, reliability, and maintainability. The craft is composed of an aluminum hull structure and a flexible skirt surrounding the bottom of the craft; it is driven by four gas turbine engines.

Systems Engineering Activities

- **Systems Engineering Plan (SEP)** – DASD(SE) approved the SSC SEP in June 2012. The program is fulfilling the objectives of the SEP without waivers or deviations. The Textron Systems Engineering Management Plan aligns with the program SEP to guide the contractor's developmental efforts, synchronized with the PMO activities, and consistent with Navy systems engineering technical review criteria.
- **Requirements** – The JROC approved the CDD in June 2010. The CDD requirements are reasonable and stable. The SSC program has eight KPPs, including those addressing materiel availability, payload capacity, interoperability with amphibious and well deck ships, and inland accessibility. The prime contractor is using a requirements management tool to trace all requirements from the CDD to the system specification and into individual product specifications.
- **Life Cycle Management** – The PMO is addressing total ownership cost reductions through craft weight management and maintenance design considerations. The contractor has maintained craft payload and design margins while finalizing the engineering design. Reliability-centered maintenance has influenced the planned periodicity of maintenance and ease of access for subsystem and component maintenance actions.
- **Program Protection Plan (PPP)** – USD(AT&L) approved the PPP in January 2012. The program is preparing an update for Service approval to support the MS C review in FY 2015.

Data as of 4th quarter FY 2014.

Assessments

- **DASD(SE) Assessments** – DASD(SE) participated in subsystem design reviews, software and hardware design reviews, and the craft system CDR to assess design maturity and risk. SSC development is tracking with the program SEP and APB. DASD(SE) assessed the Command, Control, Communications, Computers and Navigation (C4N) development and determined that the subcontractor followed its disciplined corporate processes, which conformed to and exceeded the program SEP requirements. The subcontractor used Technical Performance Measures (TPM) in defining the C4N architecture, the allocation of requirements between hardware and software, and the underway software generation/verification efforts. DASD(SE) assessed that the craft system CDR was conducted in accordance with the SEP and identified the ability of the design to meet the requirements. The CDR addressed several design changes that require completion before the design is ready for manufacturing.
- **Risk Management** – The program is executing a Risk Management Plan that is integrated with the contractor's risk management process to identify, track, and mitigate risk. Risk mitigation efforts for drivetrain integration, main engine development, and C4N control system development continue to reduce the impact of the risks.
- **Performance** – Craft design is expected to meet the eight KPPs, eight KSAs, and TPMs identified in the SEP. The program created a prototype of the Command Module layout, console display screens, and Integrated Flight Control interfaces and subjected the prototype to review by experienced operators. This review resulted in changes to better support warfighting conditions.
- **Schedule** – The program achieved MS B in June 2012 and MS C is scheduled for FY 2015. The IMS replan in December 2013 provided more realistic activity start dates and durations to allow the program to effectively manage work progress and avoid slipping the first craft delivery date.
- **Reliability** – The program is following a phased craft-level reliability growth strategy. System-level reliability demonstrations will begin after delivery of the first craft in FY 2017. The program will use a closed loop FRACAS (failure reporting, analysis, and corrective action system) to document failures and to determine the corrective actions.
- **Software** – The majority of software development and integration is associated with the C4N subsystem. At the C4N System CDR, the program presented the final system architecture, requirements allocation between hardware and software, system safety analysis, and human system integration. The software build plan prioritizes development complexity and provides three releases to support craft integration and risk reduction activities. The PMO defined and is using software metrics to track the software development effort.
- **Manufacturing** – The contractor is on track to complete design products in time for fabrication of the first craft and is mapping the drawing releases to detailed work packages and tooling requirements. The manufacturer has established new production initiatives designed to reduce construction man-hours by 3 percent through product model improvements, new fabrication techniques, and automated assembly processes, promoting craft quality.
- **Integration** – The program is on track to demonstrate incremental assembly and verification during the fabrication process. The program's System Integration Lab provides an environment for C4N hardware and software integration verification before delivery to the production line. Software integration for Build 1 is underway and on schedule.

Conclusion: The SSC program is executing to plan and is on track to complete detailed design and begin craft fabrication in FY 2015.

Data as of 4th quarter FY 2014.

Unmanned Carrier-Launched Airborne Surveillance and Strike (UCLASS)

Prime Contractor: To be determined

Executive Summary: The UCLASS system will provide a Carrier (CVN)-based, persistent surveillance and strike capability. The program is a pre-MDAP (prospective ACAT ID) and achieved a Materiel Development Decision (MDD) in August 2011. The program completed four preliminary design contracts to inform a limited competition follow-on contract to deliver the air vehicle design, integration, assembly, test, and CVN certification/verification. The Government will act as the lead system integrator. In FY 2014, DASD(SE) conducted Preliminary Design Review (PDR) assessments for each of four contractors' PDRs of the Air Vehicle for the Air Segment (AS). The PDR assessments identified risks, some of which were common to all four designs, and documented the likelihood of each contractor's design to achieve the user-defined requirements.

Mission and System Description: The UCLASS system is a carrier-based Unmanned Air System (UAS) providing the CVN Battle Group a persistent intelligence, surveillance, reconnaissance (ISR), targeting, and limited strike capability. The system consists of three segments: the AS, the CVN Segment, and the Control System and Connectivity (CS&C) Segment. The program plans to increase capability incrementally. The acquisition approach focuses on providing a capable unmanned ISR Early Operational Capability (EOC), while establishing a technical and programmatic foundation to enable capability growth including survivability, payloads, and refueling.

Systems Engineering Activities

- **Systems Engineering Plan (SEP)** – The program has a draft SEP, which will be approved to support the next MS decision. The draft SEP contains Technical Performance Measures (TPM), technical review requirements, and was provided to the PDR contractors as part of the RFP. No waivers or deviations are expected.
- **Requirements** – The JROC approved the Initial Capabilities Document in June 2011, and the Navy approved a CDD in January 2013. The program decomposed the requirements and provisions for capability growth to an operational Air Segment Performance Specification (ASPS) and provided the specification to four contractors for their use in PDRs. The ASPS was modified after its initial release to clarify requirements. A final ASPS to reflect the approved set of program requirements will be included in the AS development RFP.
- **Life Cycle Management** – The December 2012 JROC Memorandum emphasized affordability as the priority for the program. The CDD established an affordability KPP in which the recurring fly-away cost of the air vehicles to conduct one 600 nautical mile orbit shall not exceed $150 million.
- **Program Protection Plan (PPP)** – The PPP is in development. The PPP will be submitted for approval to support the next MS decision. Key elements of system protection requirements were evaluated at the technical reviews during the PDR contracts.

Data as of 4th quarter FY 2014.

Assessments

- **DASD(SE) Assessments** – DASD(SE) conducted four PDR assessments for the AS designs and provided input to the program Technology Development Strategy to improve the level of technical rigor and risk analysis to be completed during program development. DASD(SE) participated in four contractor System Requirements Reviews (SRR), 27 subsystem PDRs, and the four AS system-level PDRs.
  - The assessments concluded the contractor PDRs were complete and not abbreviated when compared with PDRs conducted for other MDAPs, consistent with the policies specified in DoDI 5000.02. Risks common to each design were identified, and the likelihood for the AS to meet the ASPS requirements was assessed.
  - In FY 2015 DASD(SE) plans to support the MS decision and PDRs for the AS, CVN, and CS&C segments. DASD(SE) will assess the risk associated with any additional or new capability requirements.
- **Risk Assessment** – The program is executing its risk management process in accordance with its approved Risk Management Plan. The program's initial risk assessment is based on market research, industry input, and lessons learned from similar programs. The program is mitigating risk in the areas of system-of-systems integration, the Joint Precision Approach and Landing System (JPALS) fielding schedule, Common Control Station development schedule, and the ability to meet the system requirements within the budget. Risks identified in the AS PDRs will be reevaluated for each proposal for the planned follow-on development of the AS.
- **Performance** – The Navy-approved CDD has six KPPs and six KSAs that delineate total system (AS, CVN, CS&C) performance. The draft SEP has a set of TPMs to which each PDR contractor may propose modifications. The program will approve a final set of TPMs to monitor technical performance to plan. Predicted and/or demonstrated AS performance was evaluated and reported in the PDR assessments.
- **Schedule** – The program completed four contractor PDRs in June 2014. The JROC requirement to deliver a deployed capability in 4 to 5 years allows for little or no margin for new development or significant changes to existing designs. AS schedule risk is reported in the PDR assessment. The future schedule will be approved at the next program MS DAB.
- **Reliability** – The program used historical and predictive reliability and maintainability metrics to inform an estimated time-on-station model that predicts performance of the persistence KPP. A set of reliability requirements feed this model and are included in the ASPS. The Navy-approved CDD and draft SEP include additional suitability-related reliability requirements and TPMs.
- **Software** – The three system segments will leverage existing software and also will require new software development. Software algorithms from the UCAS-D program will be available to all contractors. Software development risk is contractor dependent and was assessed during the PDRs, but all four contractors were assessed as having software schedule risk.
- **Manufacturing** – The program assessed the potential contractors as capable of producing the air vehicle based on their experience manufacturing fielded unmanned systems. The program will draw on industrial capability from ongoing DoD and contractor efforts.
- **Integration** – The program must integrate the three major segments and relies on more than 20 in-service, deployed systems. The program developed Interface Requirements Specifications between the aircraft and the segments/programs using an approved DoD Architectural Framework. Multiple Integrated Product Teams will coordinate information exchange requirements and manage the integration activities across the AS, CVN, and CS&C segments.

Conclusion: The UCLASS program completed technical evaluation of four contractor preliminary designs. The PDR assessments identified risks, some of which were common to all four designs, and documented the likelihood of each contractor's design to achieve the user-defined requirements.

Data as of 4th quarter FY 2014.

VH-92A Presidential Helicopter Fleet Replacement

Prime Contractor: Sikorsky Aircraft Corporation

Executive Summary: VH-92A (formerly VXX) will provide presidential and executive-level transport, replacing the legacy fleet of executive lift helicopters. The ACAT ID program initiated the Engineering and Manufacturing Development phase with a MS B in April 2014. The VH-92A program will modify an in-production Sikorsky S-92A aircraft and integrate a Government-defined Mission Communication System (MCS). DASD(SE) participated in the MCS Critical Design Review (CDR) and the program System Requirements Review (SRR) among others. The program is on track to complete the Preliminary Design Review (PDR) in 4th quarter FY 2015 and has established a strong Government/industry team with an event-based development philosophy.

Mission and System Description: The VH-92A mission is to transport the President, Vice President, visiting heads of state, and other parties as directed by the White House Military Office. A single type/model/series aircraft will replace the current combination of VH-3D and VH-60N aircraft.

Systems Engineering Activities

- **Systems Engineering Plan (SEP)** – DASD(SE) approved the VH-92A SEP in February 2013. The program is fulfilling the objectives of the SEP without waivers or deviations. The SEP contains a robust set of Technical Performance Measures (TPM) the program will use to track technical performance to plan throughout system development and integration.
- **Requirements** – The JROC approved the CDD in January 2013. The Navy revised the CDD using lessons learned from the VH-71 to finalize an affordable set of system requirements. A senior-level advisory board meets regularly to mitigate requirements changes during the development process. The contractor is developing a Performance-Based Specification Design Description to meet the Government Performance-Based Specification, which is traced to the CDD.
- **Life Cycle Management** – The program is pursuing a "best value" approach and has presented affordability targets that demonstrate significantly lower procurement and life cycle costs compared with the VH-71. The program intends to achieve the lower costs by leveraging the commercial executive helicopter market and in-service upgrades such as crypto modernization and analog communications improvements. Costs were reduced by conducting Government-defined mission system development and associated risk reduction activities in advance of the aircraft solicitation.
- **Program Protection Plan (PPP)** – USD(AT&L) approved the PPP in February 2014 to support MS B. The program will update the PPP within 180 days of completing the PDR to reflect platform-specific and associated subsystem design details.

Data as of 4th quarter FY 2014.

Assessments

- **DASD(SE) Assessments** – DASD(SE) participated in the MCS CDR, USD(AT&L) preparations for the MS B decision, and the program SRR.
  - The SRR solidified Government/contractor roles and responsibilities, established good working relationships, and validated the system requirements. The SRR team identified a risk in the area of maintaining the Federal Aviation Administration (FAA) airworthiness certification throughout the integration process.
  - In FY 2015 DASD(SE) will participate in the program's System Functional Review (SFR) and the program PDR. DASD(SE) will review the Schedule Risk Assessment from the Integrated Baseline Review and will conduct regular SE Working Integrated Product Team meetings.
- **Risk Assessment** – The program is executing the risk management planning documented in the approved SEP. The program is mitigating risks in the areas of subsystem integration, air worthiness certification, commercial-off-the-shelf equipment supportability, and weight management. The program will continue to refine its risk mitigation strategies as it progresses through SFR and PDR.
- **Performance** – The program has 10 KPPs, 29 KSAs, and 29 TPMs. The contractor is projecting to meet all system requirements. The procurement of a mature, in-production aircraft provides a baseline for performance estimates. Actual performance will be measured and validated against VH-92A-specific integration and design modifications throughout the technical review process.
- **Schedule** – The program completed a MS B DAB in April 2014 and awarded a contract to Sikorsky Aircraft in May 2014. The program schedule is reasonable and includes all applicable technical reviews. The program conducted an SRR in August 2014 and is on track to complete the next APB milestone, a PDR, in FY 2015.
- **Reliability** – The program used the mission scenarios in the RAM-C Rationale Report to determine the system reliability requirements and the fleet size requirements. System reliability is heavily dependent on the S-92A baseline reliability, which exceeds established system-level reliability thresholds. The program will not make design changes to the baseline aircraft subsystems for reliability growth, except for integration of the new subsystems. Changes to the system to grow reliability will be limited to the new or modified subsystems and components.
- **Software** – The SEP defines software architecture priorities, addresses interface control requirements, and identifies appropriate metrics such as requirements stability, lines of code, memory usage, and processor throughput that the program will use to manage software development. The Government MCS team is developing the majority of the software. The MCS has 4.1 million estimated software lines of code.
- **Manufacturing** – The contractor has an established aircraft production line and a mature supply chain delivering more than 200 S-92A aircraft to customers worldwide.
- **Integration** – The program is using well-established processes to manage the interrelationships, dependencies, and synchronization with complementary systems within the existing presidential transportation environment. The program is managing risk associated with the integration of Government-developed systems while maintaining the FAA certification.

Conclusion: The program is on track to complete PDR in 4th quarter FY 2015 and has established a strong Government/industry team with an event-based development philosophy.

Data as of 4th quarter FY 2014.

4.3 DASD(SE) Assessments of Air Force Programs

Assessments are as of 4th quarter FY 2014. This section includes summaries on the following 15 programs:

- Advanced Extremely High Frequency (AEHF)
- Air and Space Operations Center–Weapon System, Increment 10.2 (AOC-WS Inc 10.2)
- B-2 Defensive Management System Modernization (B-2 DMS-M)
- B61 Tailkit Assembly (B61 TKA)
- Enhanced Polar System (EPS)
- F-22A, Increment 3.2B Modernization (F-22A Inc 3.2B Mod)
- Global Positioning System (GPS) Enterprise
- HH-60W Combat Rescue Helicopter
- Integrated Strategic Planning and Analysis Network, Increment 4 (ISPAN Inc 4)
- Joint Air-to-Surface Standoff Missile–Extended Range (JASSM-ER)
- Joint Space Operations Center (JSpOC) Mission System (JMS)
- KC-46 Aerial Refueling Tanker (KC-46A)
- RQ-4B Global Hawk Unmanned Aircraft System (UAS)
- Small Diameter Bomb, Increment II (SDB II)
- Three-Dimensional Expeditionary Long-Range Radar (3DELRR)

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Advanced Extremely High Frequency (AEHF)

Prime Contractor: Lockheed Martin Space Systems

Executive Summary: AEHF is an ACAT ID joint service satellite communications system that provides global, survivable, secure, protected, and jam-resistant communications for high-priority military ground, sea, and air assets. AEHF has been in FRP since May 2012. In FY 2013, the AEHF program submitted a Program Deviation Report identifying an Initial Operational Capability (IOC) schedule breach caused by Mission Control Segment (MCS) software delays. In response, OSD recommended the program complete a Software Focused Review (SFR) before approval of an updated APB. The Assistant Secretary of Defense for Acquisition chaired the SFR in FY 2014. The AEHF program showed it successfully identified and mitigated the root causes of the delays and demonstrated confidence in achieving the IOC date in the updated APB. USD(AT&L) approved the new APB in FY 2014, and the program is on track to meet the IOC date as well as the launch dates for AEHF 5 and AEHF 6.

Mission and System Description: AEHF's secure, survivable, high-data-rate communications allow the National Security Council and Combatant Commanders to control their tactical and strategic forces at all levels of conflict. AEHF provides critical voice and data communications protected against jamming, interception, detection, natural and nuclear effects at low, medium, extended data rates; substantially increased coverage opportunities; and more flexible planning options. The AEHF program has three international partners: Canada, the Netherlands, and the United Kingdom. AEHF consists of three segments: the Space Segment, the Mission Control Segment, and the Terminal Segment. The Space Segment is composed of the AEHF satellites. The Mission Control Segment operates and controls an integrated constellation of Milstar and AEHF satellites and includes mission operations as well as planning, testing, training, and support elements. The Terminal Segment includes ground fixed, ground mobile, man-portable, transportable, airborne, submarine, and shipborne configurations.

Systems Engineering Activities

- **Systems Engineering Plan (SEP)** – AEHF is in Production and Deployment and continues to use the SEP written to support the Build and Operations phases as approved by the Air Force Service Acquisition Executive in July 2009. The program is fulfilling the objectives of the SEP without waivers or deviations. The Space and Missile Systems Center (SMC) requires annual reviews of SEPs and forwards any major updates to OSD for additional review and/or approval by DASD(SE).
- **Requirements** – The JROC approved the AEHF Operational Requirements Document in October 2000. AEHF is in Production and Deployment, and its requirements are stable.
- **Life Cycle Management** – AEHF has implemented block buy decisions to reduce individual satellite costs and has provided international partners with access to protected communications resources in exchange for financial participation in program development. The MCS will require future software updates or continued contractor support to correct or compensate for identified deficiencies prior to declaration of Full Operational Capability (FOC).
- **Program Protection Plan (PPP)** – The program has an approved PPP dated October 6, 2004.

Data as of 4th quarter FY 2014.

Assessments

- **DASD(SE) Assessments** – DASD(SE) participated in an SFR on the AEHF MCS software in March 2014 to ensure the program would be able to achieve the recommended IOC date before USD(AT&L) approved the updated APB. The SFR technical analyses and benchmarking of historical information validated the revised APB date and resulted in approval of the updated APB. AEHF has maintained the new schedule and is on track to declare IOC in advance of the APB date of December 2015. The AEHF SFR identified MCS operational deficiencies that will require extensive work-arounds and contractor support to establish and maintain IOC. AEHF will need to correct these deficiencies before declaration of FOC. The SFR recommended, and AEHF agreed, to define the requirements and the schedule of events leading to FOC.
- **Risk Assessment** – The program office is executing the Integrated Risk Management program as documented in the SEP. AEHF closed its MCS software risk with the on-time start of Multi-Service Operational Test and Evaluation (MOT&E) of MCS Increment 7 (Inc 7) and is on track to complete testing in time to declare IOC on or before the December 2015APB threshold date.
- **Performance** – AEHF program verified the system will meet all five KPPs through requirement sell-off and the successful launch and operations of AEHF 1 and 2. The evaluation of system performance during MOT&E testing in FY 2014/2015 will support MCS Inc 7 operational acceptance and the AEHF system IOC declaration in CY 2015.
- **Schedule** – In FY 2013, AEHF submitted a Program Deviation Report identifying an IOC schedule breach caused by delays to the development of the MCS software. USD(AT&L) approved the updated program APB in FY 2014 after an SFR showed the program had identified and mitigated the causes of the delays. AEHF is currently on schedule to declare IOC 6 months prior to the new APB date of December 2015. AEHF 4-6 are currently on schedule to meet their FY 2017, FY 2018, and FY 2019 launch dates.
- **Reliability** – AEHF is executing its reliability and maintainability programs as documented in the SEP. Actual, measured mission reliability exceeds the 97 percent threshold.
- **Software** – Past issues with the development of the Mission Planning Element (MPE) portion of the AEHF MCS Inc 5 software, combined with the lack of a clear mission planning operational concept, led AEHF to move the MPE software to Inc 7 where it continued to cause delays and eventually triggered a schedule breach. OSD reviewed the subsequent Program Deviation Report, approved AEHF's recovery plan and directed an SFR before approval of a new APB. DASD(SE) participated in the SFR in March 2014. Technical analyses and benchmarking of historical information validated the revised APB date and resulted in USD(AT&L) approval of the updated APB. MCS will require additional software development to mitigate operational work-arounds and/or contractor support prior to FOC, but AEHF has not fully defined this effort yet.
- **Manufacturing** – Deliveries of AEHF 4-6 are currently on schedule to meet their FY 2017, FY 2018, and FY 2019 launch dates.
- **Integration** – AEHF provides for the planning and operations functionality for the legacy Milstar system and is backward compatible with Milstar satellite crosslinks and Milstar terminals. All three international partners have signed memoranda of understanding allocating protected communications resources in exchange for financial participation in program development and allowing for Foreign Military Sales of international partner variants of AEHF terminals.

Conclusion: The AEHF program is on track to achieve IOC on or before the December 2015 date defined in the APB. AEHF 4-6 are currently on schedule to meet their FY 2017, FY 2018, and FY 2019 launch dates, respectively.

Data as of 4th quarter FY 2014.

Air and Space Operations Center–Weapon System, Increment 10.2 (AOC-WS Inc 10.2)

Prime Contractor: Northrop Grumman Information Systems, Command and Control Division

Executive Summary: AOC-WS Inc 10.2 will integrate more than 40 third-party mission applications into a net-centric structure, automating mission processes through a single user interface. The ACAT IAM program initiated Engineering and Manufacturing Development (EMD) activities in October 2013 and completed Critical Design Review (CDR) on schedule in March 2014. Through a CDR assessment, DASD(SE) assessed the program is developing a viable risk mitigation approach and is ready to complete software development and integration in preparation for system verification.

Mission and System Description: AOC-WS is the Combined and Joint Force Air Component Commander's weapon system for planning, executing, and assessing theater-wide air operations. AOC-WS Inc 10.2 establishes a common service-oriented and standards-based infrastructure to integrate mission systems and services developed by third-party capability providers outside of the AOC-WS program. AOC-WS Inc 10.2 infrastructure employs the fielded AOC-WS Inc 10.1 hardware, virtualized applications, and thin servers/clients. It enables a common user interface; provides modular applications with standard interfaces, shared data to support agile integration, and rapid fielding of future capabilities; and increases speed of command.

Systems Engineering Activities

- **Systems Engineering Plan (SEP)** – DASD(SE) approved the SEP in August 2013, in support of MS B, and directed the program to establish system performance measures not later than 60 days before CDR. In January 2014, the program submitted a revised Technical Performance Measure (TPM) table with an additional TPM measuring the time to perform the Fix-Track-Target process. The program is not fully implementing its reliability and maintainability program as documented in the approved SEP, lacking defined critical failures and verifiable reliability values to forecast system reliability. The program will update the SEP in FY 2015 in support of MS C.
- **Requirements** – The JROC approved the CDD in October 2006 and approved an update in December 2009. The requirements are traceable through the Technical Requirements Document and Release Specification to 45 subsystem design documents. The program reduced requirements and technical risk by incorporating user feedback during the Technology Development and EMD phases via monthly demonstrations and Warfighter assessments at the conclusion of each software build.
- **Life Cycle Management** – The program successfully reduced will-cost estimates through eight should-cost initiatives, saving FY 2014 $3.4 million by developing alternative deployment options and using the Inc 10.2 part-task trainer for Inc 10.2 training. The program has identified reduction of total ownership cost (RTOC) as a KSA. The contractor presented a methodology at the CDR to address total ownership cost (TOC) and recommended the program focus on two main cost drivers (operations personnel and software licensing).

Data as of 4th quarter FY 2014.

- **Program Protection Plan (PPP)** – USD(AT&L) approved the PPP in January 2014 in support of MS B, and the program will update the PPP in preparation for FY 2016 MS C.

Assessments

- **DASD(SE) Assessments** – DASD(SE) conducted a CDR assessment during FY 2014 to support FY 2016 MS C and determined the program is developing a viable risk mitigation approach and is ready to complete software development and integration in preparation for system verification. DASD(SE) identified risks pertaining to an insufficiently defined mission thread automation baseline, performance measurement, Information Assurance certification, reliability and maintainability, and software defect management. The program adopted recommendations to document reduced automation with the user, identify additional performance measures, classify critical failures and corresponding scoring criteria, minimize certification deficiencies, and reinforce software defect management.
- **Risk Assessment** – The program is executing risk management planning as documented in the SEP and is working to mitigate risks associated with performance measurement, Information Assurance certification, reliability and maintainability, and software defect management.
- **Performance** – The program is on track to meet all four KPPs and two KSAs by the FY 2016 Full Deployment Decision (FDD). The program lacks sufficient performance measures to assess system performance to plan before verification.
- **Schedule** – The program completed CDR in March 2014 and delayed its MS C by 4 months to November 2015 due to delayed achievement of Interim Authority to Test (IATT) and ineffective software defect management progress. DASD(SE) analysis at CDR predicted the contractor underestimated the number of defects and the level of effort to fix them. The program accepted DASD(SE) recommendations to identify a new system risk in this area, increase its defect estimate, and apply additional resources to defect burn-down.
- **Reliability** – The program is not fully implementing its reliability and maintainability program as documented in the MS B approved SEP, lacking defined critical failures and verifiable reliability values used to forecast system reliability and measure attainment during verification and validation.
- **Software** – The program is developing approximately 125,000 lines of integration code for over 40 third-party applications in five software builds. The program's underestimation, coupled with a slow closure rate, impacted the program's readiness for the November 2014 contractor test and will subsequently delay MS C by 4 months to November 2015.
- **Deployment** – The program finalized its fielding/deployment plan in preparation for the CDR. The program is on track to meet the FY 2016 FDD.
- **Integration** – The program reduced mission thread automation to maintain development schedule, possibly creating a "user expectation gap" during validation. Monthly prototype demonstrations provided user insights on system interfaces and hands-on user feedback.

Conclusion: The AOC-WS Inc 10.2 program initiated EMD activities in October 2013 and completed a CDR on schedule in March 2014. Through a CDR assessment, DASD(SE) assessed that the program is developing a viable risk mitigation approach and is ready to complete software development and integration in preparation for system verification.

Data as of 4th quarter FY 2014.

B-2 Defensive Management System Modernization (B-2 DMS-M)

Prime Contractor: Northrop Grumman, Aerospace Systems

Executive Summary: The B-2 DMS-M is a program to replace the legacy DMS receivers, antennas, and display processors. The program is a pre-MDAP in the Technology Maturation and Risk Reduction (TMRR) phase. The program achieved MS A in 4th quarter FY 2011. DASD(SE) initiated a Program Support Assessment (PSA) in September 2014 and participated in the September 2014 Preliminary Design Review (PDR). DASD(SE) will complete the PSA and the PDR assessment in FY 2015. The B-2 DMS-M program continues to progress and is expected to meet the requirements.

Mission and System Description: The B-2 stealth bomber is an all-wing, two-person crew aircraft with twin weapon bays. The aircraft is a multi-role, low-observable bomber capable of delivering conventional and nuclear munitions with loadouts of 20,000-pounds or more. The DMS-M is a principal survivability enabler for the B-2. The legacy DMS Threat Emitter Locator System (TELS) detects, identifies, and locates enemy radar systems and facilitates real-time threat avoidance by providing threat warning and threat situational awareness information to the aircrew via the Tactical Situation Display. The DMS-M will replace TELS and its associated antennas with a more current Electronic Support Measure subsystem to improve threat detection. The upgrade also will provide expanded aircraft display processors to increase situational awareness.

Systems Engineering Activities

- **Systems Engineering Plan (SEP)** – DASD(SE) approved the MS A SEP in August 2011; the SEP guides technical planning and execution through TMRR. The program is fulfilling the objectives of the SEP without waivers or deviations. The program is preparing a SEP update to support MS B in 4th quarter FY 2015.
- **Requirements** – The JROC approved the CDD in April 2013. The overall requirements are reasonable and stable. The Air Force is updating the CDD in FY 2015 to support MS B and to incorporate lessons from the TMRR phase. The September 2014 PDR allocated the requirements as traced from the CDD and B-2 Weapon System Specification to the Subsystem Requirements Document to the Architecture Item Specification and the Product Specification.
- **Life Cycle Management** – The DMS-M will emphasize reliability in the design process to reduce total ownership cost. To achieve USD(AT&L) Better Buying Power initiatives, the program is including reliability maturity incentives in the Engineering and Manufacturing Development (EMD) phase contract.
- **Program Protection Plan (PPP)** – The program does not have an approved PPP but is drafting a PPP to support the 4th quarter FY 2015 MS B.

Assessments

- **DASD(SE) Assessments** – DASD(SE) initiated a PSA in September 2014. Throughout the TMRR phase, the program focus areas have included software development, subsystem integration, and antenna maturation. DASD(SE) will complete the PSA in FY 2015 and will

Data as of 4th quarter FY 2014.

provide recommendations to the program office. DASD(SE) participated in the September 2014 PDR and will complete the PDR assessment in FY 2015. The PDR was well conducted and well attended. Northrop Grumman established the allocated baseline and successfully met established entrance and exit criteria.

- **Risk Assessment** – The program is executing the risk management program documented in the SEP and the B-2 Common Enterprise Risk Process Guide. The program is mitigating risks related to integration with concurrent B-2 upgrades, software, and antenna maturation. The program is mitigating antenna maturation risk by measuring the antenna radar signature, antenna gain, and the voltage standing wave ratio of the antenna signal transmission system in relevant test fixtures.
- **Performance** – The program is projected to meet or exceed all 5 KPPs and all 12 KSAs.
- **Schedule** – The program completed a MS A DAB in August 2011. The program successfully completed the PDR in September 2014. Funding reductions caused the program schedule to slip, delaying the MS B DAB by 15 months from April 2014 to July 2015. The Initial Operational Capability (IOC) date slid 24 months to FY 2021. The program office incorporated the delay to MS A by extending the TMRR effort and moving several tasks from EMD into TMRR. Overall, the revised schedule provides additional schedule realism while reducing schedule risk to achieving the updated IOC. The USD(AT&L) will establish an APB at MS B.
- **Reliability** – The B-2 DMS-M CDD contains a reliability KSA. The program expects to achieve these requirements by IOC. The program presented acceptable reliability allocations at the PDR. In addition, the program's SEP includes reliability growth planning to the expected requirement and addresses plans to ensure the contractor meets required reliability.
- **Software** – DASD(SE) is in the process of assessing software development and processes as part of the PSA. DASD(SE) will provide the results of the assessment to the program in FY 2015. At the September 2014 PDR, the program allocated the requirements to the Software Requirement Specifications. The software metrics used on the program are immature, and to date metrics collection has been inadequate. The program plans increased emphasis with formal metrics collection beginning with the upcoming development software build, the third of four engineering builds.
- **Manufacturing** – The program will leverage fielded systems or systems already in development for the Electronic Support Measure and Avionics and Graphics Processors; therefore, unusual or elevated manufacturing risk is not expected. The SEP reflects program plans to assess manufacturing readiness throughout the life cycle to include during all Systems Engineering Technical Reviews and in support of major milestones. The program demonstrated adequate maturity at the September 2014 PDR.
- **Integration** – The program has identified integration risk with existing systems and concurrent B-2 upgrades. The B-2 program office has established risk mitigations to address technical and programmatic challenges, for example, system-level power/cooling considerations and dedicated DMS-M test aircraft.

Conclusion: The B-2 DMS-M program continues to progress to the revised schedule. The program is projected to meet requirements.

Data as of 4th quarter FY 2014.

B61 Tailkit Assembly (TKA)

Prime Contractor: Boeing Defense, Space & Security

Executive Summary: The life extension of the B61-12 (B61) ensures the United States and its allies will have nuclear deterrence options into the future. The B61 Tailkit Assembly (TKA) is an ACAT ID program in the first of two Engineering and Manufacturing Development (EMD) phases. The program achieved MS B in November 2012. At that time, the USD(AT&L) approved a two-phase EMD program with an option for the second phase to incentivize unit pricing at or below design-to-unit-cost goals. The second phase begins after Critical Design Review. In FY 2014, DASD(SE) participated in the November 2013 Preliminary Design Review (PDR) and the July 2014 PDR Closeout. The program has completed preliminary design, identified risks, developed viable mitigation steps, and demonstrates a high likelihood of accomplishing its intended mission.

Mission and System Description: The TKA provides weapon-delivery accuracy to achieve the desired operational effects of the B61. The TKA enables consolidation of multiple bomb assembly (BA) modifications (-3/4/7/10) into a single all-up round (AUR), the B61-12, reducing the number of life extension programs and life cycle costs for both the Department of Defense (DoD) and the Department of Energy (DOE). The goal of the dual-agency B61 program is to extend the life of the weapon while modernizing within the existing capabilities, as directed by the Nuclear Weapons Council (NWC) in the June 2008 Tasking Memorandum. The AUR consists of two major assemblies: the BA developed and managed by DOE, and the TKA developed and managed by DoD.

Systems Engineering Activities

- **Systems Engineering Plan (SEP)** – DASD(SE) approved the SEP in September 2012 in support of the November 2012 MS B DAB. The program is executing the SE processes and fulfilling the objectives of the SEP without waivers or deviations.
- **Requirements** – The JROC approved the TKA MS B CDD in September 2012. The top-level requirements are reasonable and stable. The Air Force Configuration Steering Board reviewed the requirements in September 2014 with no changes. The July 2014 PDR Closeout completed allocation of the requirements as traced from the CDD to the System Requirements Document (SRD) and to the Boeing System Performance Specification (SPS). The BA-to-TKA Interface Control Document (BTICD) and the Platform-to-Store ICD (PSICD) align with the CDD, SRD, and the SPS, and were released and placed under configuration control in February 2014.
- **Life Cycle Management** – The design takes extended service life components into consideration to allow the program to meet AUR service life requirements without costly and time-consuming recertification. In addition, design-to-unit-cost is on contract.
- **Program Protection Plan (PPP)** – USD(AT&L) approved the PPP in August 2014. The program is executing the processes documented in the PPP.

Assessments

- **DASD(SE) Assessments** – DASD(SE) conducted a PDR assessment in FY 2014 as required by DoDI 5000.02. DASD(SE) participated in the November 2013 PDR and July 2014 PDR Closeout; both were well conducted and well attended. At the PDR, Boeing had not completed software allocations to the Software Requirement Specifications (SRS), and the Weapon

Data as of 4th quarter FY 2014.

Integration Sub Group had not released the BTICD and PSICD; these issues prevented PDR closure. These items were complete by the PDR Closeout, and Boeing formally established the allocated baseline. No DASD(SE) assessments are planned in FY 2015.

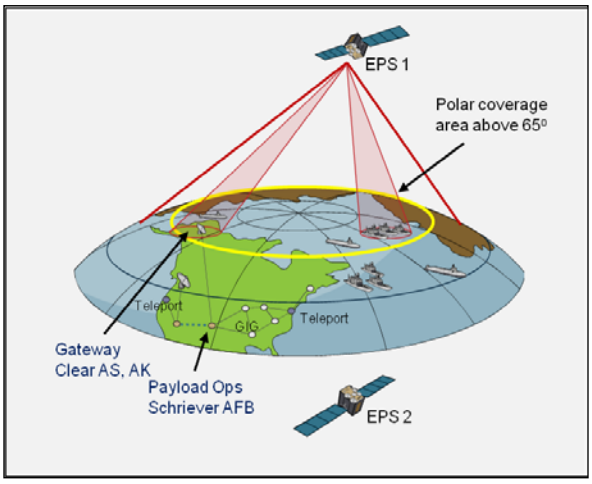
- **Risk Assessment** – The program is executing the risk management program as documented in the SEP and Risk Management Plan. The program is mitigating risks related to performance, production, schedule, and integration.
- **Performance** – The program is on track to meet three of four KPPs. The program is mitigating an accuracy KPP risk through updated model assumptions; simple design changes remain an option. This risk should be mitigated in FY 2015 when the System 1 Joint Test Assembly flight is successfully completed.
- **Schedule** – The program completed MS B in November 2012. The program plans to begin EMD-2 in FY 2016 with MS C in FY 2018. The program is projected to meet all APB schedule thresholds and all planned technical review timeframes in the September 2012 SEP.
- **Reliability** – The program has a comprehensive reliability program and a robust reliability growth program, which includes system- and subsystem-level growth curves. Planned reliability metrics are adequate to manage the program. The program is mitigating operational and storage reliability risks (KSAs) through accelerated component and subsystem testing as well as environmental testing. The program has contract incentives for reliability during developmental test and plans to conduct qualification and quality testing in EMD-2. In addition, the program added test assets to provide adequate reliability confidence.
- **Software** – The TKA Software Development Plan is adequate. As of the July 2014 PDR Closeout, the program has decomposed software requirements to the SRS and established defined software metrics. Software development is resourced appropriately and is on schedule.
- **Manufacturing** – The program is executing to manufacturing guidance in the SEP. The TKA production is based on mature JDAM manufacturing processes. The program completed an initial manufacturing assessment in support of the November 2013 PDR. The program has defined and characterized manufacturing processes and has documented the TKA manufacturing approach. The program is mitigating risks related to stringent safe-assembly requirements and production transition with close Sandia National Lab coordination.
- **Integration** – Integration planning between the TKA and the BA, as well as between the B61 and the threshold and objective aircraft, is sufficient to support EMD activities. The Weapon Integration Sub Group released the BTICD and the PSICD in February 2014, but the Interface Control Working Group has more than 60 action items to complete by the end of December 2014. The program is mitigating F-35 integration risk through the use of environmental data from other weapon integration activities and fit checks with a Government-fabricated legacy adapter. The TKA program is executing to a June 2012 memorandum of understanding (MOU) with the Air Force Nuclear Weapons Center, the DOE/National Nuclear Security Administration, the Air Armament Center, and the aircraft program offices. This MOU ensures each organization's responsibilities are identified with respect to AUR development, production, and integration.

Conclusion: In FY 2014, DASD(SE) participated in the November 2013 PDR and the July 2014 PDR Closeout. The program has completed preliminary design, has identified risks, developed viable risk mitigations, and demonstrates a high likelihood of accomplishing its intended mission.

Data as of 4th quarter FY 2014.

Enhanced Polar System (EPS)

Prime Contractor: No prime contractor



Executive Summary: The EPS program is the next generation of communications satellites to provide coverage in the North Polar Region. The program achieved MS B in April 2014 and was delegated to the Air Force as an ACAT 1C program. DASD(SE) conducted a Preliminary Design Review (PDR) assessment and Software Focused Review and participated in the EPS Command and Planning Segment (CAPS) Critical Design Review (CDR) and the EPS System CDR. The program is on track and is effectively executing Engineering and Manufacturing Development (EMD).

Mission and System Description: The mission of the EPS is to provide communications coverage to users in the North Polar Region, above 65 degrees latitude. The system consists of two satellites in high-inclination Molniya orbits, using an EPS payload integrated on a host satellite bus. EPS payload design is based on a simplification of the Advanced Extremely High Frequency (AEHF) payload and implements the Extended Data Rate (XDR) waveform. The system uses a stand-alone tool for communications network planning developed as part of the CAPS. A terrestrial gateway provides interoperability for midlatitude users through the Global Information Grid (GIG). This architecture leverages a mature XDR payload-to-ground interface, austere CAPS and gateway architectures that leverage Government off-the-shelf (GOTS) and commercial off-the-shelf (COTS) hardware, and a common GIG connection standard.

Systems Engineering Activities

- **Systems Engineering Plan (SEP)** – DASD(SE) approved the EPS SEP in February 2014 to support MS B. In accordance with the approval memo, the program updated the SEP to include reliability growth planning in June 2014. The program is fulfilling the objectives of the SEP without waivers or deviations. The program office plans to conduct an annual SEP update in October 2015.
- **Requirements** – The JROC approved the CDD in 2006. However, due to cost issues, the ground segments were downscoped and the CDD was updated (and approved by the AFROC, as no KPPs were changed) in 2011. The requirements are mature and stable. At the CAPS and System CDR events, the program office demonstrated complete allocation and traceability of the program requirements into the matured program baseline.
- **Life Cycle Management** – The program conducted trade-offs to determine a dedicated CAPS as a more cost-effective approach to the downscoped requirements than using the AEHF ground segment.
- **Program Protection Plan (PPP)** – USD(AT&L) approved the PPP in April 2014. The program is executing the processes documented in the approved PPP.

Data as of 4th quarter FY 2014.

Assessments

- **DASD(SE) Assessments** – In FY 2014, DASD(SE) conducted an EPS PDR assessment and a Software Focused Review and also participated in the CAPS and System CDR. The PDR assessment identified risk in the maturity of the software architecture and the need for a Software Focused Review, which was conducted in January 2014 prior to closing out the PDR assessment in February 2014. The Software Focused Review examined progress in mitigating risks identified at the PDR. The review also examined details of the Software Build Plan, development schedule, and integration plan to evaluate the proposed EMD baseline and APB thresholds. The review team determined the program successfully addressed the software risks raised at the PDR and solidified the PDR baseline. At the CAPS CDR and System CDR the program demonstrated their initial product baseline and margin against all requirements. At MS B, EPS was delegated to the Air Force, which conducted the CDR assessment.
- **Risk Assessment** – The program is executing risk management planning in accordance with the program SEP. The program is working to mitigate risks in the areas of software maturity, parts obsolescence, and system integration.
- **Performance** – The program is on track to meet all KPPs, KSAs, and Technical Performance Measures (TPM) documented in the EPS SEP. The program KPPs and TPMs were assessed at the EPS System PDR in August 2013, the CAPS CDR in April 2014, and the System CDR in July 2014 with margin against all requirements.
- **Schedule** – The program completed a MS B DAB in April 2014. The program is on track to meet the APB schedule thresholds and has held all technical reviews on time. There is no MS C.
- **Reliability** – The SEP establishes a reliability growth planning curve, which is reflected in plans for software development and maintenance. Reliability projections assessed at the EPS System CDR showed the program is on track to meet all reliability requirements with margin.
- **Software** – The latest program office estimate for the CAPS software size is approximately 358,000 equivalent source lines of code (ESLOC). During risk reduction activities, the developer completed 105,000 ESLOC. The parametric analysis of the CAPS software effort indicates some risk to complete software products to support system-integration events, but sufficient schedule margin to maintain Initial Operational Capability/Final Operational Capability in FY 2018.
- **Manufacturing** – The EPS program relies on heritage AEHF payload hardware and software, a hosted satellite bus, and a combination of GOTS and COTS hardware for the terrestrial gateway and CAPS. The program has completed both payloads and delivered them to the host for integration and test.
- **Integration** – The Government is the system integrator. The EPS program has memoranda of agreement in place with all the external organizations with which it has interrelationships specified in the SEP to include the payload host and the Navy's SPAWAR Systems Center. The program office is participating in all working groups necessary to maintain awareness of issues affecting EPS program GOTS items.

Conclusion: The program is on track and is effectively executing EMD.

Data as of 4th quarter FY 2014.

F-22A, Increment 3.2B Modernization (F-22A Inc 3.2B Mod)

Prime Contractors: Lockheed Martin Aeronautics

Executive Summary: The F-22A Inc 3.2B Mod is a hardware and software upgrade for the F-22A, the Air Force's advanced tactical fighter aircraft. Inc 3.2B is an ACAT ID program in the Engineering and Manufacturing Development phase. The program achieved MS B in 3rd quarter FY 2013. In FY 2014, DASD(SE) participated in two Increment Capability Reviews (ICR) among other acquisition meetings. The program is currently on track to achieve requirements; however, key development activities and associated verification will occur in FY 2015 and early FY 2016.

Mission and System Description: The F-22A is a fifth-generation single-seat, twin-engine fighter designed for air dominance. The low-observable, highly maneuverable, super-cruise F-22A incorporates advanced avionics and survivable first-day and beyond air-to-ground capability. Inc 3.2B hardware and software modernization includes air-to-air missile upgrades (AIM-120D, AIM-9X), additional electronic protection, geolocation, data-link, and stores management improvements. The program replaces selected computer processors to improve throughput and margins.

Systems Engineering Activities

- **Systems Engineering Plan (SEP)** – DASD(SE) approved the SEP in August 2012. The program updated the SEP in 4th quarter FY 2013. An update is expected in 2015 to support MS C in FY 2016. The program is meeting the objectives of the SEP without waivers or deviations.
- **Requirements** – The JROC validated the F-22A Enhanced Global Strike Inc 3 CPD in FY 2007. The baseline platform has 12 KPPs. The program is addressing the three remaining KPPs with Inc 3.2A in FY 2015. Therefore, Inc 3.2B has no specific KPPs but does include the Inc 3 CPD KSAs: geolocation and AIM-9X/120D integration. The Inc 3.2B requirements are stable and reasonable. The PMO controls the functional baseline through a contractually incorporated Tier-0 Operational Capability Description Document (OCDD) and a Capability Verification Plan (CVP). The contractor in turn derives detailed Tier-1-to-5 development specifications from the OCDD and CVP to form the design baseline. The Air Force is planning future increments to address mandated safety, navigation, and security requirements.
- **Life Cycle Management** – There is a risk to the program's software sustainability due to the highly integrated and closed system architecture of the F-22A. Risk mitigation at the enterprise level includes adherence to a modular open systems architecture roadmap, procurement of data rights, and distributed processing designs when practical.
- **Program Protection Plan (PPP)** – USD(AT&L) approved the PPP in FY 2013 for MS B. The program plans to submit an update in 2015 to support MS C.

Assessments

- **DASD(SE) Assessments** – DASD(SE) participated in both of the FY 2014 ICRs (the second and third of six planned) to assess prototype hardware and software drops to the lab. The program is

Data as of 4th quarter FY 2014.

a third of the way through detailed capability objectives. Predecessor program development slips have created lab availability challenges and present approximately 6 months schedule risk to completion of planned capability drops, primarily due to a buildup of software defects needing correction in subsequent drops. DASD(SE) did not conduct any formal technical-review assessments in FY 2014 but provided quarterly DAES assessments in the areas of schedule, performance, management, interoperability, and production. The program has made progress in addressing FY 2012 Program Support Review recommendations.

- **Risk Assessment** – The program has documented the risk management process in the SEP and in the F-22 Risk and Opportunity Management Plan. There are currently nine technical risks in the areas of mission-data availability, lab shortfalls, avionics stability, weapons models, and verification execution. The program has mitigation plans and conducts risk reviews monthly to reduce probability of occurrence. There are schedule risks resulting from delays in predecessor modernization capabilities (Inc 3.2A) and sustainment updates (Update 5). The program projects the 3.2A Fleet Release in July 2015, a delay of one year from the baseline date. In addition, the development and integration schedule of the AIM-9X operational flight software is a watch item.
- **Performance** – The remaining capability drops and flight verification will not commence until FY 2015, but the Inc 3.2B program is still on track to meet all KSAs, other top-level attributes, and the Technical Performance Measures referenced in the SEP.
- **Schedule** – Inc 3.2B MS B occurred in May 2013. The threshold APB date for MS C is September 2016. The program has schedule margin to absorb development delays from the buildup of Inc 3.2B software problems and integration of Inc 3.2A and Update 5 efforts.
- **Reliability** – The program has a reliability and maintainability program consistent with USD(AT&L) policy. The design is projected to meet Inc 3.2B reliability requirements.
- **Software** – After ICR-2 the program estimated Inc 3.2B development requires approximately 750,000 new airborne and ground equivalent source lines of code (ESLOC). This includes approximately 270,000 ESLOC for the Enhanced Stores Management System completed in FY 2013. The development incorporates 10 distinct, integrated hardware and software capability drops to the lab and/or flight test, with six ICRs prior to the final System Critical Design Review. As of ICR-3 the program has accomplished only 75 percent of the expected software plan due to verification constraints blocking integrated testing, data shortfalls, late prototype-hardware delays, and more defects than expected. As a result there is buildup of remaining work (technical debt). The program has shifted the correction of technical debt to later drops.
- **Manufacturing** – The program baseline is 143 Inc 3.2B retrofit kits for Block 30/35 aircraft, plus 9 kits for test aircraft. The program completed safety-of-flight and durability-life testing on all seven early-developed prototype-hardware components, and the program is on track to complete the remainder of production qualification testing by the end of development in FY 2016. The USD(AT&L) approved advanced procurement (AP) to mitigate delivery gaps from hardware risk-reduction efforts; however, if an emerging AP funding issue (Congressional Marks) is not resolved, LRIP and fielding may be delayed a year.
- **Integration** – Inc 3.2B has integration risks for timely verification of software and weapons integration. DASD(SE) anticipates the program will conduct integrated weapons launches in advance of MS C as recommended at MS B for a more event-driven development.

Conclusion: The program continues to mitigate schedule and technical risks. The program is currently on track to achieve requirements; however, key development activities and associated verification will occur in FY 2015 and early FY 2016.

Data as of 4th quarter FY 2014.

Global Positioning System (GPS) Enterprise

Prime Contractor: Multiple

Executive Summary: The GPS Enterprise consists of multiple MDAPs and pre-MDAPs in varying phases of acquisition and development. DASD(SE) participated in an AGER deep dive for the GPS Enterprise in December 2013, MGUE System Design Review (SDR) and Preliminary Design Review (PDR) events, and a program review in September 2014 supporting the FY 2015 AGER. The program has experienced development delays in both the OCX and GPS III programs, which delay delivery of enhanced capabilities and continue to drive constellation sustainment risk.

Mission and System Description: The mission of GPS is to acquire, deliver, and sustain reliable position, navigation, and timing (PNT) and nuclear detonation (NUDET) detection capabilities to U.S. Warfighters, our allies, and civil users. The GPS Enterprise has three segments—space, ground, and user—and comprises multiple MDAPs, each with significant scope and complexity.

- The space segment provides the GPS space vehicles (SV) (satellites) that make up the constellation. This segment includes five programs: GPS IIA, GPS IIR, GPS IIR-M, GPS IIF, and GPS III. The first three programs are in the Operations and Support phase. The GPS IIF satellites (Production and Deployment phase) are designed by Boeing, and the next generation GPS III satellites (Production and Deployment phase) are designed by Lockheed Martin. This segment also provides the NUDET detection capabilities.
- The ground segment provides the control system for the satellites and includes two programs: the current Operational Control System (OCS) and the Next Generation Operational Control System (OCX). OCS is currently in the Operations and Support phase. OCX is post MS B.
- The user segment consists of various receiver and processor systems that provide GPS PNT services to meet the needs of a broad user base in air, land, sea, and space. The Military GPS User Equipment (MGUE) program is in the Technology Development (TD) phase and is planning for a combined MS B/C decision in 2015.

Systems Engineering Activities

- **Systems Engineering Plan (SEP)** – DASD(SE) approved the GPS Enterprise SEP with associated OCX and GPS III Annexes in August 2014. The program is fulfilling the objectives of the SEP without waivers or deviations. The program is preparing an update to the MGUE SEP Annex to detail plans for engineering activities supporting the revised MGUE Acquisition Strategy, and plans to submit the annex for formal review in early FY 2015.
- **Requirements** – The JROC approved the GPS III CDD in February 2011 and the MGUE CDD in July 2014. The program requirements are reasonable and stable. The program decomposed and allocated the GPS III CDD requirements into separate CDDs for the OCX ground segment and GPS III space segment, and then flowed those requirements into system specifications for each. The MGUE program has used TD phase prototyping successfully to inform the approved CDD and has updated the MGUE system specification to align with the approved CDD.

Data as of 4th quarter FY 2014.

- **Life Cycle Management** – The program has been proactive in evaluating procurement options to consider budget profiles, procurement quantities, and cost savings for the next Follow-on Production Decision for GPS III satellites.
- **Program Protection Plan (PPP)** – USD(AT&L) approved the PPP in April 2014. The updated PPP addresses recent policy changes. The program is executing the processes documented in the approved PPP.

Assessments

- **DASD(SE) Assessments** - DASD(SE) participated in an AGER deep dive for the GPS Enterprise in December 2013, MGUE SDR and PDR events, and a program review in September 2014 supporting the FY2015 AGER.
  - The deep dive found opportunities to accelerate the MGUE program based on progress and successes in TD phase prototyping, continued challenges in resolving technical issues with the first GPS III navigation payload, identification of options for alternative GPS III procurement strategies, and continued delays in the OCX software development.
  - DASD(SE) participated in MGUE contractor SDR and PDR events conducted to demonstrate readiness to move forward in preparation for a combined MS B/C decision in FY 2015. The program met all PDR exit criteria. DASD(SE) will complete the full PDR assessment in FY 2015.
  - The pre-FY 2014 AGER program review found mature and stable MGUE designs, progress in resolving GPS III navigation payload issues and delivering the first payload for integration, and extended satellite life time estimates for the current constellation, which has mitigated the risk of late delivery of the first GPS III satellite. However, a continued delay in OCX delivery maintains near-term risk to constellation sustainment. The program is continuing to refine mitigation options due to the OCX delay.
  - DASD(SE) will conduct a Program Support Assessment in FY 2015 to support the MGUE MS B/C.
- **Risk Assessment** – The Enterprise and segments are executing their risk management programs in accordance with the approved SEP. The program office is working to mitigate risks to each component program, particularly in the area of information assurance vulnerabilities, constellation sustainment, and the fielding of an integrated M-code capability.
- **Performance** – The GPS III and OCX programs are on track to meet all eight KPPs and associated KSAs and Technical Performance Measures (TPM). The MGUE contractors assessed KPPs and TPMs at their SDR events in January-March 2014 and PDR events in August-September 2014. The MGUE program is on track to meet all eight KPPs, KSAs, and associated TPMs but has risk for meeting two anti-jam and precise tracking derived requirements. The program has plans in place to mitigate these risks.
- **Schedule –** The GPS III and OCX programs have both eroded program schedule margin, breached APB schedule thresholds, and are in the process of completing Over Target Baseline activities. The program will propose revised schedule thresholds in updated APB documents in FY 2015. Poor systems engineering discipline has been the primary cause of delay on the OCX program. Delays in development and production of the SV-01 mission data unit are the primary cause of GPS III program delays. The GPS Enterprise is executing several initiatives to extend the lifetime of the on-orbit IIR and IIR-M space vehicles, which has relieved some risk of GPS III and OCX delays.
- **Reliability** – All GPS Enterprise segments are meeting their reliability requirements and demonstrating reliability growth with significant margin. However, availability predictions for the GPS constellation show risk in sustaining the constellation, due to aging on-orbit satellites

Data as of 4th quarter FY 2014.

until OCX is delivered and GPS III satellites are available for launch. The program office currently predicts that the constellation will remain at or above the required 24 satellites until the first GPS III is available for launch. However, OCX, or surrogate capability, is required to place the new GPS III satellites into service.

- **Software** – OCX is the most software-intensive segment of the GPS Enterprise. The program will deliver OCX capability in two blocks. Block 1 is estimated at 1,241,000 equivalent source lines of code (ESLOC), and Block 2 at 68,000 ESLOC. The program manages and tracks software metrics, which have identified work being deferred to later iterations, ESLOC growth in each iteration, and a high generation rate of software deficiency reports. These metrics are primary indicators of continued OCX program schedule slip, which is primarily caused by poor systems engineering discipline. Due to this shortfall, the program implemented a freeze on software coding to resolve existing gaps and ensure prerequisite detailed systems engineering artifacts are complete before proceeding with further software coding.
- **Manufacturing** – The GPS III program is reducing manufacturing risk through the use of the GPS III Non-Flight Satellite Testbed (GNST). The GNST is a pathfinder vehicle that will be used as an early integration and verification resource, which will also refine manufacturing processes in advance of the production of satellites SV-01 to SV-08. The program has been delayed due to design and manufacturing issues associated with the delivery of the first satellite navigation payload. These manufacturing issues have been resolved and the payload delivered for integration; however, the program will continue to carry risk through the thermal-vacuum verification activities.
- **Integration** – The program has faced challenges in maintaining system integration and minimizing schedule synchronization issues among its space, ground, and user segments. Recent assessments recognized that across the GPS Enterprise, system integration process and tools have improved. There is some risk that current MGUE program interface standards and resulting designs may not be rigorous enough to account for all possible MGUE implementations in all possible operating environments. This concern will be better understood as data from additional early integration activities is collected.

Conclusion: The program has experienced development delays in both the OCX and GPS III programs, which delay delivery of enhanced capabilities and continue to drive constellation sustainment risk. Progress made in the MGUE technical baseline allows for opportunities to accelerate MGUE capability.

Data as of 4th quarter FY 2014.

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HH-60W Combat Rescue Helicopter

Prime Contractor: Sikorsky Aircraft Corporation

Executive Summary: The HH-60W program (formerly CRH) will replace the Air Force's HH-60G Pave Hawk helicopter fleet with 112 new air vehicles plus training systems and product support as required for the Personnel Recovery (PR) mission. The program is an ACAT ID in the Engineering and Manufacturing Development (EMD) phase. The program achieved MS B in June 2014, after an extended period of inactivity due to uncertainty in Air Force budget priorities. DASD(SE) participated in a SEP review and approval, a Systems Engineering Working Integrated Product Team (SE WIPT), an OIPT, and the MS B DAB. The program is incorporating sound systems engineering practices into program and contractor activities to ensure effective program execution.

Mission and System Description: The primary mission of the HH-60W is to recover isolated personnel from hostile or denied territory. HH-60W will also execute humanitarian missions, civil search and rescue, disaster relief, casualty/medical evacuation, and non-combatant evacuation operations. The HH-60W is a dual-piloted, multi-engine, vertical takeoff and landing platform that will provide improved vertical lift capability along with enhanced command and control communications technology to meet Air Force PR mission requirements.

Systems Engineering Activities

- **Systems Engineering Plan (SEP)** – DASD(SE) approved the SEP in May 2014, supporting MS B. The program is fulfilling the objectives of the SEP without waivers or deviations. The SEP contains a robust set of Technical Performance Measures (TPM), which the program will use to track technical performance to plan throughout system development and integration.
- **Requirements** – The JROC approved the program CDD in July 2010. A July 2012 JROC Memorandum revalidated the 6 KPPs and clarified 14 of the 27 KSA requirements. The System Specification traces to the CDD and was attached to the RFP. The contractor is developing a design specification traced to the System Specification. The Acquisition Strategy (AS) limits the introduction of new technologies and focuses on the integration of existing systems into a proven air vehicle. The HH-60W requirements are reasonable and stable.
- **Life Cycle Management** – The program AS addresses affordability and cost reduction through the procurement of aircraft currently in production, the integration of existing systems, and the incorporation of a production affordability target in the RFP. The program identified should-cost initiatives at MS B and will provide annual updates.
- **Program Protection Plan (PPP)** – The Air Force approved the PPP in April 2014 in support of MS B. The program is required to submit an updated PPP to USD(AT&L) for approval in FY 2016. The program's RFP contained language to implement program protection.

Assessments

- **DASD(SE) Assessments** – DASD(SE) reassessed findings and recommendations made in the FY 2013 Program Support Assessment through SE WIPTs; DASD(SE) also provided the OIPT and DAB with technical insight to affirm the low-risk approach to program and contract execution.

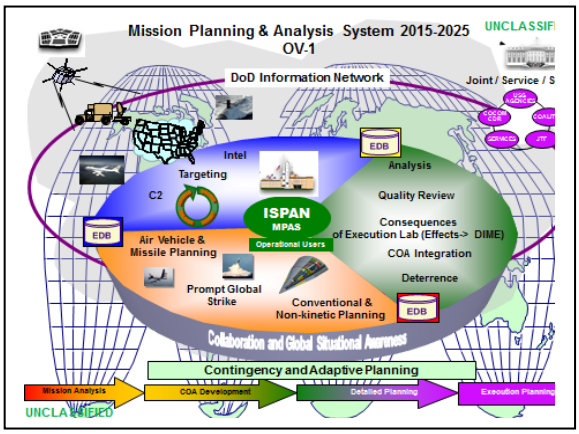
Data as of 4th quarter FY 2014.

  - The program implemented recommended actions in software development, weight management, concurrency, and staffing to reduce risk in EMD and incorporated SE equities into the contract and program execution activities.
  - In FY 2015 DASD(SE) plans to participate in the System Requirements Review (SRR), will review the Schedule Risk Assessment from the Integrated Baseline Review, and will conduct regular SE WIPTs.
- **Risk Assessment** – The program is executing its risk management program as documented in their 2014 SEP and Risk Management Plan. The program is mitigating risks with aircraft weight, staffing, concurrency of effort, and subsystem integration.
- **Performance** – The program has 6 KPPs and 27 KSAs. The program has a robust set of 35 TPMs identified in their SEP to track performance to plan. The procurement of mature in-production systems significantly reduces performance risk normally present during the EMD.
- **Schedule** – The program completed a MS B in June 2014. The program met all FY 2014 APB thresholds and is on track to meet the remaining APB thresholds. The program plans to conduct a SRR in FY 2015 and a Preliminary Design Review in FY 2016.
- **Reliability** – The reliability and maintainability requirements and engineering activities are realistic and adequately defined in both the SEP and the RAM-C Rationale Report. The HH-60W reliability program has planned for a tailored off-the-shelf based approach to reliability design and growth. The program has developed preliminary reliability growth curves, included in the SEP.
- **Software** – The program identified the software development schedule as a critical path driver. The program plans to implement an incremental software development approach and increase program office software staffing, but the complexity of the software development effort will not be fully understood until the SRR is complete. The program plans to implement a quantitative metrics tracking process to inform progress to plan.
- **Manufacturing** – The program is on track with manufacturing requirements appropriate to the program's current phase. Contractor manufacturing processes and supply chains are mature. Operational production lines exist for the airframe, cockpit, and subsystems, with sufficient production capacity to meet HH-60W requirements.
- **Integration** – Concurrent initial aircraft production and subsystem integration are the most significant integration risk. The program plans to ensure close management of the production line to avoid changes that could result from a late understanding of integration requirements for space, weight, power, cooling, wiring, and electromagnetic shielding. The contractor will develop, implement, and maintain a Systems Integration Plan that addresses the system functional configuration and integration process.

Conclusion: The HH-60W program entered the acquisition cycle at MS B. The program has made a dedicated effort to incorporate sound systems engineering practices into program and contractor activities to ensure effective program execution.

Data as of 4th quarter FY 2014.

Integrated Strategic Planning and Analysis Network, Increment 4 (ISPAN Inc 4)



Prime Contractor: The Government is the lead integrator (LI) of five largely independent prime contractor software development teams from four vendors: Leidos, C2 Systems Division; Lockheed Martin, Information Systems and Global Solutions Division; Northrop Grumman Information Systems, Defense Technologies Division; and BAE, Defense Systems and Solutions Division.

Executive Summary: ISPAN Inc 4 will modernize strategic mission planning for air vehicles and missiles (nuclear and conventional). ISPAN Inc 4 will reduce the planning and training time, will be easier for operators to use than previous versions of the system, and will allow for lower sustainment costs across the system life cycle. The program is an ACAT IAM in the Engineering and Manufacturing Development phase. The program achieved MS B in June 2014. In FY 2014, DASD(SE) participated in the system Preliminary Design Review (PDR), a PDR dry run, and each of the five subsystem PDRs. The program has established a mature technical baseline and is on track to deliver its first spiral (Spiral 1) of capability by December 2015.

Mission and System Description: ISPAN is a system of systems that provides planning capabilities to the United States Strategic Command (USSTRATCOM) in support of their Unified Command Plan responsibilities for strategic deterrence and global strike. ISPAN comprises two major elements, the Mission Planning and Analysis System (MPAS) and the Global Adaptive Planning Collaborative Information Environment (GAP CIE). The objective of ISPAN Inc 4 is the modernization of the MPAS element. MPAS supports the development of Joint Staff Level I through Level IV nuclear and conventional plans and options in support of National and Theater requirements.

Systems Engineering Activities

- **Systems Engineering Plan (SEP)** – DASD(SE) approved the SEP in June 2014 in support of MS B. The program is fulfilling the objectives of the SEP without waivers or deviations. The program completed five Spiral 1 System Requirements Reviews by 4th quarter FY 2014 and is proceeding with efforts to complete five subsystem Critical Design Reviews.
- **Requirements** – The JROC approved the CDD in November 2013. The MPAS System/Subsystem Specification and System/Subsystem Design Description are baselined with reasonable quantitative measures. The program has traced 100 percent of CDD requirements to the system requirements and has mapped the requirements to the preliminary design. Ongoing analysis indicates the design will meet the requirements.
- **Life Cycle Management** – The design follows a modular and scalable implementation consistent with the DoD Open Systems Architecture (OSA) Contract Guidebook for Program Managers. The subsystem designs adequately addressed the OSA design practices of nonproprietary software products and unlimited data rights to promote reduced Operations and Support cost and

Data as of 4th quarter FY 2014.

improved maintainability. The program is on track to meet the ease of integration KSA, the maintainability KSA, and the cost of ownership KSA.

- **Program Protection Plan (PPP)** – USD(AT&L) approved the MS B PPP in June 2014.

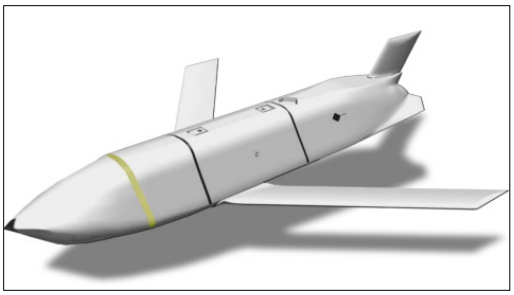
Assessments

- **DASD(SE) Assessments** – DASD(SE) conducted a Program Support Assessment in conjunction with the required PDR assessment in FY 2014, in support of the June MS B. The program PDR and subsystem PDRs informed both of these DASD(SE) reviews. The PMO conducted five subsystem PDRs in preparation for the PDR.
  - The Chief Engineer accepted PDR recommendations in the following areas: independent PDR Chair, risk management, system security, and schedule risk assessment.
  - The Government demonstrated the ability to plan and execute the LI tasks to modernize MPAS with acceptable risks. The LI reduced integration risk by establishing a USSTRATCOM Systems Integration Facility with corresponding governance and implementation details in the ISPAN Integration Plan.
  - In FY 2015 DASD(SE) plans to continue to monitor the program's execution to plan.
- **Risk Assessment** – The program is executing its risk management program documented in the SEP and is working to mitigate risks in the legacy baseline changes, multiple security certification, and software development areas.
- **Performance** – According to predicted performance presented at the PDR, results from prototyping efforts, and Technical Performance Measures, the program is on track to meet its 3 KPPs and 10 KSAs.
- **Schedule** – The program completed a MS B DAB in June 2014 and is on track to meet the thresholds established in the APB approved in June 2014. The program is on track for the 4th quarter FY 2018 Full Deployment Decision (FDD).
- **Reliability** – The approach for reliability leverages software quality practices and the analysis of deficiency reports. The LI established a disciplined defect management process including defect density, defect aging, and defect trends.
- **Software** – The software development effort is a blend of modernization and new development efforts delivering more than 2 million equivalent source lines of code (ESLOC) in three spirals. Parametric analysis predicted risk to delivery of the full scope by the FDD in 2018. The Air Force Service Cost Position increased the FY 2015 President's Budget by $19 million to mitigate the schedule risk.
- **Deployment** – The program is on track for the single site deployment to USSTRATCOM to support verification and validation. No further deployment is required to achieve full deployment.
- **Integration** – The program achieved MS B in June 2014 and is on track to demonstrate interoperability of Spiral 1 by December 2015. The results of the PDR confirmed the maturity of the MPAS integration process and the compliance by the five vendor teams. Each vendor addressed its integration activities, consistent with the detailed ISPAN Integration Plan developed by the LI.

Conclusion: The program demonstrates a high likelihood of accomplishing its intended mission. The program had a successful PDR, has established a mature technical baseline, and is on track for Spiral 1 delivery by December 2015.

Data as of 4th quarter FY 2014.

Joint Air-to-Surface Standoff Missile–Extended Range (JASSM-ER)



Prime Contractor: Lockheed Martin, Missiles and Fire Control

Executive Summary: The JASSM baseline is a highly survivable, long-range standoff missile designed to attack fixed and relocatable, highly valued targets. The JASSM-ER is an extended-range derivative of the baseline missile. The JASSM-ER was an ACAT ID until September 8, 2014, when the USD(AT&L) delegated the program to the Air Force as an ACAT IC. In FY 2014, DASD(SE) conducted an FRP decision review Program Support Assessment (PSA), finding the program ready for the FRP milestone decision. The program successfully completed the Air Force Review Board (AFRB) in September 2014, which recommended approval to enter FRP.

Mission and System Description: The JASSM is a highly survivable, long-range standoff missile designed to attack fixed and relocatable, highly valued targets. JASSM, designated AGM-158A, is in FRP. JASSM-ER, designated AGM-158B, is a derivative of the baseline. The JASSM-ER adds a turbofan engine and fuel capacity within essentially the same outer mold line and low-observable design to maintain baseline capabilities while more than doubling the range. These missiles provide fighter and bomber aircraft with the capability to strike critical, high-value, heavily defended targets early in a campaign.

Systems Engineering Activities

- **Systems Engineering Plan (SEP)** – DASD(SE) approved the SEP in August 2010 to guide technical activity for the Production and Deployment phase. DASD(SE) received an update to this SEP in December 2013. The program is fulfilling the objectives of the SEP without waivers or deviations.
- **Requirements** – The JROC validated the CPD in April 2010. The requirements are reasonable and have been stable throughout the program.
- **Life Cycle Management** – The program will implement production initiatives related to cost reductions in test facilitation with a low-cost Common Test Instrument Kit (C-TIK) for both the JASSM and JASSM-ER. The C-TIK will provide a means to continue surveillance testing of the JASSM-ER, which was not previously feasible. The program also expects to benefit from Foreign Military Sales of the baseline missile.
- **Program Protection Plan (PPP) –** The Assistant Secretary of the Air Force (Acquisition) approved the PPP in September 2014. The program is executing the processes documented in the approved PPP.

Assessments

- **DASD(SE) Assessments –** DASD(SE) completed the FRP PSA in September 2014. DASD(SE) commended (1) the program's use of well-defined processes for evaluating and executing affordability programs; (2) Lockheed Martin's (LM) use of a cooperative, state-sponsored personnel screening and training process; and (3) Williams's use of Federal Aviation Administration-approved processes to produce the engine and continued attempt to stay ahead of

Data as of 4th quarter FY 2014.

industry in technology and practices. The program accepted and is implementing manufacturing readiness and manufacturing performance recommendations. In FY 2015, DASD(SE) will conduct quarterly DAES assessments in the areas of schedule, performance, management, interoperability, and production.

- **Risk Assessment** – The program is executing the processes documented in the December 2013 SEP and June 2010 Risk Management Plan. The program is currently mitigating three risks: one regarding JAGR-S (JASSM Anti-jam GPS Receiver-Selective Availability Anti-Spoofing Module) obsolescence and two regarding test-unique hardware (battery and Test Instrumentation Kit).
- **Performance –** The program demonstrated all 4 KPPs and 11 KSAs through verification and validation including the 2012 IOT&E, where 20 out of 21 test shots were successful.
- **Schedule –** The program met the B-1 Assets Available schedule milestone in March 2014 and completed an AFRB recommending FRP. The program has no other APB schedule thresholds remaining.
- **Reliability** – The program exceeded the reliability requirement during the 2012 IOT&E. The next opportunity to evaluate JASSM-ER performance will be during the May and August 2015 Weapon System Evaluation Programs.
- **Software** – The program's software was stable throughout the development as the software is 95 percent common with the fielded JASSM baseline.
- **Manufacturing** –The program was mitigating a production risk related to the engine lube pump design not efficiently supporting FRP. The program awarded a Value Engineering Change Proposal in September 2014 with expectations of a new lube pump being ready for all-up-round assembly in FY 2015. The program accepted and is implementing manufacturing readiness and manufacturing performance PSA recommendations.
- **Integration** – The JASSM-ER design introduced no new interfaces. The design is 70 percent common with the JASSM baseline. The program has memoranda of agreement (MOA) with five aircraft programs (B-1, B-2, B-52, F-15E, and F-16), the Air Force Mission Planning System program, and the Global Positioning System Directorate. The program is executing these MOAs, which have been in place since 2003. JASSM-ER is currently being integrated on F-15E, B-2A, and B-52.

Conclusion: In FY 2014, DASD(SE) conducted a PSA, finding the program ready for FRP.

Data as of 4th quarter FY 2014.

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

Prime Contractor: N/A; the JMS System Program Office uses the Navy's Space and Naval Warfare (SPAWAR) Systems Center as system integrator.

Executive Summary: JMS is an ACAT IAM program that delivers a space command and control (C2) capability for the Commander, Joint Functional Component Command (JFCC) for Space, as well as space services to JFCC Space and other users. JMS Increment 1 (Inc 1) achieved Initial Operational Capability in April 2013, and Inc 2 entered Engineering and Manufacturing Development in June 2013. DASD(SE) participated in the Inc 2 System Review (SR) in May 2014. DASD(SE) assesses the program has completed the critical design of Service Pack (SP) 11 and demonstrates a high likelihood of accomplishing the technical aspects of its intended mission as well as satisfying all KPPs; however, completing Inc 2 before the APB threshold date is at risk.

Mission and System Description: JMS provides the infrastructure, core services, a space User-Defined Operational Picture, and mission services to support and enable the Commander, JFCC Space to accomplish the space missions assigned by the Commander, U.S. Strategic Command. These missions include space object identification, spectrum characterization, launch and reentry (excluding intercontinental ballistic missiles), support to contingency operations, and joint space support. JMS will interface with legacy systems and new sensors including the Space Surveillance Network, Space Object Identification sensors, advanced space surveillance sensors, Intelligence Community data and analysis systems, satellite C2, missile warning and defense asset management systems, space environmental systems, and defensive counter-space control assets.

Systems Engineering Activities

- **Systems Engineering Plan (SEP)** – DASD(SE) approved the Inc 1 MS C/Inc 2 MS B SEP in February 2013. The program is fulfilling the objectives of the SEP without waivers or deviations. The program's Agile software development approach delivers incremental capabilities based on prioritized operational needs that leverage existing technology. An updated SEP, approved by DASD(SE), will be required to support Inc 2 MS C in FY 2016.
- **Requirements** – The JROC validated the JMS CDD in August 2012. The Air Force is using an Agile software development process, in which a Requirements and Planning Council (R&PC) balances budget, schedule, and user priorities to allocate requirements to specific increments and SPs. The JMS systems engineering process integrates its Agile development environment with a traditional top-down requirement-decomposition process to develop the allocated baseline. Requirements trace from the approved CDD to the Functional Requirements Document and down to the Inc 2 Applications Requirements Document. This allocation has remained stable; however, JMS may need to defer some non-KPP content to maintain schedule.
- **Life Cycle Management** – JMS has implemented affordability measures to reduce cost compared with the original 2010 program Independent Cost Estimate. These efforts include maximizing use of existing Government-developed software and prototypes; maximizing use of mature, commercially available software under fixed-price contracts; deferring selected non-KPP requirements to future increments; and leveraging Government integration expertise in lieu of a large integration contract. The June 2013 Acquisition Decision Memorandum assigned affordability caps for both acquisition and operations/support costs.

Data as of 4th quarter FY 2014.

- **Program Protection Plan (PPP)** – USD(AT&L) approved the PPP in May 2013. There are no known issues and no plans for an update until MS C.

Assessments

- **DASD(SE) Assessments** – DASD(SE) participated in the JMS SR in May 2014. This SR focused on SP 11 design, technical risks, and projected performance. DASD(SE) assesses that the program has completed the critical design of SP 11 and demonstrates a high likelihood of accomplishing the technical aspects of its intended mission; however, the program has risk in achieving the Inc 2 Full Deployment Decision (FDD) by the APB threshold date of December 2016. The PO accepted the recommendations to develop prioritized options and timelines for deferring non-KPP capabilities, which may help reduce the likelihood of a schedule breach. The next SR will be in FY 2015.
- **Risk Assessment** – The program office is executing the risk management program documented in the Risk Management Plan and in the SEP. JMS is working to mitigate risks related to integrating commercial and Government software, cybersecurity, and migrating data between different security/classification levels.
- **Performance** – JMS has met two of five KPPs with Inc 1 and is on track to meet the remaining three KPPs with Inc 2. The program is meeting or exceeding all Technical Performance Measures identified in the SEP.
- **Schedule** – Software parametric analysis indicates risk to the achievement of Inc 2 FDD by the APB threshold date of December 2016. This risk has accumulated due to delays in the completion of SP 7 development, caused by the addition of incomplete Inc 1 work, funding cuts that reduced manpower, and a larger-than-expected number of deficiencies requiring resolution. Concurrent SP development activities with limited manpower compound this risk. The JMS program is planning an In-Process Review with USD(AT&L) following the SR in FY 2015.
- **Reliability** – JMS has defined numerous Critical Operational Functions that must be available 99.5 percent of the time with a mean time between critical failures greater than 2,000 hours, a mean time to restore function less than 10 hours, and no outages greater than 2 minutes that prevent completion of these functions. Preliminary reliability analysis indicates that JMS Inc 2, with a complete dual redundant suite configuration, will meet these requirements. Inc 1, currently in operations at the JSpOC, is exceeding the reliability measures.
- **Software** – JMS estimates the Inc 2 software size at approximately 410,000 equivalent source lines of code. JMS continuously tracks software development and quality metrics. JMS Inc 2 software development has experienced delays causing increased overlap of SP development and test efforts, further increasing the risk to meeting the APB threshold dates.
- **Deployment** – JMS Inc 2 will deploy four SPs of software to the JSpOC, each providing unique capabilities improving on or adding to the previous SP's capabilities. The first Inc 2 SP, SP 7, will reach Operational Acceptance in 1st quarter FY 2015.
- **Integration** – JMS is a software-integration program that incorporates Government-developed software and commercial off-the-shelf software into its service-oriented architecture infrastructure. Through the SEP-defined gating process, the program screens candidate software before accepting it for integration as a JMS product. The program has in place or is developing necessary agreements with external organizations. JMS is working closely with the Space Fence program office to refine and extend the JMS Enterprise Data Model to ensure integration. JMS Inc 2 will support testing with the Space Fence program.

Conclusion: The JMS program demonstrates a high likelihood of accomplishing the technical aspects of its intended mission as well as satisfying all KPPs; however, completing Inc 2 before the APB threshold date is at risk.

Data as of 4th quarter FY 2014.

KC-46 Aerial Refueling Tanker (KC-46A)

Prime Contractor: Boeing Defense, Space & Security

Executive Summary: The KC-46A is a militarized version of the Boeing 767-2C commercial aircraft. The new aerial refueling tanker is an ACAT ID program in the Engineering and Manufacturing Development (EMD) phase. The program successfully completed Critical Design Review (CDR) in August 2013. In FY 2014, DASD(SE) participated in program working groups focused on systems engineering, design, and verification. The program is on track to achieve all KPPs and KSAs but has experienced delays in manufacturing the first four EMD aircraft.

Mission and System Description: The KC-46's primary mission is to provide aerial refueling support to the Air Force, Navy, Marine Corps, and allied aircraft. Secondary missions include emergency aerial refueling, airlift, communications gateway, aeromedical evacuation, forward area refueling point, combat search and rescue, and treaty compliance.

Systems Engineering Activities

- **Systems Engineering Plan (SEP)** – DASD(SE) approved the SEP in January 2012. The SEP guides the technical planning and execution during the EMD phase. The program is fulfilling the objectives of the SEP without waivers or deviations and plans to update the SEP to support MS C in 4th quarter FY 2015.
- **Requirements** – The JROC approved the CDD for the KC-135 Replacement Aircraft in December 2006. The CDD addresses "air refueling" shortfalls and documents specific capabilities the KC-46 program must provide. The program requirements are reasonable and stable. There have been no Level I Engineering Change Proposals to date. Requirements are traceable to the performance specification and/or appropriate artifacts in the technical baseline. DASD(SE) projects the program will meet requirements.
- **Life Cycle Management** – The KC-46 program is undergoing an Independent Logistics Assessment (ILA) and is conducting a Product Support Business Case Analysis in preparation for MS C. In addition, the KC-46 program conducts a Logistics Health Assessment quarterly. Logistics support elements are on track to support IOT&E. The program began support equipment provisioning in 4th quarter FY 2014, later than anticipated, and projects to be on track in 3rd quarter FY 2016.
- **Program Protection Plan (PPP)** – USD(AT&L) approved the PPP in December 2010, and the program is executing the processes documented in the approved PPP. An update is under way to support the MS C decision in 4th quarter FY 2015.

Assessments

- **DASD(SE) Assessments** – DASD(SE) conducted quarterly DAES assessments in FY 2014, assessing the areas of schedule, performance, management, interoperability, and production.

Data as of 4th quarter FY 2014.

  - In FY 2015 DASD(SE) is conducting a MS C Program Support Assessment to review the program's technical and materiel readiness. The assessment will evaluate the engineering and management processes and resources available entering production.
- **Risk Assessment** – The program is executing the risk management program as defined in the SEP and Risk Management Plan. The program conducted an integrated risk assessment in April 2014 and is working to mitigate risks in the refueling system maturity and qualification; software integration; flight test resources; and schedule. There is one program-level issue: the integration of the fuel system and the On Board Inert Gas Generator System (OBIGGS). The contractor redesigned components to address the deficiency and is evaluating the changes in the wet fuels lab.
- **Performance** – The program has nine KPPs and five KSAs. The program is on track to meet all requirements by FRP.
- **Schedule** – The program completed CDR in August 2013. Several key events such as Power-On and 767-2C first flight were delayed by 4 to 6 months because of wiring bundle changes and associated work. The program will conduct a comprehensive schedule risk health assessment in 2nd quarter FY 2015 after the contractor completes the replan of the Integrated Master Schedule. The next key events are the 767-2C and KC-46 first flights, projected to occur in 1st and 3rd quarter FY 2015. MS C is the next APB event and is planned to occur by the end of FY 2015. The program expects to meet the Required Assets Available APB event by August 2017.
- **Reliability** – The KC-46A is based on the 767 commercial aircraft, which has a demonstrated high reliability. The program is on track to meet reliability and maintainability requirements (mission capable rate, fix rate, break rate, and mission completion success probability) by FRP. The program has an approved Reliability and Maintainability Program Plan.
- **Software** – The program is developing 6.93 million software lines of code (SLOC), an increase of 14.6 percent since the CDR. Modified code decreased slightly while new and reuse code increased by 931,000 SLOC. The increased code resides primarily in the Avionics Flight Management Computer and Aerial Refueling Management System. While functionality has delivered slightly behind plan, defect discovery is running above projections. Utilization of computing resources is within required levels.
- **Manufacturing** – The manufacturing of the first four aircraft and four booms is under way. Key suppliers are challenged to meet original delivery dates, potentially impacting the manufacturing build schedule. A wiring bundle anomaly caused several key events (Power-On, ground test, Test Readiness Review, and first flight) to be delayed by approximately 6 months. Originally, the 767-2C (provision freighter variant to the KC-46) first flight event was planned for June 2014; it is now scheduled for 1st quarter FY 2015. Late supplier deliveries are hindering the aircraft manufacturing schedule, which has an impact on the EMD aircraft delivery. Schedule pressure is likely to continue throughout FY 2015.
- **Integration** – The program is testing subsystems in the contractor's System Integration Labs. The higher than projected defect discovery rate is requiring additional resources to analyze, fix, and retest the software. The program is negotiating memoranda of agreement with the Air Force, Navy, and the United Kingdom to secure the receiver aircraft (B-2A, F-16C, F/A-18C, AV-8B, Tornado, etc.) required to verify the aerial refueling capabilities including handling qualities, mechanical compatibility, and interoperability.

Conclusion: The program is on track to achieve the required KPPs and KSAs. The first four EMD aircraft have experienced initial integration issues, adding pressure to the program schedule as evidenced by a delay of several key events by approximately 6 months.

Data as of 4th quarter FY 2014.

RQ-4B Global Hawk Unmanned Aircraft System (UAS)

Prime Contractor: Northrop Grumman, Aerospace Systems

Executive Summary: Global Hawk provides all-weather, day-night intelligence, surveillance, and reconnaissance capability. The system consists of an aircraft, payload, data links, ground control station, and logistics support packages. The program is an ACAT ID in the Production and Deployment phase with all systems on contract for delivery. The program is completing a 2011 Nunn-McCurdy recertification process to reenter the formal acquisition framework with a MS C schedule in FY 2015. In FY 2014, DASD(SE) supported the In-Process Review (IPR) DAB and numerous Systems Engineering (SE) Working Integrated Program Teams to update the program SEP. The program plans implementation of future capabilities through separate, individual ACAT programs as the Air Force continues to define the content of an affordable modernization program.

Mission and System Description: Global Hawk provides continuous, high-altitude, long-endurance, wide-area surveillance capability in near real time. Global Hawk operates in low-threat, permissive environments, providing a variety of intelligence capabilities to support joint combatant forces or national authorities in worldwide peace, crisis, and wartime operations. The Global Hawk enterprise consists primarily of Block 30 and 40 variants.

Systems Engineering Activities

- **Systems Engineering Plan (SEP)** – DASD(SE) approved the SEP in July 2011. The program is fulfilling the objectives of the SEP without waivers or deviations. The program is revising the SEP to support a MS C DAB in FY 2015.
- **Requirements** – The JROC approved the Global Hawk requirements in the July 2006 CDD forming the basis for the program. The program has generated the Block 30 and 40 CPDs to reflect current system capabilities, and they are undergoing the JROC approval process. The CPDs provide achievable threshold goals for sensor requirements, system reliability, net readiness, ground station capabilities, and integration.
- **Life Cycle Management** – To achieve system affordability, the program eliminates redundancy by tracing planned and future modifications and enhancement efforts to validated Global Hawk requirements. The program is gaining further efficiencies by building strong partnerships between the requirements and acquisition communities and by utilizing modular open systems architecture to more effectively integrate ground control and air vehicle segments.
- **Program Protection Plan (PPP)** – USD(AT&L) approved the PPP in October 2013. The program is executing the process documented in the approved PPP.

Assessments

- **DASD(SE) Assessments** – DASD (SE) participated in the July 2014 IPR DAB, which emphasized the need to establish a stable set of program requirements from which current performance and future development activity could be assessed. The program has proposed a set

Data as of 4th quarter FY 2014.

of baseline program requirements and a process for adding future capability, which will be reviewed at the MS C DAB in FY 2015.
  - In FY 2015 DASD(SE) will support the MS C DAB and conduct SE Working Integrated Product Team meetings as needed.
- **Risk Assessment** – The program is executing its risk management program as documented in the SEP and is mitigating risks in the areas of materiel shortages and ground control station interoperability.
- **Performance** – The program has seven KPPs, eight KSAs, and two Technical Performance Measures. The CPD is being staffed through the JROC, which modifies the KPPs and KSAs to align with baseline system performance. The Block 40 system has been flying in theater operationally since September 2013 and is performing effectively in direct support of combat operations. Global Hawk continues to demonstrate its military utility, having flown more than 124,000 flight hours, of which 90,000 have been in direct support of overseas contingency operations.
- **Schedule** – The program completed an IPR DAB in July 2014 in advance of the MS C DAB scheduled for January 2015. The program is working to establish a new schedule baseline for IOT&E and MS C that would rescind the 2011 Nunn-McCurdy breach. The program will incorporate this revised schedule baseline into a new APB being prepared for the MS C decision.
- **Reliability** – The program is meeting its reliability requirements. The Block 40 Early Operational Capability has achieved a mission effectiveness rate and system availability rate of 95 percent in September 2014. The program is reporting materiel availability rates at 82 percent in June 2014, exceeding its overall materiel availability requirement of 61 percent.
- **Software** – The program has developed more than 4 million lines of code, resulting in continuous improvements to the current development practices and reduced delays for delivery of added capabilities. A reduction in the number of software builds from three to one per year has resulted in more stable and structured software delivery for both Block 30 and 40 aircraft.
- **Manufacturing** – The program is on track with manufacturing requirements and has fielded 18 of 21 Block 30 aircraft with the three remaining on schedule for a 2017 delivery. The 11 Block 40 production aircraft will complete delivery in FY 2015. The prime contractor's manufacturing performance is above average after emplacing manufacturing controls of subcontractors and suppliers.
- **Integration** – The program is working to ensure the Air Force Distributed Common Ground System (DCGS) can process advanced data emanating from the Block 40 aircraft. The program is working to incorporate affordable capability upgrades by incrementally developing hardware and software an Integrated Functional Capability (IFC) approach. Each IFC adds a new level of capability to the baseline program, providing capability enhancements in manageable building blocks.

Conclusion: Global Hawk is delivering operational capability through a tailored Acquisition Strategy that mitigates technical risk by leveraging program restructuring and re-baselining, requirements stabilization, and systems engineering process improvements. The program plans the implementation of future capabilities through separate, individual ACAT programs as the Air Force continues to define the content of an affordable modernization program.

Data as of 4th quarter FY 2014.

Small Diameter Bomb, Increment II (SDB II)

Prime Contractor: Raytheon Missile Systems

Executive Summary: The SDB II is a 250-pound class glide weapon designed to attack moving and stationary targets in adverse weather conditions. SDB II is an ACAT ID program in the Engineering and Manufacturing Development phase. In FY 2014, DASD(SE) monitored system verification results for indications of system performance and completed the MS C Program Support Assessment (PSA). The SDB II is progressing toward MS C; however, the program is a year behind schedule as a result of delays in all-up-round (AUR) qualification and time to correct deficiencies discovered in verification.

Mission and System Description: The SDB II weapon has three principal attack modes: normal, laser-illuminated, and coordinate attack. The weapon addresses the following Warfighter requirements: attack moving, stationary, and fixed targets; adverse weather operations; standoff range; multiple kills per pass; multiple ordnance carriage; precision munitions capability; reduced munitions footprint; increased weapons effectiveness; minimized potential for collateral damage; and reduced susceptibility of munitions to countermeasures. The SDB II provides a network-enabled weapon capability via a dual-mode Link 16/Ultra High Frequency Weapon Data Link.

Systems Engineering Activities

- **Systems Engineering Plan (SEP)** – DASD(SE) approved the MS B SEP in May 2010. The program is fulfilling the objectives of the SEP without waivers or deviations. The program submitted a final draft MS C SEP to DASD(SE) for review in January 2014.
- **Requirements** – The JROC validated the CDD in July 2009. For MS C, the program submitted the CDD in lieu of a CPD as the requirements were unchanged. The joint and Air Force requirements staffs concurred with this approach. The June 2014 PSA and the August 2014 Configuration Steering Board confirmed the requirements are reasonable and stable. All KPPs and KSAs adequately trace to the System Performance Specification, design specifications, and the Technical Data Package specifications and drawings.
- **Life Cycle Management** – The program will implement production initiatives related to cost reductions in the flight termination, telemetry, and tracking; and control actuation systems. The program cost may also benefit from Foreign Military Sales. SDB II is a Defense Exportability Features (DEF) pilot program. It commenced a DEF study for system design and development in FY 2014.
- **Program Protection Plan (PPP)** – USD(AT&L) approved the MS C PPP in July 2014, and the program is executing the processes in the PPP.

Assessments

- **DASD(SE) Assessments** – DASD(SE) completed the MS C PSA in June 2014 per DoDI 5000.02. DASD(SE) commended the program's use of open communication with stakeholders, a fixed-price incentive fee contract, a 20-year warranty, a strong process for controlling design changes, and a production reliability incentive program.

Data as of 4th quarter FY 2014.

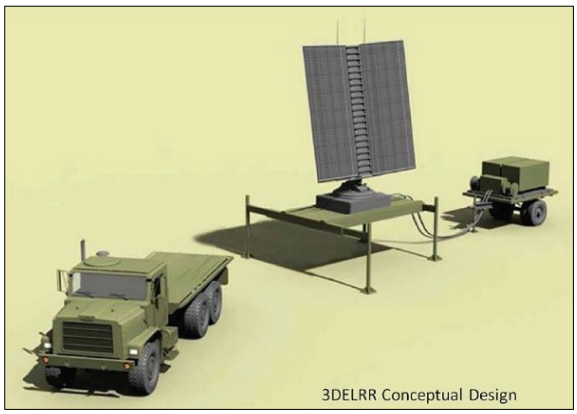
  - The program accepted the PSA recommendations (1) to revise the free flight reliability estimate to better represent the impact of DT failures; (2) to reduce schedule risk by basing the Integrated Master Schedule on an independent risk and confidence assessment; and (3) to determine whether more data will be needed to verify the Integrated Flight Simulation (IFS).
  - In FY 2015, DASD(SE) will conduct quarterly DAES assessments in the areas of schedule, performance, management, interoperability, and production.
- **Risk Assessment** – The program is executing to the May 2010 SEP. The program is mitigating one F-35 integration risk and one IFS performance verification risk.
- **Performance** – The program is on track to meet all 5 KPPs, 8 of 10 KSAs, and 8 of 11 Technical Performance Measures. The scenario weapon effectiveness (SWE) KPP and weapon effectiveness (WE) KSA, however, may not be fully demonstrated until Lot 3 or later due to a dependency on meeting an allocated Free Flight Reliability (P_{FFR}) of 0.91. The demonstrated P_{FFR} is currently 7 percent below the growth curve needed to support the SWE and WE requirements by IOT&E. The program has mitigation plans in place.
- **Schedule** – The program manager estimates MS C will slip beyond the APB schedule threshold of January 2014, to March 2015. The MS C delay is a result of challenges in integrating parallel development activities, delays in qualification, and time to correct developmental test deficiencies, culminating in a System Verification Review schedule slip by the contractor.
- **Reliability** – The program is required to meet the P_{FFR} KSA of 0.91 by Lot 5, but is on track to meet the P_{FFR} by Lot 3. The demonstrated performance and growth projections to date, however, are 7 percent below the reliability needed to meet the SWE KPP and WE KSA by IOT&E.
- **Software** – SDB II software includes approximately 380,000 source lines of code across three computer software configuration items. The program is developing software iteratively over six builds; Build 6 is in work. The PSA team noted the program lacked expected software engineering depth and recommended addition of a Government software lead, which the program has corrected.
- **Manufacturing** – The May 2013 Air Force-led Manufacturing Readiness Assessment indicated all 68 production processes are mature. Raytheon and its suppliers have established pilot production lines and demonstrated production processes using engineering assets. In addition, Raytheon has built 26 AUR test assets on the production line using expected full-rate processes and personnel. The industrial base has sufficient capacity to support LRIP.
- **Integration** –
  - The program participates fully in the Network-Enabled Weapons Steering Group to address interface and integration concerns with command and control systems of systems. The steering group consists of members from network-enabled weapons and platform programs.
  - The program is executing to memoranda of agreement with the F-15E, F-35, and the Joint Tactical Air Controller programs, as well as with the Air Force Mission Planning Division; these agreements have been in place since 2007.
  - The program is on track to complete all certifications identified in the SEP relating to information assurance and net-ready.
  - The program is mitigating one risk related to the F-35 development delays and potential impacts associated with concurrent development and the program designing the SDB II to an F-35 bay environment, which has yet to be fully characterized.

Conclusion: The SDB II program is progressing toward MS C; however, the program is a year behind schedule due to delays in AUR qualification and time required to correct deficiencies discovered in verification.

Data as of 4th quarter FY 2014.

Three-Dimensional Expeditionary Long-Range Radar (3DELRR)

Prime Contractor: To be determined



Executive Summary: 3DELRR will be the principal Air Force long-range, ground-based sensor for detecting, identifying, tracking, and reporting aerial targets for the Joint Force Air Component Commander through the Theater Air Control System. It will replace the aging Air Force AN/TPS-75 radar system, which is incapable of detecting some current and emerging threats and is becoming more difficult and costly to maintain. The 3DELRR is an ACAT ID that just entered the Engineering and Manufacturing Development (EMD) phase. The program completed both the pre-EMD review and MS B DAB this year. As of 4th quarter FY 2014 the program has not announced selection of a prime contractor for EMD. The results of preliminary reviews and prototyping indicate the program is on track.

Mission and System Description: The 3DELRR will provide the Air Force Control and Reporting Center (CRC) operators with a precise, real-time air picture of sufficient quality to display air activity and conduct positive control of individual aircraft. The 3DELRR will be a transportable/deployable system consisting of a rotating antenna array assembly on a pedestal. Signal and data processing electronics are housed both in the rotating array assembly and in the pedestal. An additional shelter houses communications equipment and additional data-processing hardware and software. An identification, friend or foe system will be an integral part of the 3DELRR. The 3DELRR may be controlled locally by operator/maintainers, or remotely by operators at the CRC. The system may be powered by Government-furnished generators or grid power.

Systems Engineering Activities

- **Systems Engineering Plan (SEP)** – DASD(SE) approved the SEP in April 2014 to support MS B and EMD. The program is fulfilling the objectives of the SEP without waivers or deviations and is positioned to continue to do so when a prime contractor is selected.
- **Requirements** – The JROC approved a revised CDD in July 2013, before the pre-EMD review and RFP release; the program requirements have since remained stable. The revised CDD requirements reflect the results of trade studies, prototyping, and the preliminary design process. The program revised the Technical Requirements Document (TRD) to conform to the revised CDD and included the TRD with the EMD RFP. Contractors are expected to modify their design specifications, which were reviewed during the Preliminary Design Reviews (PDR), to meet the revised TRD requirements and submit them with their EMD proposals. The EMD contractor is to be determined, pending completion of the source selection process and contract award. The program requirements are reasonable and stable. The requirements led to a radar that will include a high-power and efficient transmit-and-receive capability with advanced digital beam forming to meet system requirements.
- **Life Cycle Management** – The program office and the Technology Development (TD) phase contractors conducted requirements analyses by assessing the performance of varied radar architectures in five key areas against costs to identify the appropriate balance of performance

Data as of 4th quarter FY 2014.

and life cycle cost targets. The 3DELRR is a Defense Exportability Features (DEF) pilot program. The contractors' PDRs included an assessment of how DEF may be included and the impact on cost and performance. The program also completed three parallel DEF studies during the TD phase. It also included DEF as a requirement in its EMD RFP to conduct DEF design and development.

- **Program Protection Plan (PPP)** – USD(AT&L) approved the PPP in May 2014.

Assessments

- **DASD(SE) Assessments** – DASD(SE) completed a Program Support Assessment in preparation for the pre-EMD review and MS B DAB. The program made minor adjustments to the program documentation before the pre-EMD review as a result of the assessment.
- **Risk Assessment** – The program continues to manage risks as documented in the SEP and Risk Management Plan. The program plans to revise its risk assessment and mitigation plans based on the selected EMD contractor.
- **Performance** – According to predicted performance presented at the PDRs, results from prototyping efforts, and Technical Performance Measures, the program is on track to meet its six KPPs and seven KSAs.
- **Schedule** – The program has recently entered the EMD phase, having achieved MS B in September 2014. The program completed PDRs for each of three contractors in June 2013 as planned in the program's SEP. A pre-EMD review was held in October 2013, and the MS B DAB was held in September 2014.
- **Reliability** – The program updated the reliability requirements in the CDD and TRD in FY 2013 to align with the RAM-C Rationale.
- **Software** – The software development in the TD phase was completed in FY 2013. DASD(SE) analyzed the TD phase vendors' estimated EMD software development efforts and provided a quantitative comparison of competing vendors to the program. DASD(SE) assessed the effects of schedule compression on the EMD software staffing needs and defects. The program has not announced a prime contractor, so no contract work on software has been conducted in FY 2014.
- **Manufacturing** – The program office assessed each contractor's manufacturing capabilities and plans in conjunction with the PDRs. Contractors have indicated that existing facilities and processes may be used for much of the manufacturing efforts. The manufacturing assessments indicate critical technology elements (e.g., gallium nitride (GaN)-based transmit receive modules) are mature and that planned manufacturing capabilities are mature for this point in the program.
- **Integration** – After their PDR, each contractor demonstrated internal system integration as part of the system prototype demonstration. The program office has established working relationships with external organizations as needed and plans to establish memoranda of agreement for the EMD phase.

Conclusion: The program is on track to provide a radar system that will meet the user's operational requirements.

Data as of 4th quarter FY 2014.

4.4 DASD(SE) Assessments of DoD Programs

Assessments are as of 4th quarter FY 2014. This section includes summaries on the following three programs:

- F-35 Joint Strike Fighter Aircraft
- Joint Light Tactical Vehicle (JLTV)
- Public Key Infrastructure, Increment 2 (PKI Inc 2)

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F-35 Joint Strike Fighter Aircraft

Prime Contractor: Lockheed Martin Aeronautics and Pratt and Whitney Military Engines Division

Executive Summary: The F-35 is a three-variant family of multi-role fighter aircraft. The F-35 is an ACAT ID program in the System Development and Demonstration (SDD) phase with concurrent LRIP. The program achieved MS B recertification in March 2012. In 2014, DASD(SE) participated in subsystem technical reviews, risk review boards, and Production Readiness Reviews (PRR); assessed software development and reported the results to Congress; and conducted an assessment of manufacturing risk to inform the Milestone Decision Authority regarding readiness for increased production rates. The F-35 program continues to make progress, but many challenges remain.

Mission and System Description: The F-35 program plans to develop and field an affordable, common family of next-generation, multi-role strike aircraft for the U.S. Air Force, Navy, Marine Corps, and allies. The three variants are the Air Force Conventional Takeoff and Landing (CTOL), the Navy Carrier Variant (CV), and the Marine Corps Short Takeoff and Vertical Landing (STOVL).

Systems Engineering Activities

- **Systems Engineering Plan (SEP)** – DASD(SE) approved the SEP in December 2009. An update in November 2010 included improvements in risk management. The program is fulfilling the objectives of the SEP without waivers or deviations. However, the SEP lacks a description of current technical processes, schedule, and organization. USD(AT&L) expects the program to submit SEP updates to support Follow-on Development and SDD MS C.
- **Requirements** – The JROC approved the MS B Operational Requirements Document (ORD) in April 2000, and the Joint Program Office (JPO) incorporated the requirements in the Joint Strike Fighter Contract Specification (JCS). During a 2013 review, the program reaffirmed the JCS contained all ORD requirements. Program-level requirements are stable.
- **Life Cycle Management** – The program has implemented multiple affordability initiatives, investing an additional $160 million to complete SDD. In 2014, the program entered into a cost-sharing agreement with industry to reemphasize share costs. The program established a "cost-war room" in the JPO to reduce Operations and Support costs and to identify potential should-cost savings.
- **Program Protection Plan (PPP)** – USD(AT&L) approved the PPP in December 2010. The program is executing the processes documented in the approved PPP. The program is working to address supply-chain risks and vulnerabilities for an updated PPP expected in 1st quarter FY 2015.

Assessments

- **DASD(SE) Assessments –** A USD(AT&L)-directed review of the program's manufacturing progress revealed acceptable risk to allow an increased ramp rate in FY 2015. DASD(SE) participated in subsystem technical reviews including several PRRs. DASD(SE) also led a congressionally directed, 6-month deep dive into F-35 software development, which confirmed

Data as of 4th quarter FY 2014.

software continues to present schedule risk with estimates of 6 to 14 months of pressure to software delivery milestones.

- **Risk Assessment** – The program is executing a risk management program as documented in the Risk Management Plan. As a result of concurrency, the program is simultaneously working to mitigate risks in all phases: development, production, and sustainment. Risk mitigation plans are in place.
- **Performance** – The program is on track to meet 8 of the 10 KPPs listed in the ORD. The validity of the modeling assumptions is hampering demonstration of the sortie generation rate (SGR) and logistic footprint KPPs. The program plans to reassess the SGR and logistic footprint using operationally realistic ground rules and current design attributes. Although on track, the STOVL combat radius, STOVL performance, and CV recovery KPPs have limited margins.
- **Schedule –** The program completed an Interim Program Review DAB in October 2013. The program is at risk for meeting some APB thresholds by up to 9 months due to the delays in software development mentioned previously. For example, DASD(SE) estimates indicated the Block 3F Fleet Release threshold of February 2018 may slip 9 months and the MS C/FRP decision threshold of October 2019 may slip 4 months.
- **Reliability** – Reliability performance to date remains mixed across all variants with some metrics on track and others below plan. Overall, the program is continuing to work to meet key reliability requirements. In 2014, the program funded a reliability improvement program with contract incentives to improve reliability.
- **Software** – Software development continues as a primary schedule risk due largely to past performance including inadequate SE and integration practices. The congressionally directed software review team conducted software parametric and schedule analyses to assess program progress. The team estimated software delays of up to 14 months and recommended management improvements to reduce potential APB impacts of approximately 9 months. The team identified key software risks including lack of sustainment planning, use of software metrics and defect resolution. The program has adopted the recommendations and continues to improve software development processes. Since the assessment, the Block 2B software has continued in flight test with one or two additional clean up builds still likely. Block 3i began flight tests in FY 2014 but is 3 to 5 months behind the current schedule. The program is working to accelerate Block 3F development by reducing schedule margins and implementing productivity improvements.
- **Manufacturing** – DASD(SE) conducted an independent assessment of manufacturing risks associated with increased production rates. The assessment indicated year-over-year improvement. However, moderate risk remains due to parts availability, quality, and ultimately aircraft deliveries. Since the assessment, the program has improved quality, optimization of production sequences, factory floor flow, tooling, interchangeability-replaceability, and engineering change management. The program continues to execute cost-reduction initiatives.
- **Integration** – Interoperability and Information Assurance (IA) certifications and verification and lab capacities are watch items. IA certification is on the critical path as the program cannot complete interoperability certifications until Block 3F capability is through verification. Overall, verification and lab capacity are stretched to support concurrent block activity. The program has implemented lab and desktop tool upgrades and expects more efficient verification while continuing to evaluate lab-capacity options. The program has established memoranda of agreement and Interface Control Working Groups with weapon program offices as documented in the SEP.

Conclusion: The F-35 program is making steady progress, but many challenges remain. Software development continues to be a top challenge and is a major program focus area.

Data as of 4th quarter FY 2014.

Joint Light Tactical Vehicle (JLTV)

Prime Contractors: AM General LLC; Lockheed Martin Corporation; Oshkosh Defense LLC (competition)

AM General | Lockheed Martin | Oshkosh

Executive Summary: JLTV is a light truck intended to increase protection, payload, and performance over the High-Mobility Multipurpose Wheeled Vehicle (HMWWV). The program is in the Engineering and Manufacturing Development (EMD) phase. JLTV has an established initial product baseline with stable requirements. The program is managing and mitigating risks leading to MS C through requirements updates and plans for Best Value competition in FY 2015.

Mission and System Description: The JLTV is a Joint Service (Army and Marine Corps) program. It consists of a family of vehicles with companion trailers, capable of performing multiple mission roles while providing protected, sustained, networked mobility for personnel and payloads across the full range of military operations. The JLTV includes two variants with a common automotive vehicle platform: a two-seat variant to satisfy the Combat Support Vehicle (CSV) requirement and a four-seat variant to satisfy the Combat Tactical Vehicle (CTV) requirement. The two-seat CSV variant has one base vehicle platform, the Utility/Shelter Carrier. The four-seat CTV variant has two base vehicle platforms, the Close Combat Weapons Carrier and the General Purpose vehicle.

Systems Engineering Activities

- **Systems Engineering Plan (SEP)** – DASD(SE) approved the JLTV EMD SEP in June 2012. The program continues to follow the approved SEP, with the exception of risk management. The program modified risk consequence definitions after MS B to non-standard risk definitions. The revised definitions allow the program to discern between primary and non-primary KPPs and to better manage resources during EMD. Adequate plans are in place to address technical and schedule risks. A SEP update is under way to support MS C planned for 4th quarter FY 2015 for entry into the Production and Deployment (P&D) phase.
- **Requirements** – The JROC approved the JLTV CDD in January 2012. The JLTV CPD approval is expected in the 1st quarter FY 2015 to support the next phase. This CPD went through a series of five predetermined event-based data reviews called Knowledge Points (KP), three of which occurred during FY 2014. Program stakeholders used the results of these KPs to refine the program's requirements for the P&D phase. Requirements are reasonable and stable.
- **Life Cycle Management** – The program's Acquisition Strategy and requirements are structured to incentivize the three EMD phase contractors to continue to adjust their vehicle designs to stay within the targeted $255,000 average unit manufacturing cost and $399,000 average procurement unit cost. The Budget Year 2012 (BY12) targets also support APB objectives. The program office developed an Operations and Support cost model to establish a cost target of $29,100 (BY12) per year per vehicle. JLTV expects to release the P&D phase RFP in 1st quarter FY 2015 and make a final best value selection at MS C in 4th quarter FY 2015.
- **Program Protection Plan (PPP)** – USD(AT&L) approved the PPP in August 2012. The program continues to follow the processes specified in the PPP. Updates to the PPP are under way to support MS C and LRIP.

Assessments

- **DASD(SE) Assessments** – The program conducted a Production Readiness Review (PRR) and System Verification Review (SVR) for each of the three contractors. DASD(SE) assessed that all

Data as of 4th quarter FY 2014.

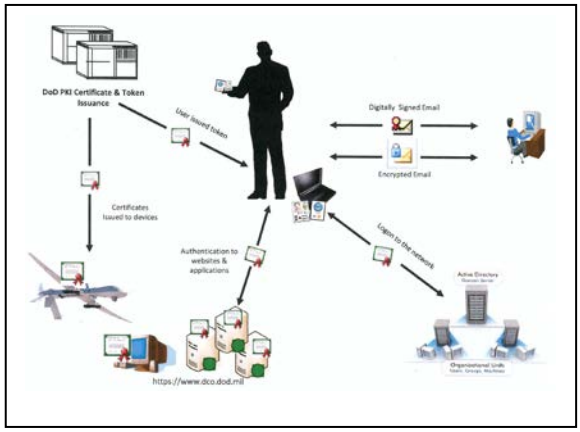
contractors demonstrated adequate processes, procedures, production tooling, and modeling and simulation to support LRIP beginning in 4th quarter FY 2015. DASD(SE) assessed that the program has verified contractor compliance levels for the JLTV requirements. In addition:
  - DASD(SE) engaged in the requirements KP process and Systems Engineering Working Integrated Product Team (SE WIPT) meetings.
  - DASD(SE) conducted quarterly DAES assessments in FY 2014 in the areas of schedule, performance, management, interoperability, and production.
- **Risk Assessment** – The program deviated from the risk management process documented in the approved June 2012 SEP by changing the risk consequence definitions to non-standard definitions. The non-standard definitions discern between primary and non-primary KPPs, enabling better management of resources during EMD. The program's risk review board has approved 39 risks, which the program is managing. Mitigation plans are in place to address the program's risks, with some C4 (command, control, communication, and computers) integration risks deferred until the P&D phase to align with maturity of the integrated systems.
- **Performance** – Demonstrated EMD performance during developmental testing for each of the 22 prototypes per vendor indicates that the KPPs and KSAs are achievable within the affordability cap. Although not every KPP and KSA was fully demonstrated during EMD testing, the JPO assesses the risk of the winning vendor's ability to fully demonstrate KPP/KSA compliance by the operational test as low. The SVRs in August and September 2014 verified compliance levels of the competing contractors. The program is on track to meet all Technical Performance Measures by FRP. To be deemed awardable for the next phase contract, the winning vendor must claim compliance for all KPPs/KSAs.
- **Schedule** – The program entered the EMD phase at MS B in August 2012. The program completed PRRs and SVRs in FY 2014 as scheduled. JLTV is on track to achieve MS C in 4th quarter FY 2015 ahead of its threshold of November 2015.
- **Reliability** – The results from developmental testing in FY 2014 indicate that the CDD threshold requirement of 2,400 mean miles between operational mission failures is achievable through the competitive Acquisition Strategy for the next phase. At the June KP 5, the emerging results indicated that the operational availability requirement of the sustainability KPP is achievable with acceptable risk. Based on emerging results from reliability testing, the program projects testing will collect sufficient performance data to support down-select. The program projects that reliability growth improvements and other corrective actions will increase the likelihood of achieving the reliability KSA threshold, which will also improve sustainability.
- **Software** – Each of the contractors has demonstrated software maturity during developmental testing in FY 2014, with some information assurance risks identified for future corrective actions prior to certification.
- **Manufacturing –** The program completed a PRR for each of the three competing contractors in September 2014. DASD(SE) assessed that each of the three contractors demonstrated adequate processes, procedures, production tooling, and modeling and simulation to support LRIP in 4th quarter FY 2015.
- **Integration** – The program office monitors design changes in EMD to ensure proper integration of contractor and Government-furnished equipment through a series of monthly contract deliverables. The program manages 17 external memoranda of agreement in accordance with the approved SEP. Each vendor has demonstrated the appropriate level of integration through delivery of 22 prototypes, which have undergone developmental testing in FY 2014.

Conclusion: The program is on track to meet MS C in 4th quarter FY 2015 ahead of its APB threshold of November 2015. It has updated requirements through a KP process and plans for a best value competition for an LRIP contract award. JLTV is likely to meet all of its KPPs by FRP.

Data as of 4th quarter FY 2014.

Public Key Infrastructure, Increment 2 (PKI Inc 2)

Prime Contractor: General Dynamics C4 Systems



Executive Summary: PKI Inc 2 is intended to enable information assurance services on the Secret Internet Protocol Router Network (SIPRNet) by providing non-forgeable and non-changeable credentials on a hardware token. The program is an ACAT IAM in the Production and Deployment phase. The program achieved MS C in 2nd quarter FY 2011 and has been deployed but is experiencing difficulties in execution. In FY 2014, DASD(SE) participated in a Critical Change Review (CCR) and other reviews. DASD(SE) provided technical guidance to assist the program in restarting the technical processes needed to deploy the program successfully. PKI Inc 2 continues to experience challenges but is working to form realistic program plans.

Mission and System Description: PKI Inc 2 provides a standards-based representation of physical identity in an electronic form. PKI Inc 2 incorporates upgrades over previous identification systems to enhance the confidentiality and integrity of the data shared across the Department. PKI Inc 2 allows Warfighters to securely access, process, and store information on the SIPRNet regardless of system, organization, or location.

Systems Engineering Activities

- **Systems Engineering Plan (SEP)** – The National Security Agency (NSA) approved the SEP for MS C in April 2011. During the production and manufacturing phase, the program has experienced deviations and is not fulfilling the objectives of the SEP. The CCR determined that the program was not performing the documented SE processes. The CCR senior official determined the program needed to reestablish the SE processes and update the SEP for DASD(SE) approval by 1st quarter FY 2015, establishing metrics to track progress.
- **Requirements** – The JROC approved using the CDD with amendments in lieu of a CPD in May 2009 and revalidated the requirements documents in March 2014. The Identity and Protection Management Senior Coordination Group vetted and accepted the decomposed functional requirements. The program uses the functional requirements document and Service Concept of Operations (CONOPS) to guide the remaining system development activities. The requirements are reasonable and stable. PKI Inc 2 is in the process of further decomposing and documenting the requirements in a System/Subsystem Specification and a Software Requirements Specification.
- **Life Cycle Management** – The program has not completely addressed life cycle management requirements. The program has developed the functional requirements but not the system level requirements. The program has not determined the needed corrections to help resolve the 2013 FOT&E determinations of not operationally effective and not operationally suitable.
- **Program Protection Plan** – The DoD CIO, as the Milestone Decision Authority, approved the PPP in December 2013. The program is executing the processes documented in the approved PPP.

Data as of 4th quarter FY 2014.

Assessments

- **DASD(SE) Assessments** – DASD(SE) led the technical management team during the CCR. The review found that the SE processes were inadequate, and the CCR senior official required the program to update its processes. USD(AT&L) increased oversight by conducting both a DAES review and a follow-on deep dive with the program. The deep dive highlighted the difficulties the program continued to experience.
  - The program is implementing recommendations to leverage the SE expertise at NSA to add technical rigor as it restarts its SE processes. Oversight organizations in OSD are providing additional technical insight and mentorship.
  - The program is implementing a metrics framework to provide greater insight into progress and system technical performance. The program accepted the recommendation to provide regular updates to stakeholders throughout the Department.
  - In FY 2015 DASD(SE) plans to attend the release-level technical reviews, assess development metrics, and provide mentorship to improve risk management procedures.
- **Risk Assessment** – PKI Inc 2 risk management processes are not mature enough to identify root cause and create adequate mitigation plans. The program has identified risk in the requirements and funding, SIPRNet token reliability, Token Management System (TMS) stability, and program integration areas.
- **Performance** – The program has four KPPs. The program has not fully demonstrated the KPPs and has not met the availability KPP. An issue with stability of the TMS is impacting the attainment of the availability KPP. As a result, the program manager is considering a change to the infrastructure architecture.
- **Schedule** – The program completed a CCR in July 2014, which postponed the Full Deployment Decision until September 2017. The program continues to struggle and has not completed the Acquisition Strategy, APB, or SEP within the timelines set by the Critical Change Report. DASD(SE) continues to monitor the program schedule for concurrency and realism.
- **Reliability** – The program is not meeting the requirement for system availability. The annual downtime of the system was 122 hours, which is 14 times the allowable downtime to meet the availability requirement. The TMS is experiencing frequent failovers from the primary to secondary site. The program has proposed an architecture redesign in addition to hardware refresh to correct the issue, but the program has not included these efforts in its overall planning. Token reliability issues are degrading the user experience and increasing the manpower burden needed to manage the system. The program is drafting a token reliability improvement plan.
- **Software** – PKI Inc 2 software is made up primarily of commercial off-the-shelf products, which the program is customizing with add-ons that require program development of approximately 250,000 lines of code. The program is developing its software development metrics.
- **Deployment** – PKI Inc 2 is currently deployed to more than 400,000 users; however, the Department had difficulty meeting its timelines for conversion from user name and password to PKI Inc 2. The additional capability in future development efforts will increase the scale of the system, but the final scale of the system is not yet determined. The unknown design consideration degrades the program's ability to properly size the infrastructure.
- **Integration** – The program is in the process of establishing a lead integrator role for the prime contractor, while maintaining Government responsibility for overall system integration. The program is behind schedule in completing the required memoranda of agreement and service-level agreements.

Conclusion: The PKI Inc 2 program continues to experience execution difficulties. The increased frequency of oversight functions will assist the program in forming its foundational plans.

Data as of 4th quarter FY 2014.

5 CONCLUSION

The Department remains committed to growing our systems engineering capability through our focus on people, process, and appropriate policy. DASD(SE) continues to assess the impact of systems engineering as executed across MDAPs and MAIS programs. The Military Departments' FY 2014 achievements and FY 2015 plans captured in this report demonstrate a continued commitment to the provisions of WSARA focused on improving DoD systems engineering.

Following submission of this FY 2014 report, we will deliver our next report in March 2017, covering FY 2015 and FY 2016 systems engineering accomplishments in accordance with the FY 2015 NDAA section 221, making the DoD Systems Engineering Annual Report a biennial requirement.

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APPENDIX A

Department of the Army
Systems Engineering Self-Assessment

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Fiscal Year 2014 (FY14) Army Systems Engineering Self Assessment

6 February 2015

Advancing the State of Systems Engineering for the Army

ASA(ALT) System of Systems Engineering and Integration (SoSE&I)

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1.0 Systems Engineering Overview

The System of Systems Engineering and Integration (SoSE&I) Directorate is the Army's focal point for promoting and implementing effective Systems Engineering (SE) practices across the department and ensuring a trained SE workforce is ready and available. The Executive Director, SoSE&I serves as the overarching management and oversight authority for System of Systems (SoS) engineering policies and processes for the Army, and works collaboratively with Program Executive Offices (PEO) and Program Managers (PM) to synchronize SE processes, ensuring common execution across the Army. In this role, the SoSE&I Directorate executes Army-level SE in support of the acquisition process with a particular emphasis on SoS Engineering and Integration, cross-cutting capabilities (CCC), Cyber Defense, SoS-focused Test and Evaluation (T&E), and SoS capability fielding. The SoSE&I Directorate's efforts are critical to supporting the Assistant Secretary of the Army for Acquisition, Logistics and Technology (ASA(ALT)) Army Acquisition Executive's (AAE's) responsibility for developing, fielding, and supporting a broad-based set of systems that can be mixed and matched to achieve Army end-state objectives. These end-state objectives are expressed in the Army Campaign Plan (ACP) and SoS Engineering provides the means to ensure the right mix of systems are available at any given point to achieve Army capability needs.

FY14 Progress and Shortfalls

The Army identified three SE implementation improvement focus areas in Fiscal Year 2014 (FY14):

1. ***System of Systems Engineering Management Plan (SoSEMP)***: The SoSE&I Directorate developed a SoSEMP to guide SoS acquisition planning, roadmaps, and decision making and socialized it with the Acquisition Community. The SoSEMP is still in draft and the SoSE&I Directorate will work to publish it in FY15.
2. ***" 'Always On-On Demand (AO-OD)' Business Capability Lifecycle " Acquisition Effort***: The SoSE&I Directorate implemented a Live, Virtual, Constructive-Distributed Environment (LVC-DE)—an Operational Synthetic Environment—to research, develop, test, evaluate, and integrate tactical systems into a tactically relevant, at-scale, SoS environment.
3. ***Systems Engineering Capability Optimization***: In conjunction with the Training and Doctrine Command (TRADOC), the SoSE&I Directorate conducted the Network Capability Review (NCR) to identify a "good enough" tactical architecture, reduce the cost of equipping the Army's tactical network, and minimize the impact to operational capabilities.

The Army has also identified three focus areas to improve in FY15:

1. ***Cybersecurity***: The ASA(ALT) Cyber Focal team within SOSE&I plans to expand and increase communications with the cyberspace and materiel development communities by re-organizing the existing ASA(ALT) Chief Information Officer (CIO) responsibilities with the team that will be working new identified ASA(ALT) Cybersecurity function(s). This will combine the mission of the two ASA(ALT) entities to improve coordination, synchronization, and integration of Cyber programs, information assurance and

compliance, ASA(ALT) CIO governance, and Cybersecurity functions into one unified team for the ASA(ALT).

2. ***Common Operating Environment (COE)***: The Army is executing the COE mandate by establishing Common Foundation objectives and support standards, implementing the Common Foundation across systems, and identifying opportunities to reduce costs.
3. ***System of System Engineering and Integration in support of Capability Set Fielding and Network Integration Evaluation (NIE)*:** The SoSE&I Directorate will enhance capability package development and fielding support, which will deliver greater network capability to tactical units. The directorate will provide SE expertise to assist with planning and executing the NIEs and help integrate, evaluate, and refine the Army's tactical network.

1.1 Service-Level SE Strategy

The Army SE strategy aligns overarching objectives with the ACP and the ASA(ALT) Strategic goals. The mutual dependency between the Army's operational, acquisition, and technical communities highlights ASA(ALT)'s role as the focal point for effective materiel acquisition, and the importance of effecting SoS engineering. The Army operational community, spearheaded by the Deputy Chief of Staff G-3/5/7, provides capability needs and shortfalls, and works with ASA(ALT) in concert with TRADOC and G-8 to determine which of the needs/shortfalls are best filled by a materiel solution. Likewise, the Army Information Technology (IT) community, led by the CIO/G-6, provides the technical standards needed to ensure commonality across the network, enabling technical interoperability.

There is a clear distinction between the SoSE&I Directorate's role in SE and that of the PEOs and PMs. Whereas PEOs focus on the acquisition of a portfolio of related systems and PMs on one or more specific systems, the SoSE&I Directorate takes a more strategic viewpoint that aligns a broad scope of cross-PEO capabilities and Science and Technology (S&T) efforts against Army capability objectives.

1.1.1 Objectives and Focus Areas

The SoSE&I Directorate's approach centers on three key concepts of Army-level management: acquisition planning, decision support, and risk/opportunity management. The SoSE&I Directorate's SE processes define procedures, products, and stakeholder interactions required to implement these concepts to better achieve the objectives for the SoS across cost, performance, and schedule.

These three processes are executed continuously and work within the Weapon System Review (WSR) annual battle rhythm and the Capability Set (CS) Fielding process. The WSRs are the primary means within the Headquarters, Department of the Army (HQDA) to affect changes to a program, especially as related to funding, so the result of the SoSE&I Directorate's SE process is a cohesive cross-portfolio view of SoS issues and risk related to the systems under review. While the WSR battle rhythm provides a primary focus for engineering analysis, the T&E and synchronized fielding processes follow the CS Fielding battle rhythm.

- **Acquisition Planning**: The ASA(ALT)/AAE, supported by the ASA(ALT) Principal Military Deputy leads execution of the Army's acquisition function and the acquisition

management system, to include providing oversight for the life-cycle management and sustainment of Army weapons systems and equipment across the Acquire to Retire (A2R) end-to-end (E2E) process. Specifically, the SoSE&I Directorate focuses on working with the operational community to define the materiel solutions needed to achieve the goals of the ACP.

- **Decision Support**: The SoSE&I Directorate is responsible for providing engineering and technical research and analysis required by the ASA(ALT)/AAE and staff elements to make defensible acquisition decisions based on technical merit. In this role, the SoSE&I Directorate makes assessments and recommendations to the ASA(ALT)/AAE and staff that span the life-cycle of acquisition programs, from concept development through disposition.
- **Risk/Opportunity Management**: At the Army-level, effectively managing SoS efforts is contingent on identifying, and then mitigating, the risks associated with realizing the SoS objectives, as well as identifying opportunities to improve the performance of the SoS against the objectives. These SoS-level risks are cross-portfolio risks that must be avoided, accepted, or mitigated to achieve Army capability objectives for a specific timeframe. Risk and opportunity management specifically assesses second- and third-order affects of one program's decision on other programs or on the engineering of the SoS as a whole. The SoSE&I Directorate provides the ASA(ALT)/AAE an assessment of managed risks that may affect multiple programs across one or more portfolios, or risks relating to a CCC.

The complexity of the Army's modern systems makes a strong SE capability important to ensure the right systems are built and designed correctly, with minimal modifications. The Army Acquisition SE Community applies SE best practices, ensuring the best value for the Warfighter to support the ASA(ALT) strategic goals and ACP objectives and to equip the Army for the 21st Century, by emphasizing the following focus areas and objectives:

- **Early SE** and a disciplined acquisition approach that improves early understanding of requirements and technology, refines designs early, informs key decision points, and reduces uncertainty before commitment to a specific program path.
- Continue to establish a **Development Planning** capability to instill greater rigor and emphasize collaboration in new program initiatives, existing product improvements, and SoS combination and trade assessments. Development Planning facilitates a collaborative process to ensure the right programs are chosen and developed.
- **Identify cost drivers**, to include acquisition and life-cycle costs, to ensure cost estimates identify characteristics that will inform decisions based on evaluation of cost versus benefits.
- **Improve reliability** by emphasizing Reliability, Availability, Maintainability, and Sustainability (RAM&S) best practices and tools.
- Implement the **COE,** which will unify software development across the Army and will be developed around a Common Foundation approach supported by common interfaces and standards implemented across the Army's Computing Environments (CEs).
- Continue **Army Cloud Development** through the Army Cloud Working Group, focusing on advancing IT efficiencies by establishing common standards.

- Identify **Modeling & Simulation (M&S)** tools and applications to support program and Army leadership decisions across acquisition phases and to evaluate concepts, understand cost, reduce uncertainty, and predict performance.

The Army Acquisition SE Community will develop and use the following fundamentals to meet outlined objectives:

- **Organization**: Define essential functions, refine organization structures, and document concept plans.
- **Workforce**: The Army Acquisition SE Community will strive to "build the bench," selecting and training personnel in hard engineering skills and appropriate soft skills.
- **Strategic guidance**: Develop necessary strategic guidance to communicate Army goals and provide direction to the SE workforce.
- **Community collaboration and sharing of best practices**: Identify common and systemic issues, formulate proposals, and socialize potential solutions through community forums and promote the use of identified best practices.
- Identify **common SE tools, methodologies, processes, and products** that promote efficiency across programs and architectures.
- **Information Management**: Build information sharing capabilities to ensure an informed workforce and make key information easily available and searchable.
- **Enforcement at the PEO Level**: Stress the importance of SE, track progress, and impose rigor and discipline into SE processes at the PEO level.

1.1.2 SE Strategy Implementation

To implement the Army SE Strategy in FY14, the SoSE&I Directorate focused on the following initiatives:

- Establishing the SoS General Officer Steering Council (GOSC) to shape and synchronize the development, production, and fielding of integrated materiel capabilities.
- Creating a SoSEMP that provides guidance on managing the development, design, delivery, and configuration of the management process.
- Delivering strategic-level, SoS engineering/architectural analysis for current/future force capabilities.
- Implementing the CS Fielding construct to deliver fully-integrated suites of networked equipment.
- Developing a COE to converge the operating environment baselines.
- Utilizing NIEs to integrate and mature the Army's tactical network.
- Establishing engineering policy, guides, best practices templates, and metrics to ensure SoS discipline across the Army.
- Improving SE documentation review processes to improve quality through strict adherence to the Office of the Secretary of Defense (OSD) and Army policy and guidance.
- Conducting program reviews to ensure compliance with established policy guidance, architectures, and standards.

1.1.3 SE Contributions to Program Affordability

The Army has established affordability constraints, set at the Materiel Development Decision, to inform requirements, design tradeoffs, procurement and sustainment costs estimates. Annual Configuration Steering Boards (CSBs) look at the progress the Army has made to achieve affordability and provide those results to the ASA(ALT)/AAE. In concert with the current fiscal climate, PEOs also took steps in FY14 to contribute to cost effective programs without sacrificing SE integrity of systems fielded to the Soldier. The PEOs/ PMs contributed to SE affordability efforts by:

- PEO Ammunition's Excalibur program kicked off a cost reduction opportunity program that, to date, has identified potential cost savings by eliminating redundant testing and improving personnel efficiency. In FY15, the Excalibur program will focus on identifying cost savings in material and subcontractor costs.
- PEO Command, Control and Communications-Tactical (C3T) uses the Value Management process across the Warfighter Information Network-Tactical (WIN-T) environment to reduce duplicative software instances and leverage common servers to increase memory, processor speed, and hard drive size.
- PEO Combat Support and Combat Service Support (CS&CSS), as part of the Joint Light Tactical Vehicle (JLTV) program Engineering and Manufacturing Development (EMD) phase, conducted the SE practice of knowledge point (KP) reviews to further refine program requirements and identify trade items. A key cost control effort was the Cost Informed Trade Analysis, which analyzed significant cost contributors against significant capability and recommended approximately $50,000/vehicle of trades just prior to the EMD phase.
- PEO Intelligence, Electronic Warfare and Sensors (IEW&S) implemented Long-Range Investment Requirements Analysis (LIRA) to tie S&T investments and Program Objective Memorandum (POM) strategies to user requirements, ensuring a single consolidated sustainment contract.
- The PEO Missiles and Space (MS) Heliborne Fire and Forget missile program implemented an Affordability Integrated Product Team (IPT) to identify potential production improvements to achieve cost savings and reduce program risk. The affordability process includes identifying candidate improvements, conducting business case analyses to determine return on investment, working closely with stakeholders for implementation, and qualifying products and processes, as applicable.
- PEO Simulation, Training and Instrumentation (STRI) reduced the cost of producing and sustaining two independent simulators by using common architectures and components for each training device. The commonality exercise demonstrated improved resource allocation, interoperability, acquisition cycle time, and synchronized the training methodologies. The estimated cost savings from FY14-19 is $40 million (M).

1.1.4 Program Oversight

The Army SE community executes program oversight in three ways: 1) from an SoS perspective; 2) from a portfolio perspective, and 3) from a single system perspective. Each perspective has a discrete set of SE processes, which together combine to form a multi-layered oversight process designed to ensure each program meets its capability requirements and

integrates into the Army SoS as a whole. The SoSE&I Directorate supports the ASA(ALT) headquarters (HQ) by providing cross-portfolio and CCC assessments to ensure a program provides the SoS-level capabilities required. The PEOs execute this role though their portfolio management processes, in which a set of closely related programs, such as the Army Integrated Air and Missile Defense (AIAMD) programs within PEO MS, combine to provide a discrete set of capabilities. In addition, PMs review Acquisition Category (ACAT) II and III programs through Program Management Reviews, in accordance with Defense Acquisition University (DAU)/Program Management Office (PMO) Processes.

Documentation is also integral to standardizing the oversight and management of ACAT II and III programs. The PEO Aviation (AVN) system engineers use Systems Engineering Plans (SEPs), Performance Work Statements, Risk Management Plans, and System Specifications to support key decision points in the acquisition cycle. Any effort or modification that affects the configuration of an aviation platform, whether through Program of Record (PoR) Milestone Decisions, Engineering Change Proposals (ECPs), or modification work orders must utilize and adhere to established SE processes outlined in the above documents. These processes define specific work and documentation products that must be available at each major decision point throughout the acquisition cycle.

Software tools are also used as part of program oversight. The PEO AVN utilizes the TopVue software toolset to track and provide comments and approvals where applicable. SE oversight also includes the use of various tools such as the contract data requirements list (CDRL)Vue, Configuration Management (CM)Vue, RiskVue and SharePoint for program status and oversight. CDRLVue is used to manage CDRL documents, while CMVue and RiskVue provide the means to manage the product configuration and identified risks. SharePoint provides a collaborative environment and in-house design applications for the PMO.

1.2 Pre-Milestones A and B Rigor

One of the major challenges the Department of Defense (DOD) acquisition community faces is how to effectively translate operational needs into the identification of the best materiel solutions. Historically, SE best practices have been employed mostly during the EMD phase of the DOD Acquisition Model, more so than the Pre-Milestone A and Technology Maturation and Risk Reduction (TMRR) phases. This is in spite of the well-established view that decisions made early in the system life-cycle have a largely positive effect on total life-cycle cost, effectiveness, and timeliness. The Army has committed to supporting SE activities during early acquisition phases by increasing the SE support and rigor applied to programs through Requirements Analysis, Test planning, CSBs, SoS engineering steering forums, and other efforts identified in Sections 1.2-1.7 of this self assessment.

1.2.1 Systems Engineering Plans (SEPs)

The SoSE&I Directorate is participating in Pre-Milestone A activities by assisting PEO/PM representatives with developing program SEPs. The SoSE&I Directorate, in conjunction with the Office of the Deputy Assistant Secretary of Defense Systems Engineering (DASD(SE)) Major Program Support office, offers information, training, and guidance to PEOs/PMs and stakeholders with other delegation authorities on ACAT I, II and III program SEP development.

The SoSE&I Directorate also reviews SEPs to ensure compliance with the OSD SEP outline, ASA(ALT)/AAE SEP policy, statutory and regulatory requirements, as well as verifying the SEP establishes a clear and consistent SE technical approach to meet program objectives. The SEP reviews have assisted programs in improving their SE rigor in areas including risk identification and management.

1.2.2 Development Planning (DP)

The SE best practices developed to support Pre-Milestone A efforts also serve as good DP practices. The SoSE&I Directorate and the PEOs/PMs implemented a number of activities and tools in early SE phases that advanced the Army's capabilities, which are described throughout section 1.2.

1.2.2.1 Tool Development

A number of different tools and frameworks have been developed to facilitate DP, as well as better SE throughout the life-cycle. These assist in performing functions ranging from enabling collaboration among requirements and acquisition stakeholders, modeling system and SoS performance, to the engineering required to determine system performance, cost, and risk, and finally, in helping to choose among multiple materiel solutions.

- **Modeling, Emulation, Simulation Tool for Analysis Software Development**: Developed by the Communications-Electronics Center of the Research, Development and Engineering Center (CERDEC), it is a common framework for tactical command, control, communications, computers, intelligence, surveillance, and reconnaissance (C4ISR) network M&S that uses common data models and standardizes inputs/outputs so commercial and government tools can leverage common data sets, improving effectiveness and efficiency.
- **Soldier SE Architecture**: Developed by the RDECOM U.S. Army Natick Soldier, Research, Development and Engineering Center (NSRDEC), it uses an analytical decision-based model to optimize the Soldier as a System through synergy between the Human Dimension, User Requirements, and Material Solutions.
- **Enterprise Knowledge Repository**: Developed by the Office of Business Transformation, it is a suite of tools that the SoSE&I Directorate uses to capture, organize, and integrate architecture data about Defense Business Systems (DBSs), and to provide support for life-cycle management of model-based architectures for the Army's portfolio of business systems.

1.2.3 Decision Centric Systems Engineering (DCSE)

The Research, Development and Engineering Command (RDECOM), in collaboration with academia and industry, is developing an SE trade-off analysis methodology that enables the Research and Development (R&D) community to assess a large set of alternatives across competing objectives of performance, life-cycle costs, and development schedule. The emerging methodology is being called the DCSE, formerly the Decision Model Based Systems Engineering, and will explore trade-space as requirements and system design approaches are being refined early in the acquisition process, as well as across all of the acquisition phases. The DCSE's data visualization and sensitivity analysis capability have strong explanatory power,

giving decision makers a robust understanding of the complex trade-space needed to inform requirements and make fact-based decisions throughout the acquisition life-cycle.

It is currently being used as the governing process for the Small Arms Ammunition Configuration study, an 81mm Mortar improvement S&T effort and a cluster munitions replacement investigation.

1.2.4 Systems Architecting

The Systems Architecting competency has also been integral to providing Pre-Milestone A support, utilizing operational and systems architecture tools and techniques in the early phases of a PoR's technology development efforts. Systems architectures are used to define the structure, behavior, and temporal aspects of the technology/system under development. The Army continues to promote the corporate use of Model Based Systems Engineering (MBSE) as a methodology to develop systems engineering and architecture artifacts as it provides a mechanism to structure and communicate key technical information in a purposeful way to inform the decision making process. It also allows for requirements data to be traced directly to design decisions and ensure all requirements are satisfied.

1.2.5 Army Technology Maturation Initiative

The Army Technology Maturation Initiative creates a strategic partnership between S&T and acquisition, and facilitates the timely transition of high-payoff technologies to programs of record at reduced cost and risk. This program provides a mechanism to improve the alignment between S&T and acquisition and address the risk-reduction goals laid out by the Weapon Systems Acquisition Reform Act and DOD Instruction 5000.02. Technology Maturation Initiative activities are focused on maturing S&T products (goal Technology Readiness Level (TRL) 7) to increase transition success; enable high-payoff, competitive prototyping earlier in the acquisition life-cycle (prior to Milestone B); adopt acquisition rigor for mature S&T efforts; inform materiel requirements to expedite capabilities to the Warfighter; and reduce technology risks for acquisition PoRs.

Projects selected for Technology Maturation Initiative funding are co-sponsored by the S&T developer and the receiving PM/ PEO to ensure that the effort is, and remains, aligned to the PoR's needs. Efforts must also be approved by the Executive Steering Group comprised of senior representatives of ASA(ALT), Army G-3/5/7, and the Army G-8.

The Army initiated three Technology Maturation Initiative efforts in FY14:

- **Assured Positioning, Navigation, and Timing (PNT) (FY14-17)**. This initiative matures, integrates, and validates key enabling technologies for the Assured PNT PoR, which will provide a secure, affordable, next-generation positioning and timing signal for all Army systems. The Technology Maturation Initiative investment reduces PoR risk and costs, and accelerates the Assured PNT Initial Operational Capability (IOC) by over two years through the early initiation of the Technology Maturation and Risk Reduction Phases.
- **Vehicular Integration for C4ISR/Electronic Warfare Interoperability (VICTORY) Enabled Company Transformation, (FY14-15)**. This initiative reduces programmatic

risks and non-recurring engineering/production costs that currently hinder the transition of the VICTORY architecture and standards onto the U.S. Army's Ground Vehicle Platforms. Activities include the development, evaluation, testing and TRL 7 demonstration of VICTORY system designs and products on a set of ground vehicle platforms. It will also transition a mature and productized open-source VICTORY Adapter component for integration and evaluation in major vehicle systems. It provides the basis for converting legacy platforms into VICTORY-ready platforms, positioning them to support the integration of Army CSs at significantly reduced costs.

- **Common Automatic Fire Extinguishing Systems (AFES), (FY14-15)**. This initiative qualifies components and provides vehicle-level testing and validation of backward-compatible, common AFES extinguishers for use across all Army ground and combat vehicle platforms.

1.2.6 FY14 PEO/PM Efforts

The PEOs/PMs, in addition to developing SEPs, are employing SE best practices and collaborating with internal and external partners to introduce greater SE rigor in both Pre-Milestone A and B phases of the Acquisition life-cycle. In FY14, PEO Soldier utilized the Soldier Modernization Process (SMP) to provide a forum for TRADOC, PMs, System of Systems Integration, S&T Communities, and Army Staff to synchronize S&T requirements, upcoming PoRs, and requirements development documents. The products developed by the SMP serve as authoritative sources to inform Capability Portfolio Reviews, Soldier and Squad Systems Reviews, and Long-range Investment Requirements Analysis (LIRA), ensuring continuity across the S&T, financial, PoR, and requirements communities.

The PEO MS requires an independent assessment be conducted on all reviews. Technical reviews are intended to assess the design maturity of a system, review program progress, and authorize continued program development. An Independent Assessment Team (IAT) is led by the PEO MS Chief Engineer or designee, with team members from outside the project office selected by the PEO MS Chief Engineer. Members of the IAT verify that technical review entry and exit criteria are established and met. Program risks are identified and mitigated to acceptable levels, appropriate stakeholders are present and all review action items are dispositioned before the weapon systems proceeds into the next phase of development. In FY14, the Chief Engineer's IAT conducted 11 reviews.

The PEO STRI has established an Engineering Standards and Process Board (ESPB) as an oversight group for SE processes, guidance, and policy. The PEO STRI also utilizes the SE Index, a SharePoint repository, to provide authoritative information for the acquisition life-cycle using user-friendly interface. Collectively, the ESPB, the SE Index, and the issuance of Engineering Instructions enable the establishment and implementation of SE policy, standards, processes, and best practices across the PEO STRI.

Through collaboration with internal and external acquisition partners, the PEOs/PMs have been able to expand the Army's involvement in Pre-Milestone A and B activities, extending SE best practices into all phases of the Acquisition life-cycle. During FY14, the Joint PEO (JPEO) Chemical and Biological Defense (CBD) engaged the Services and the Joint Requirements Office to finalize the Next Generation Diagnostics System Increment (Inc) 1 Capability

Development Document (CDD), ensuring the program will meet requirements and that changes can occur early in the technical development phase, rather than at a more costly juncture in the future.

To leverage PM efforts across the Army, the SoSE&I Directorate monitors the implementation of both routine and innovative SE practices across the acquisition community, within industry, and in other circles. Events such as the monthly Army Systems Engineering Forum (ASEF), International Council on Systems Engineering (INCOSE) conferences, and the National Defense Industrial Association (NDIA) SE forum provide valuable insight into SE challenges and successes, particularly when a PEO/PM has solved a challenging SE issue, has seen success, and that success should be replicated across the community. As an example, Joint Program Manager (JPM) Guardian devised an innovative way to define requirements for a system that integrates multiple sensor feeds into a common operational display. This approach demonstrated the art of the possible, which enabled PEO IEW&S to reuse these SE processes to support a new PoR that will deliver this integrated display to the Warfighter.

1.2.7 FY15 PEO/PM Efforts

PEOs/PMs plan to continue creating, implementing, or improving the following areas in FY15:

- PEO STRI Engineering Standards and Process Board (ESPB) will improve SE activities in Pre-Milestone A and B systems analysis and SE processes by adding more SE analysis topics into the SE Index.
- JPEO CBD JPM Radiological and Nuclear Defense will target tools to improve requirements traceability across programs, particularly when conducting parallel requirements development and analysis processes.
- PEO MS staff is developing a Unified Profile for DOD Architecture Framework/Ministry of Defence Architecture Framework Test Profile to capture the Model-based Systems Engineering (MBSE) needs of the testing community. PEO MS is also actively collaborating with Army Aviation and Missile Research Development and Engineering Center (AMRDEC), the PMOs, and other PEOs to establish a community of interest for MBSE across the Joint Capabilities Integration and Development System (JCIDS).

1.3 RAM&S

In 2014, the Army remained committed to ensuring RAM&S was an integral part of design and development. The Army realized improvements in design and development processes through leading internal Reliability and Maintainability (R&M) working groups, and participating in external DOD R&M working groups. These groups provided a focal point for RAM&S activity within the Army and DOD, and leveraged individual organizations improvements and lessons learned.

1.3.1 Reliability and Maintainability Working Group (RMWG)

The Army continues to operate a RMWG with senior-level participants across the acquisition community. The RMWG performs detailed assessments of RAM&S efforts throughout the acquisition life-cycle for Army Major Automated Information Systems (MAIS)/Major Defense Acquisition Programs (MDAPs), collects lessons learned, identifies systemic root causes of

reliability issues, coordinates support for the necessary gaps, and recommends solutions to leadership. The Army RMWG lead hosts subject matter experts (SMEs) from the Army PEO/PMs; the Army Research, Development and Engineering Centers (RDECs); and other Army organizations such as TRADOC, Army Test and Evaluation Command (ATEC), and Army Materiel Systems Analysis Activity (AMSAA). During FY14 the RMWG assessed several MAIS/MDAPs including: the Attack Helicopter-64E Remanufacture and New Build, Gray Eagle, the PATRIOT Advanced Capability-3 Missile Segment Enhancement, and the Utility Helicopter (UH)-60M. In FY14, the RMWG also held educational discussions with the Acquisition Community to provide information on topics such as reliability programs connected with software intensive programs, the Acquisition Lessons Learned Portal, and the Bayesian approach to reliability growth.

1.3.2 T&E Efficiencies Task Force

In FY14, the Army established a GOSC and Council of Colonels to execute recommendations by the T&E Efficiencies Task Force established in FY13. The T&E Efficiencies Task Force FY14 initiatives included: enabling effective oversight by improving the CSB process to validate Reliability, Availability and Maintainability-Cost (RAM-C) and tradeoffs; enforcing the reliability policy; integrate testing efforts as much as possible, including combining reliability verification tests; improving reliability cycle time; accelerating the Requirements Improvement Process; and developing reliability requirements documentation procedures. Progress is reported to a GOSC on a quarterly basis.

1.3.3 Energizing Reliability, Availability and Maintainability (RAM) Community

1.3.3.1 Other Venues to Address RAM

The Army participates in the DASD(SE) Service Lead Working Group (SLWG), which meets on a quarterly basis. The Army service lead acts as a focal point for Army input to the SLWG, as well as a dissemination point to the Army RMWG. In FY14, the Army implemented new DOD requirements for MDAP and MAIS programs to submit reliability growth data within the Defense Acquisition Executive Summary process. The Army also participated in the update of R&M Data Item Descriptions for use in acquisition

1.3.3.2 RAM Army Regulation (AR) 702-3 Role and Status

The Army is committed to enhancing RAM&S in the acquisition process by implementing and revising policy, to include the AR 702-3, which incorporates R&M design, reliability planning methods, and key decision support reporting requirements to support early EMD reliability test thresholds, engineering based reliability program reviews, and operational requirements development. The AR 702-3 has been submitted for publishing after thorough review by the Army R&M and Acquisition Policy and Logistics communities.

1.3.3.3 Center for Reliability Growth (CRG) Activities

Several Army R&M organizations are recognized within the technical community for their expertise. In particular, the Army Materiel Command's (AMC's) AMSAA, partnered with the Army Evaluation Center under the CRG, continue to be recognized as the leader in reliability

growth modeling. The CRG strives to improve reliability by providing policy, guidance, standards, methods, tools, and training. Specifically in FY14, the CRG:

- Emphasized the importance of applying condition based maintenance data from actual fielded systems to enhance current systems' Operational Mode Summary (OMS)/Mission Profile (MP) values by executing case studies on such programs as Heavy Equipment Transporter, M915, Armored Multi-Purpose Vehicle (AMPV), and Stryker; all of which have demonstrated that enhanced OMS/MPs can promote test and acquisition efficiencies.
- Distributed over 700 reliability models across the DOD and major defense contractors.
- Promoted using reliability-specific contract language for both hardware and software intensive programs, establishing a structured approach to focus on cost-effective and high-payoff reliability content for Army contracts.
- Developed tools and processes to analyze "Big Data" sets to assist the Army with developing better design fixes, respond faster to customer needs, select the best vendor, and investigate test anomalies using real data-driven evidence.

1.3.4 Condition Based Maintenance Plus (CBM+)

The CBM+ effort applies and integrates multiple capabilities to improve the availability, reliability, and ownership costs of DOD weapon systems and components across their life-cycle. In FY14, the ASA(ALT)/AAE designated PEO Enterprise Information Systems (EIS) as the lead to develop the Data Store and Forward capability that will store, then deliver platform data collected at the tactical level to Enterprise-level IT systems. Fully realized, a CBM+ end-to-end solution will enable higher levels of fleet management and reduce costs of ownership. More broadly the CBM+ capability will allow the Army to execute an SE approach to collect data, enable analysis, and support the decision making process for system acquisition, sustainment, and operations as a way to optimize resource investments, reduce life-cycle costs, and provide advanced capabilities to the Warfighter.

1.3.5 PEO Efforts

The Army PEOs/PMs have focused on integrating RAM&S principles into major development/acquisition programs through reliable testing metrics, insisting on RAM&S early in the development cycles, and updating reliability processes and procedures. The inclusion of RAM&S in these programs has allowed the Army to update, upgrade, and fix fielded systems.

In FY14, PEOs/PMs used established program improvement strategies and the developmental test philosophy of test-fix-test to improve system RAM&S characteristics. Once failures are identified, PEOs/PMs use SE best practices to capture and fix problems and inefficiencies during the sustainment phase. For example, PEO AVN UH Project Office uses system and component-level RAM&S metrics to review poor performers that are degrading the overall system performance. This process has identified reliability issues and helped systems engineers determine root causes, leading to changes in both design and maintenance concepts to improve the R&M of the UH-60. The PEO Ground Combat Systems, as part of the Stryker ECP Improvement Program, upgraded the suspension system in the Double V-Hull Stryker vehicles,

allowing the vehicle to operate at a weight of up to 63,000 pounds. The upgraded suspension will provide improved mobility performance without degrading system reliability.

The PEO CS&CSS, through JLTV Competitive Prototyping and EMD RAM testing efforts with dedicated corrective action periods, drove JLTV competitors to make necessary reliability design improvements, which resulted in reliability growth in the EMD test articles. This growth will likely be represented in Low-Rate Initial Production (LRIP) systems.

During FY14 Army Program Office (APO) Mine Resistant Ambush Protected (MRAP) funded continued updates to the Reliability Centered Maintenance Analyses for the enduring Vehicle Systems platforms (MRAP all terrain vehicle (M-ATV) and MaxxPro). These analyses are being conducted utilizing the DOD Reliability Information Analysis Center (RIAC) Technical Area Tasks that APO MRAP has in place with Defense Technical Information Center. The RIAC team is on-site at Red River Army Depot in conjunction with the Reset line conducting deep dive analysis on high failure parts to identify the root cause and alternative parts that would increase the overall system RAM. So far, APO MRAP received recommendations on seven M-ATV components. Based upon initial estimates, if the recommended actions are taken, they could result in increasing safety, maintenance cost avoidance of $600,000 to $1M annually, and an increase in availability.

1.3.6 FY15 Efforts

The Army will sustain the use of the RMWG to assess MDAPs, share lessons learned, identify systemic root causes of reliability issues, and recommend solutions. The Army will continue to implement recommendations of the T&E Efficiencies Task Force, and plans to publish the Army RAM Regulation, AR 702-3. Highlights of PEO/PM FY15 plans include:

- PEO IEW&S will use static code analysis to identify software defects in software intensive programs, ensuring early detection in the development cycle and reducing sustainment costs associated with software fixes.
- PEO MS is standing up the Army Integrated Air and Missile Defense (AIAMD) Failure Review Board to address all issues (e.g., hardware, software, and operator errors) across the AIAMD enterprise.
- Continuing the reliability growth already evidenced in a competitive environment by both vendors for the Common Infrared Countermeasures System (CIRCM) during the TMRR phase, the PEO IEW&S Product Manager (PdM) Countermeasures (CM) will undertake reliability growth activities aimed at addressing identified failure modes and the revelation of new failures modes. Corrective actions for identified failures modes have already been implemented and they will be tested through stressful accelerated life testing and reliability characterization testing to ensure their effectiveness. New failure modes revealed in all testing venues will be entered into a closed loop Failure, Reporting and Analysis Corrective System, where the root cause of each failure will be identified, corrective actions will be established and evaluated to ensure they eliminate the root cause, and corrective actions will be implemented on test assets so they may be evaluated in a realistic operational environment.

1.4 SE During JCIDS and Contract Requirements

1.4.1 SE Contributions to JCIDS

SE during Pre-Milestone A and JCIDS development has, in many cases, not been fully practiced due to the challenges in establishing program resources early in program development. Early system development efforts are primarily led by the Combat Development team supported by experimentation and analysis performed by functional proponent battle laboratories. SE professionals from across the PEO and PM communities participate in these activities as resources permit, to help ensure proper attention is paid to current and future interfaces, architectural and technical standards, and to ensure system testing and verification practices are considered and understood.

In support of requirements development for SoS, the SoSE&I Directorate established the Army Integrated Requirements Framework (IRF) process to provide a proof-of-concept with which to conduct analysis, provide findings regarding the commonality of requirements across requirements documents, and describe a proposed Agile Requirements Management Process to enable execution of SoS requirements. The SoSE&I Directorate IRF efforts are defining the standards at the SoS level for requirements data and CM. The SoSE&I Directorate will align policies and directives to guide PEOs and PMs, changing the way the Army is analyzing and defining requirements to better align the PM's system requirements to the JCIDS documented requirements. The resulting analysis will be captured in the Army IRF environment to allow for easy crosswalk with the Combat Developers to update and compare against existing documented requirements; this analysis will inform the Army of the materiel gap and determine if the PMs are interpreting the requirements correctly.

1.4.2 SE Concept-to-Product (C2P) End-to-End (E2E) Process

The C2P E2E business process is a component of the overarching A2R E2E business process, which defines the life-cycle of a product produced and managed by the Army. Though SE activities are performed throughout A2R, they predominate in C2P, which focuses on those activities leading to the point where the product production bill of material has been defined, the materiel release order issued, and limited or full-rate production is approved (Milestone C). The C2P also addresses the formulation of the framework and data standards for product data, used to document product configurations and to gather, share, use, and change product data throughout the life-cycle of a product. SE plays a vital role in C2P, designing initial product configurations, supporting the integration of design, within and across PoRs, and providing technical input to continual product refresh.

1.4.3 SE in Contract Requirements

SE requirements, including RAM&S, are incorporated into development contracts with industry early in the life-cycle of the program. For example, PEO AVN includes RAM requirements as part of the contract specifications in all contract packages. Some PEOs even build RAM&S and SE requirements into their requests for proposal (RFPs), ensuring the collaborative relationship begins with a clear expectation of requirements and a loose strategy to fulfill those requirements already established. This approach yields more opportunities for minor course corrections early, thus increasing the likelihood of success.

- For all new contracts, PM Soldier Sensors and Lasers includes a reliability growth program in the statement of work.
- PEO CS&CSS JLTV TMRR and EMD contracts included many SE requirements, including detailed Risk Management, Configuration and Data Management, Future Growth Studies, Technical Metrics (computer and software), and System Integration Laboratories. There are also multiple RAM requirements in the CDD that are traced into Purchase Description (PD) contractual requirements. Reliability remains a Key System Attribute, Availability is a Key Performance Parameter, and multiple maintainability requirements exist in both the CDD and PD.
- Within PEO AVN PM Armed Scout Helicopter (ASH), an interim Draft Failure Mode Effects and Criticality Analysis (FMECA) policy has been formulated that includes contract language and CDRLs. It will be superseded by a comprehensive PM ASH RAM Program Management Plan (expected release is still to be determined), which provides management policy while addressing responsibilities, contract language, analyses, and metrics.

The following are examples where organization incorporated SE requirements into contract vehicles with industry partners:

- **SE Index**: PEO STRI developed the SE Index as the local source for authoritative policy, standards, guidance, and templates. It incorporates contract language into model documents and reorganizes the SE Index to correlate with contracting terms. In FY14, the SE Index was modified to correlate with contracting requirements for source selection process steps, with the Program Management, Finance, CIO, SE, Acquisition Logistics, and Information Assurance documents, ensuring systems engineers and contractors are using the same terms during RFP development.
- **Joint Effects Model and Joint Warning and Reporting Network (JWARN) Inc 2**: Contract includes RAM-C, Human Systems Integration, Modular Open Systems Approach, and Program Protection Plan (PPP) contractual language.

The following are examples where organizations incorporated RAM&S requirements into contract vehicles with industry partners:

- **AMPV**: The AMPV program incorporated specific RAM requirements into the AMPV RFP, which will flow into the official contract once an award is made. The contractor is required to continuously monitor and control all aspects of system and subsystem reliability performance throughout the life of the contract to ensure the program's approved Reliability Growth Curve provided by the AMPV program is met. Additionally, the RFP has specific incentive language for additional performance fees if the AMPV contractor exceeds certain specified reliability requirements during the EMD and LRIP phases.
- **CIRCM**: Multiple reliability activities were included in the TMRR and EMD Phase contracts.
- **Non-Destructive Test and Evaluation (NDTE) System**: PdM Soldier Protective Equipment defines program requirements in the Purchase Description and contracting documents, to include specifications for life, warranty, reliability, etc. The NDTE monitors those metrics.

1.5 FY14 Focus Area Progress and Improvements

1.5.1 System of Systems Engineering Management Plan (SoSEMP)

The SoSE&I Directorate is responsible for Army strategic SE focused on enabling optimized delivery of integrated materiel solutions to the Army for current and future force capabilities. Recognizing the need for a standardized, department-level SoS engineering approach, and in accordance with AR 70-1, ASA(ALT) initiated an effort to define the ASA(ALT) SoS Engineering process and capture it in a SoSEMP in the beginning of FY13. The SoS engineering process is the first strategic, cross-cutting approach developed that will span the entire ASA(ALT) Community.

The SoS engineering process, and the accompanying SoSEMP, serve as the guiding document for Army SoS strategic SE to help synchronize SE activities across the Army, to include acquisition planning, roadmap development, and governance. It addresses the full range of SE activities including technical management planning, risk management, configuration management, T&E, design verification, and other technical activities.

The SoSEMP documents the SoS Engineering process and takes a product-centric approach by defining the output of each SoS engineering process step and providing a means to measure that output. The SoSEMP is not designed to be all encompassing, providing the in-depth details of every process. Rather, the SoSEMP provides context, expectations, and metrics, sufficient to enable common application across the department, while enabling organizations to develop the detailed processes needed by its unique mission, environment, and circumstances.

1.5.2 Always On-On Demand (AO-OD)

The AO-OD initiative integrates live tactical systems with existing virtual and constructive (LVC) models and simulations, tools, technologies, and processes through the application of distributed environment (DE) architectures. SoSE&I's AO-OD is envisioned to provide a cost effective, routinely available, and realistic representation of the full SoS operational environment that can be used for research, development, integration, test and evaluation, training, and product life-cycle improvements.

In FY14, the AO-OD, by integrating with the Joint Staff J6 Bold Quest 14.2 event and conducting an On-Demand Environment Network and Net-centric Systems Event 2014 (ODENN E14), expanded concept exploration efforts and increased the quantity of tactical systems tested in the combined event. The ODENN E14 leveraged an LVC-DE approach to provide a realistic, virtual Warfighting scenario distributed across 7 Army sites and representing a brigade-size operation that called for 599 high-fidelity emulation radios, over 40 rotary wing vignettes, 125 fires missions, and boasting an air support portfolio to include over 200 theater ballistic and cruise missile launches, over 170 simulated Patriot engagements, and dozens of air-to-air sorties. The ODENN E14 demonstrated the potential for substantial cost avoidance and value added, as the sheer size of the scenario enacted through the use of a LVC-DE would have otherwise been prohibitively expensive due to the large number of players, systems, travel, and destruction of assets.

Using the evolving enduring capability, AO-OD intends to represent an entire brigade combat team, to include combat support elements and connections to joint, other government agency, and coalition capabilities. The AO-OD growth model will continually seek to address acquisition challenges and leverage a LVC-DE to support those challenges. As challenges are addressed throughout the Army's various commodity lanes, the AO-OD SoS environment will grow, eventually maturing to the full scale persistent representation needed to support analysis of our future forces.

1.5.3 SE Capability Optimization

Budget limitations have required the Army to make hard self-assessments and critically review equipment modernization plans. To help reduce the costs of equipping the Army's tactical network, while minimizing the impact to operational capabilities, in FY14, the Army performed the Network Capability Review (NCR) to support resourcing decisions within the Mission Command (MC) Portfolio. The NCR analysis was performed in collaboration with TRADOC to determine a "good enough" tactical architecture. Specifically, the analysis examined the impact of modifying quantities of equipment to the network and technical performance. The results will influence the specific configurations of future Capability Sets.

The NCR will eventually be reshaped into a broader effort to look across the integrated equipment portfolio of transport, applications, network integration, and enablers. Results of this analysis will set the conditions for future modernization efforts and be incorporated into the implementation of the COE.

1.6 Progress and Improvements – Processes and Tools for SoS

The SoSE&I Directorate responsibilities under AR 70-1, as delegated by the ASA(ALT)/AAE, are to develop, implement, and maintain a guiding document for Army SoS acquisition planning and synchronize PEO/PM SE plans to ensure common execution across the Department of the Army (DA). This organization distinguishes between SoS engineering executed at the HQDA staff level from the SE activities executed at the PEO/PM level, enabling synchronization between SoS engineering and PEO/PM SE plans to ensure common execution across the Army. The SoSE&I Directorate provides the forums and processes to define and balance system performance, cost, schedule, and risk within a family-of-systems and SoS context, complementing the SEPs that PEOs/PMs produce. The PEOs are responsible for integrating their portfolio of systems to achieve the capabilities assigned to that PEO. However, the SoSE&I Directorate and the PM continue to play an important role in supporting the PEO's execution strategy.

The following sections describe Army processes and tools that support SoS development and fielding. The Army SoS GOSC and Army Business Council (ABC) are senior-leader forums to support SoS-related decisions. In order to provide a formal venue between TRADOC and ASA(ALT) to coordinate SoS planning and development, the Army has established the Integrated Architecture Task Force (IATF). The Army Integrated Requirements Framework (IRF) provides a structure for development and identification of SoS requirements, and the Army Geospatial Enterprise (AGE) establishes the common framework for managing and utilizing the immense volume of geospatial data and services that are utilized across numerous, diverse

systems and platforms. The Army endorses Open System Architecture (OSA) as a means to enhance system interoperability; it utilizes the Common Operating Environment (COE) approved technologies and standards to promote OSA across the computing environments. The VICTORY/Future Airborne Capability Environment (FACE) architectures and standards enable OSA for Army ground vehicle platforms and aircraft.

The Agile Process assesses critical emerging technologies in an operational environment, in an effort to procure critical capabilities in a more rapid manner and deliver complete capability sets. A Capability Set (CS) provides the platforms, network, mission command systems, and other technologies needed by a formation to achieve its mission. The Army fields capabilities to the force through the Capability Set Management (CSM) process. The CSM process is the deliberate and disciplined process of synchronized fielding of network components, associated equipment, and software to provide an integrated network capability. The Capability Set Management Board (CSMB) coordinates fielding plans that are developed and managed through the Capability Set Design Database (CSDD), Capability Modernization Matrix (CMM), and Basis of Issue Feeder Data (BOI FD) data sets and architectures. The Platform Integration and Analysis (PIA) team ensures that platform integration constraints are considered in development of the reference architectures, and the SoSE&I Directorate synchronizes the configuration of data and artifacts to support configuration control across multiple unit architectures and CSs. The Army has fielded CS 14 to multiple units, and is developing the CS 15/16 capability package.

The Army Network Integration Evaluations (NIEs) are semiannual field exercises that assess the operational utility, maturity and technical readiness, integration and interoperability with tactical systems from Soldier to Brigade and higher levels. The NIE is used to refine and shape CSs. It is one of the few test events that stress SoS-level capability requirements for Brigade Combat Team (BCT) formations, and it is the only field event focused on validating the value of new technology concepts within the BCTs.

1.6.1 SoS General Officer Steering Council (GOSC)

The SoS GOSC, chaired by the Executive Director, SoSE&I and including principals from PEOs, Deputy Assistant Secretaries of the Army and internal ASA(ALT) staff, shapes and synchronizes the development, production, and fielding of integrated, materiel capabilities for the Army Materiel Enterprise at the executive level. The SoS GOSC acts on behalf of the ASA(ALT)/AAE to build consensus across ASA(ALT) organizations, adjudicate cross-PEO technical issues, capture issue positions of principal members and stakeholders, and provide recommendations for decisions.

1.6.2 Army Business Council (ABC)

The ASA(ALT)/AAE is a core voting member of the ABC, which is a key business decision forum that reviews, issues policy, and makes recommendations on potential Army investments in business systems. In FY14, the Army shifted from its Business Systems IT strategy to an Army Business Management Strategy, which provides a long-term plan for migrating Army Business Systems to a common environment. The strategy focuses on improving business operations and cost savings through end-to-end (E2E) processes and effective portfolio management of the supporting IT systems. The ASA(ALT) is the Process Champion for six of the E2E processes and manages a systems portfolio by providing rationalization, oversight, and direction for all

Army PEOs, several Army Commands (including, but not limited to, the AMC and the ATEC), and Headquarters elements.

1.6.3 Integrated Architecture Task Force (IATF)

In FY14, the SoSE&I Directorate and the TRADOC Architecture Integration and Management Directorate formed the IATF to assure SoS-level materiel solutions align with Formation-level operational capability requirements. The IATF facilitates effective sharing and integration of operational and system architecture products, and provides TRADOC and ASA(ALT) a formal avenue to coordinate architecture planning and development efforts and jointly support the modeling and analysis challenges facing Army modernization. The IATF formally recognizes the Army Capability Architecture Development and Integration Environment (ArCADIE) as the authoritative source for all Army architecture products, and to provide an effective and efficient product and process development environment.

1.6.4 Army Integrated Requirements Framework (IRF)

The Army IRF enables collaborative development, management, and analysis of requirements (e.g., Warfighting capabilities, SoS specifications, and system specifications) across the entire Army community. The Army IRF requirements are grouped by schema, based on current TRADOC and ASA(ALT) organizational structures, and while tool agnostic, the Army IRF schema has been implemented using IBM's Dynamic Object-Oriented Requirements System toolset.

In FY14, the Mission Command Center of Excellence and Army COE community used the Army IRF to manage the production of the COE Information Systems-Capability Development Document (IS-CDD) and requirements generation initiated by the TRADOC COE CE Leads. In this role, the Army IRF assisted with meeting the standards specified in the JCIDS Information Technology Box (IT-Box) approach for COE. Additionally, in FY14, through the IATF, the SoSE&I Directorate and the Army Capabilities Integration Center (ARCIC) agreed to assess the viability of and develop a plan to integrate the Army IRF into the ArCADIE. The resulting federation would potentially assist with achieving the Total Capability Visibility from Required Capabilities to CS fielding.

1.6.5 Army Geospatial Enterprise (AGE)

The United States Army Corps of Engineers Army Geospatial Center (AGC) provides geospatial subject matter expertise to the SoSE&I Directorate to implement the AGE in the acquisition community. In FY14, the AGC coordinated with the SoSE&I Directorate on the following activities: established an AGC/National Geospatial-Intelligence Agency (NGA) Foundation Geospatial-Intelligence engineering partnership to align dissemination, nomination and co-production of geospatial data; developed an AGE Roadmap and AGE Reference Architecture for the Standard and Sharable Geospatial Foundation and Common Overlay CCCs; and supported implementation of Ground-Warfighter Geospatial Data Model in systems and organizations across Army, US Marine Corps, and allied forces.

1.6.6 Open System Architecture (OSA)

The OSA benefits PMs by using established and working frameworks, already crafted with component reuse in mind, to quickly add, modify, replace, remove, and/or support common services and applications from program to program. Adding features to address evolving threats to an already tested, fielded, and working component is far less risky and costly than a new development effort.

1.6.7 VICTORY/FACE Architecture Standards

In FY14, the Army continued development of the VICTORY effort, which is an architecture and a standard set of specifications and compliance test suites that facilitate interoperability and reduced platform integration risk. In FY14, the Army completed the standard ground platform in-vehicle network, which provides a blueprint for incorporating VICTORY software into modernization programs. The Army also began planning a demonstration of a VICTORY-enabled M-ATV in NIE 15.2. PM Stryker began planning to implement the core in-vehicle network in their ECP program for FY18 fielding.

The Army also pursued the development and implementation of the FACE, which establishes a standard COE to support portable capability applications across DOD avionics systems. Both VICTORY and FACE provide improved SE standards that can reduce the total time PoRs require to design, implement, deliver, test, and field new, enhanced, and/or additional capabilities to the Warfighter.

1.6.8 Common Operating Environment (COE)

1.6.8.1 COE Execute Order (EXORD), SoS Directive, and Technical Advisory Board (TAB)

The COE EXORD was signed 10 September 2014. It assigns roles and responsibilities for execution of COE tasks and provides an Integrated Master Schedule (IMS). Updates to the EXORD will be provided through a Fragmentary Orders. In FY14, the ASA(ALT) also produced the first annual COE SoS Directive in direct support of COE baseline version 3.0 and beyond. The COE SoS Directive represents the single authorizing source to mandate changes to the COE Baseline. The annual update to this document drives the technical direction of the COE, and will be used by the CEs and PMs for planning and identifying required resources to comply. The COE TAB was established to adjudicate all COE technical decisions, establish the overall technical direction of the COE, identify and resolve technical issues, and develop uniform standards and architectures across all CEs. The TAB is the primary source for initiating cross-CE technical initiatives and identifying Joint, Interagency, Intergovernmental, and Multinational interoperability gaps.

1.6.8.2 COE Integrated Systems Engineering Plan (ISEP) and Integrated Management Schedule (IMS)

In FY14, the ASA(ALT) produced the first annual COE ISEP, which provides a framework that promotes harmonization among the COE and the CE SEPs/execution plans (EPs) and activities. Annual publication of the COE ISEP is a directed requirement in the COE EXORD. The COE

ISEP is intended to capture the COE SE strategy by addressing requirements and responsibilities, technical baseline planning, technical baseline management, recommended best practices, and how to align constituent CE SEPs/EPs. Also in FY14, the ASA(ALT) published the COE IMS and defined the process for establishing two updates to the COE IMS baseline per year.

1.6.8.3 COE Baseline version 2.0 Control Point (CP) Specifications and Cross Cutting Capabilities (CCCs)

A Control Point (CP) is defined as the collection of interfaces between CEs. The CP specifications define data exchanges between CEs from a technical, rather than operational, perspective and will be used as the basis for testing exchanges and integrating them between CEs. The CP specifications format development is a phased approach and the COE baseline version 2.0 specifications are nearing completion.

CCCs are a set of validated top-level COE requirements that are common to multiple CEs. They are used to guide the design and the architectures of the individual CEs, ensuring interoperability across the environments and fostering reuse of common components. Each of the CEs will have additional requirements unique to their own environment, but mapped back to the overarching COE requirements. The CCCs are defined and implemented as a common capability across multiple CEs. The CCC specifications define rules and provide the guidance necessary to align the information exchanges and data specified in the CCCs with the Army Information Architecture. This allows for phased retirement and savings in sustainment costs for multiple unique implementations of the same capabilities across many Army mission systems and ensures logically consistent data across CEs. Direction to implement the CCCs is contained in both the ISEP and COE SoS Directive. In FY14, the ASA(ALT) approved the Common Overlay CCC, which provides a common implementation of graphical overlays across Army systems; a first for the US Army.

1.6.8.4 Embedded Instrumentation Interface

ASA(ALT) is developing a COE Standard and a CCC to support the development of a software interface to collect data for SoS integration and testing. The embedded instrumentation interface will support the development of automated processes for conformance of interfaces and analysis of the performance of C4ISR applications. This work is being conducted with ATEC/Electronic Proving Ground as part of its development of COE instrumentation. This effort will provide new methods for data collection and analysis and significantly reduce the cost associated with data collection and analysis if implemented across the COE network.

1.6.8.5 COE Integration and Certification Strategy

As part of the migration from the Army Software Blocking Strategy to the COE for the Army Tactical Network SoS, in FY14 the SoSE&I Directorate has focused on developing a new SoS Integration and Certification Strategy to support a rapid fielding of new capabilities in accordance with new SoS network capabilities that are emerging from both the DOD and industry. The objective is to implement a new integration and testing methodology to drive improvements in the quality of system integration, reduce the time necessary to identify and correct software faults, and shorten the time to complete the Army Interoperability Certification. This methodology will be accomplished by implementing a building block approach with

established gates, defined by specific requirements, standards, Cyber Security, and Interoperability measures of success. This approach will allow PM, CE leads, SOSE&I, and the CIO/G-6 to measure and certify the maturity, integration and interoperability of the COE. The COE Integration and Certification Strategy will enable the Army to test, certify, and security accredit software capabilities more rapidly, improve security, interoperability, and reduce costs. The CIO/G-6 and the ASA(ALT) are working to develop new processes and create test tools that can be used to facilitate the integration, testing, and certification of COE baseline version 3.0.

1.6.9 Agile Process

The Army has instituted the "Agile Process" for network modernization, which provides a holistic and integrated approach for the acquisition, testing, evaluation, and fielding of capability solutions across the Army's range of operations. The Agile Process, through seven phases, is an effort to assess critical capabilities in an operational environment, while ensuring technical maturity and integration, and reducing the integration burden on deployed units and Soldiers. The phases focus on identifying requirements and potential solutions, assessing those solutions in laboratory and operational environments, and implementing TRADOC's Doctrine, Organization, Training, Materiel, Leadership and Education, Personnel, and Facilities findings. These phases are continuous in nature and react to external changes from ongoing operations and advances in IT and the traditional analysis the Army conducts to modernize the force for the future. In FY14, the Agile Process evolved to enable the SoSE&I Directorate to assess the network's baseline and pursue the Army's Force 2025 objective. The ASA(ALT)/AAE signed the PEO Directive to implement the Agile Process and conduct NIEs during FY14.

1.6.10 Capability Set Management Board (CSMB), Capability Set Design Database (CSDD), and Capability Modernization Matrix (CMM)

The SoSE&I Directorate manages the CSMB Working Group cooperatively with G3/5/7. The board coordinates all cost, schedule and performance issues with CS fielding with other stakeholders, PEOs and PMs. In FY14, the CSMB developed the CS 15/16 fielding plan and approved the CS 15/16 technical architecture, which will be used to produce and field CS 15 and CS 16. In FY14, the SoSE&I Directorate refined the CSDD; an existing SoS materiel capability set network design process supporting CS Fielding and the NIE. In FY15, the SoSE&I Directorate will collaborate with TRADOC ARCIC to develop integrated C2P processes, data sources, and enterprise support solutions to field effective, interoperable network materiel solutions to brigade formations. In FY14, the SoSE&I Directorate developed the CMM data product to provide a consistent and managed view of capability requirement phasing across CSs. The CMM is a cross-portfolio, multi-year planning tool designed to support validation of SoS acquisition requirements with stakeholders, critical-path analysis, architecture development and analysis requirements, risk determination, BOI FD validation, and other key data products.

1.6.11 Basis of Issue (BOI) Feeder Data (FD) Driven Network Architecture

In FY14, the SoSE&I Directorate automated the rendering of transport architectures built from the BOI FD to assure accurate and relevant BCT CS network architectures are developed. This capability eliminates an inherently error-prone process of manually drawing transport architecture views, and replaces it with a significantly faster architecture validation process. Once authenticated, the BOI FD data sets and architectures are validated by the Army CSMB

and then becomes the data informing the US Army Force Management Support Agency database, which generates unit Table of Equipment/Modified Table of Equipments that support fielding equipments to individual units.

1.6.12 Platform Integration and Analysis (PIA)

The Platform Integration Engineering team developed, with key CS management stakeholders, an engineering and acquisition process to incorporate platform integration constraints into the Stryker and Armored Brigade Combat Team (SBCT and ABCT, respectively) network architecture development. Through a collaborative process with the PEOs/PMs and TRADOC Capability Managers, the SoSE&I Directorate was able to develop ABCT and SBCT reference architectures that were synchronized with existing platform modernization programs.

1.6.13 Capability Set (CS) Fielding

In FY14, the Army completed the second iteration of the Agile process by fielding CS 14 to four Infantry Brigade Combat Teams (IBCTs) and one Division headquarters, as well as initiating fielding to one SBCT. The Product Director Synchronized Fielding, based on NIE results, developed and integrated CS 14 network packages into the M-ATV, Strykers, and, for the first time, High Mobility Multipurpose Wheeled Vehicles and other Light, Medium, and Heavy Tactical Vehicles. CS 14 was the first fielded CS with a full upper and lower tactical internet capability, which provided full mission command and position location information movement from brigade commander to squad leader throughout the BCT. The third iteration of the Agile Process is in development with the CS 15/16 capability package, which delivers further capability improvements for IBCTs, SBCTs, and Division headquarters.

1.6.14 Network Integration Evaluation (NIE) Update

The NIEs remain a critical component of the Army's modernization efforts, and serve as the principal driver of change among the Army's evaluation and integration events. There are few test events that stress SoS-level capability requirements for BCT formations, and it is the only brigade-level event focused on validating the functionality of CSs and the value of new technology concepts.

The NIE event serves as a CS evaluation execution function, providing a formal evaluation of the operational tests by Brigade Modernization Command, ATEC, Lab-based Risk Reduction (LBRR), as well as supplying a feedback mechanism to refine the PoRs and the CS design. In FY14, the Army closed out NIE 14.1, where the following Systems Under Test (SUTs) were evaluated: JWARN, Command Post of the Future, Joint Gateway Node, and the AN/Personal Radio Communication-117G. The NIE 14.2 executed the following SUTs: Blue Force Tracking 2; Handheld, Manpack, and Small Form Fit-Manpack (HMS MP), and Nett Warrior. A dismount IBCT formation was also demonstrated, using platoon-based HMS-MP for route and retransmission capability. Fires over Soldier Radio Waveform were also evaluated for the first time with Precision Fires Warrior. Lastly, NIE 14.2 coordinated with another operation evaluation, Bold Quest (BQ), which demonstrated how Joint and Coalition partners would exercise Concept of Operation using their MC systems within a closed network.

In FY14, the SoSE&I Directorate also completed the design for NIE 15.1, ending with a successful Validation Exercise. The WIN-T was the sole SUT. Like past NIEs, the addition of the AMP-MCOTM (SUT) continued to evaluate solutions for the TRADOC gap for Networked Air-Ground Integration. The addition of ODIN on the Mounted Android Computing Environment, as a System Under Evaluation (SUE), enabled a significant step forward in addressing the DA objective for Unit Task Reorganization. The Army also continued to evaluate other objectives: Intelligent Command Posts with Braddock (demonstration); integrating simulated systems with ARTO (demonstration), CDS3 (demonstration), and ARGON (SUE); and Network Operations tools with Trouble Ticketing (SUE) and WIT-P.

1.7 Additional SE Accomplishments

1.7.1 Notable PEO/PM FY14 Accomplishments

Additional notable PEO/PM accomplishments in FY14 include:

- The JLTV program utilized the Knowledge Point process from the Requirements Management and Analysis Plan, which requires regular and robust coordination between the Combat Developers and Materiel Developers during system development.
- PEO EIS has instituted a Software Code Review process intended to develop higher quality and more secure software code across the EIS portfolio.
- PEO IEW&S, PM Sensors Aerial Intelligence expanded connectivity to CERDEC, as well as added a robust Theater Net-Centric Geolocation (TNG) capability to the Joint Test and Integration Facility (JTIF), which is used for prototyping and risk reduction. The TNG capability will allow the Army to reduce integration and performance risk for sensors implementing JCIDS. The JTIF supported Enhanced Medium Altitude Reconnaissance and Surveillance integration and developmental testing, while also facilitating Distributed Common Ground Systems-Army development.
- PEO MS worked collaboratively with AMRDEC and the Air and Missile Defense-related program offices to establish the Integrated Air and Missile Defense (IAMD) Simulation capability. This effort merges tactical code and the existing hardware-in-the-loop simulation in an IAMD Simulation Framework infrastructure that eliminates the limitations of High Level Architecture.
- PEO Soldier S&T and R&D programs from supporting organizations, including NSRDEC, are regularly reviewed in IPTs and working groups. Technology insertions are planned with full stakeholder input for technology roadmaps, documented in Transition Agreements, and closed with Notices of Transition.
- PEO STRI commissioned an independent report to examine and recommend best governance and SE practices for SoS and Product Line development efforts. The report will be used to shape and influence governance and SE efforts for new and emerging SoS/Product Line programs.

1.7.2 Research, Development and Engineering Command (RDECOM) SE Office

The RDECOM Strategic Plan for FY2015-2040 stresses the goal "to create a RDECOM Headquarters (HQ) SE capability that supports and implements ASA(ALT) policies, develop a career path for systems engineers, and build uniform tools to use SE practices throughout the

command." The establishment of the SE Office in FY14 is one of the steps RDECOM took to meet this goal. The RDECOM SE Office develops, implements, and sustains state-of-the art, integrated, and consistent solutions to meet the Army's and customer SE needs. The RDECOM SE Office remains committed to refining the RDECOM Lexicon Dictionary, Workforce Development Initiatives, and stakeholder, requirements, and integration efforts.

1.7.3 Analysis on Extending the Army Network to Aviation

To support well-informed acquisition decisions, the Army began formal analysis of network architectures, radios, and waveforms being considered to extend the ground network to Army Aviation. Representative tactical scenarios were selected that will stress the proposed network, and network traffic models representative of expected traffic loading were used to simulate throughput demand. The initial analysis began with tests of sub-scale networks using representative radio hardware running simulated scenarios, while M&S is being used to analyze the network implications at larger scales. The analysis draws upon the technical expertise and tools of the Joint Tactical Radio System Reference Implementation Laboratory, ATEC, CERDEC, and AMSAA. It has involved collaboration among stakeholders in the acquisition and requirements communities, including PEO C3T, PEO AVN, and the Aviation Center of Excellence; the overall effort is being managed at the ASA(ALT) level. This work will continue into FY15, including M&S of a brigade scale network, to identify the implications of materiel and network design decisions. The effort is expected to transition to an operational demonstration in FY16 to confirm experimental results.

1.7.4 Army Systems Engineering Forum (ASEF)

The monthly ASEF allows PEOs/PMs, AMC RDECOM Chief Systems Engineers, Chief Software Architects, and, key members of the Army's engineering and software community to socialize key SE concepts and strategies, identify and address common SE issues, and identify solutions.

1.7.5 Program Protection Plan (PPP) Reviews

The SoSE&I Directorate is assisting PEO/PM representatives in developing PPPs by reviewing the documents for compliance with the OSD PPP format and statutory and regulatory guidance. In FY14, the SoSE&I Directorate assisted the PEOs/PMs route the PPPs through the protection process. The SoSE&I Directorate also collaborates with the Defense Intelligence Agency Threat Analysis Center to fulfill requests for information. In FY14, the SoSE&I Directorate reviewed the following PPPs: AMPV, Division eXercise Training and Review System, Excalibur, Integrated Personnel and Pay System-Army Inc II, Joint Air-to-Ground Missile, and MNVR.

1.7.6 Support to Programs

Upon request, the SoSE&I Directorate provides special services to Programs seeking hands-on assistance, participation, or input. In FY14, the SoSE&I Directorate assisted several programs who sought their expertise in SE Lifecycle Planning:

- **Mid-tier Networking Vehicular Radio (MNVR)**: The MNVR Program, a special interest program producing a modified Non-Developmental Item, requested support for

tailoring the program's life-cycle plan so it would meet SE requirements and still operate within its contractual environment.

- **Indirect Fire Protection Capability (IFPC)**: In FY14, the IFPC Program was directed, through an Acquisition Decision Memorandum, to conduct an alternate interceptor Trade Study. The PEO requested the SoSE&I Directorate assist with planning the study and participate in KP meetings. The SoSE&I Directorate provided a SME who reviewed pertinent information and trade analysis criteria, ensuring the Army and PEO MS were confident in the path forward.
- **Paladin Integrated Management (PIM)**: The DASD(SE) requested the SoSE&I Directorate assist the PIM Program, a post Milestone C program, resolve their critical Cross Domain Solution issue. The investigation showed the PIM Program Office would benefit from collaborating with key National Security Agency (NSA) representatives and initiating the effort as soon as possible to be able to absorb the Cross Domain Solution (CDS) validation timeline without impacting the program's critical path. The SoSE&I Directorate then participated in a joint PIM and NSA design review, where stakeholders developed several possible courses of action and drafted an agreement on how to proceed.

1.7.7 Product Data and Data Rights Acquisition and Management

Army programs continue to face increased program costs due to the lack of product data and/or data rights needed to competitively procure and support their products. The RDECs provide technical and subject matter experts to the SoSE&I Directorate and HQ AMC, and representatives participate in Army and DOD working groups that address the issues of product and data rights acquisition management.

1.7.8 Cybersecurity

Cybersecurity support teams continue to support the Army Agile process, to include Synchronized Fielding, LBRRs, and NIEs. In FY14, Cybersecurity continued to coordinate Blue teaming earlier in the Agile process by integrating Blue Team Vulnerability Assessments into the LBRR to validate CS protection mechanisms, monitor capabilities, and validate Assured Compliance Assessment Solutions and Host Based Security System architectures of the NIE.

1.7.9 Joint Federated Assurance Center (JFAC) Support

The Executive Director, SoSE&I was named the Army Champion for JFAC activities in Section 937 of the National Defense Authorization Act (NDAA) for FY 2014. Specifically, the SoSE&I Directorate was tasked to stand-up, implement, and execute Software Assurance and Hardware Assurance efforts. The JFAC IOC is tentatively scheduled for July 2015. The JFAC Army representatives are developing joint software and hardware solutions that will provide the foundation for federation, improve intra-organizational communication, and streamline the ability to share assets and capabilities across the Army. The SoSE&I Directorate is leading the analysis effort to identify the security protocol requirements necessary to ensure Army software and hardware systems are not vulnerable to cyber and supply-chain threats and operate effectively in the current and emerging national security environment, as well as ascertain tactical and strategic cyber opportunities.

1.7.10 Value Engineering (VE)

The Army VE program continues to lead in net savings and cost avoidance, as well as aggressive and entrepreneurial efforts focused on the Army's primary commodity areas. FY14 constitutes the second year of the Army using the Army Power Steering system to capture Army VE project data and related statistics, allowing the Army to capture Lean Six Sigma (LSS) and VE cost saving and cost avoidance data in the same system. As a result of the streamlined process, the Army completed 206 VE projects and 8 VE Contract Change Proposals (CCPs), which resulted in a total annual savings of $584M in FY14. The Army received eight DOD VE awards from the Under Secretary of Defense for Acquisition, Technology and Logistics (USD(AT&L)) for a job well done in FY14. The Army's formal FY15 VE Plan will include a greater emphasis on linking and aligning the VE program planning efforts more closely with the established budgetary cycle, to ensure more timely and robust financial reporting, as well as a better integrated VE project portfolio.

1.7.11 Business System Portfolio Management

As designated in the 2012 NDAA, the ASA(ALT) is designated as the Domain Lead for the Acquisition Domain of DBS, with the responsibility to rationalize the business systems found within the Acquisition Domain and actively manage their expenditures against investment. In FY14, as part of the portfolio annual certification for FY15, the Acquisition Domain achieved potential cost avoidance for the Army of over $45 M.

2.0 Army SE Workforce

2.1 Workforce Development Initiatives

The SoSE&I Directorate has undertaken an expanded workforce development effort, with the intent to develop a premier Acquisition SE workforce able to drive success in the Army's most challenging engineering endeavors. In FY14, AMC established a proponency office for Career Program 16 Engineers and Scientists (Non-construction), facilitating improved communication with the SE workforce regarding the Army's strategy for their development and utilization, as well as their career opportunities. There are five key initiatives to address a foreseen shortfall in the SE workforce: 1) Selecting personnel for KLPs; 2) Systems Engineering Research Center (SERC) Initiatives; 3) Specialty Engineering Education and Training (SE2T) Program; 4) Recruitment and Training; and 5) Rotational Assignments.

2.1.1 Key Leadership Positions (KLPs)

The SoSE&I Directorate is collaborating with the U.S. Army Acquisition Support Center Army Director of Acquisition Career Management (DACM) Office, AMC, OSD, and other Services to pre-qualify personnel interested in KLPs through the Joint KLP Qualification Board. Currently, KLPs must have the following overall general qualifications: Defense Acquisition Corps Membership, Level III Certification, a Tenure Agreement, and currency via 80 hours of continuous learning points every two years. To aid in evaluating and selecting the best qualified KLP candidates, the USD(AT&L), in a policy memorandum dated 8 November 2013, provided criteria in five areas to assist supervisors in selecting personnel to fill KLP vacancies: education, experience, cross-functional competencies, tenure, and currency. The Joint KLP Qualification

boards will review interested personnel against these five criteria to determine qualification. The Army is prepared to support implementation for SE candidates upon establishment of the qualification board.

2.1.2 Systems Engineering Research Center (SERC) Support

The Army is collaborating with the SERC, a University-Affiliated Research Center of the DOD, to develop an SE career development model, based on best practices gleaned from industry and academia. The USAASC Army DACM Office is providing insight to the SERC to ensure the model is all encompassing. The model will address the education, training, and experience necessary to grow systems engineers from entry level to KLPs.

The RDECOM Tank Automotive Research, Development and Engineering Center (TARDEC) is collaborating with Wayne State University (WSU), in Michigan, on two research topics: RT107, Quantitative Risk and Leading Indicators and RT113, Trade-space and Affordability. The WSU and TARDEC, in relation to RT107, will conduct a data gathering pilot, focused on leading indicators for the AMPV program, to determine how individual and combined leading indicators can be used to identify areas of risk exposure. The resulting analysis of the data will be used to determine, mathematically and logically, how to identify when a program may be exposed to increasing risk, and potentially incorporate this into the Integrated SE Framework in the future.

2.1.3 Specialty Engineering Education and Training (SE2T) Program

The SE2T is a two year program created by AMC-RDECOM, in partnership with the DAU, to rebuild the competencies for specialty engineering. The coursework trains interns/new hires in the broad engineering skills needed to support Army acquisition. The courses address expertise gaps in quality, production, manufacturing, reliability, and T&E engineering. In FY14, the SoSE&I Directorate enhanced the SE2T program by adding courses tailored for the current workforce. These courses provided refresher training in the key specialty engineering areas. Remote classroom locations have been added at Redstone Arsenal, AL; Rock Island Arsenal, IL; and Picatinny Arsenal, NJ.

2.1.4 Rotational Assignments

Providing the SE workforce with multiple rotational and developmental assignments was a key focus area of SE workforce development in FY14. The objective is to enhance SE by creating an environment that allows systems engineers to gain operational experience in multiple organizations, and broaden their breadth of knowledge. Rotational assignments also promoted the sharing and leveraging of SE best practices across the Army acquisition enterprise. To support this objective, the SoSE&I Directorate established developmental assignment programs that identify qualified candidates and provide them the opportunity to work for SoSE&I in six month developmental assignments in the National Capital Region.

The AMC, through its subordinate element RDECOM, routinely announces organization wide, SE opportunities within and across RDECOM, ASA(ALT), the PEO/PMs, and OSD. The RDECOM encourages interested engineers and scientists to pursue developmental opportunities that allow them to gain SE operational experience in multiple organizations to broaden their breadth of SE knowledge.

In FY14, individuals participated in rotational assignments in the RDECOM SE Office. In addition, multiple SE rotational assignments were conducted within RDECOM's RDEC. Rotational assignments included SE leadership positions, project SE leads, chief systems engineers, requirements engineers, and system architects.

2.1.5 Recruitment and Training

The Army recognizes the challenge to recruit, train, and retain systems engineers. In an effort to recruit qualified applicants, and then continue to develop their skills once hired, the Army maintains consortiums with universities. For example, AMC-Edgewood Chemical Biological Center has reached an agreement with Johns Hopkins University to provide a single, limited participant *Introduction to Systems Engineering Course*. Also in FY14, the AMC-RDECOM entered its final year of partnership with the Naval Post Graduate School, sponsoring 23 engineers to obtain System Engineering Master of Science degrees. All students graduated the program in the spring of 2014.

In FY14, AMRDEC completed its fourth year using a competency measurement tool assessing select SE competencies. Use of this competency measurement tool has identified several best practices that contribute to the development and sustainment of individual and organizational SE competencies.

2.1.6 PEO Efforts

PEOs/PMs are responsible for ensuring their workforce has the required certifications and qualifications for their positions, as well as fostering individual growth in a way that balances with organizational objectives. In addition to aggressive recruitment, smart personnel allocation, top-down mentoring programs, and student opportunities, PEOs/PMs fulfill this directive through collaborative relationships with engineering centers, Defense Universities, and utilizing competitive recruitment programs to sustain matrix support; mandatory acquisition career field Engineering certification; and expanding training opportunities for existing SE employees, to include encouraging the workforce to pursue Master's and Doctorate Degrees in their respective fields.

The PEO STRI has taken advantage of highly competitive recruitment programs, such as the Acquisition Academy (A2) to screen and recruit qualified candidates. To date, PEO STRI has recruited 23 high performing new engineering graduates through A2. The A2 is experiencing an 83 percent retention rate for SE positions. The PEO STRI also teams with the Naval Air Warfare Center Training Support Division, the Software Engineering Institute at Carnegie-Mellon, the NDIA, the National Training and Simulations Association, and the INCOSE to ensure their staff is receiving state-of-the-art training.

The PEO AVN, PM Aviation Systems approach to "Building the SE Bench" is to utilize a chief engineer that monitors and mentors all product development efforts. Each product team is staffed with a product lead senior engineer and mid-level engineers to manage and coordinate all design and development efforts. The product team lead assigns and mentors a mid-level engineer to appropriate subsystems for daily management as a training technique to develop their careers and talents in acquisition and technical management. This "Building the SE Bench"

strategy at succession planning creates the kind of leadership and management capability that delivers sustainable business practices within the product office.

2.2 Workforce Resourcing

Section 852 of the FY08 NDAA (Pub. L. 110-181) directed the establishment of the Defense Acquisition Workforce Development Fund (DAWDF), which funds DOD efforts to recruit, hire, train, develop, and retain its Acquisition workforce. The Army utilizes DAWDF funds in all these areas, and they have been instrumental in meeting established goals for training and addressing gaps in acquisition functional competencies. In FY14, DAWDF 852 dollars were used to fund seven rotational assignments in the National Capital Region. In FY15, the SoSE&I Directorate expects to use DAWDF 852 dollars to fill the following areas in workforce development: Workforce Transition Hiring, Mentoring, Leadership Development, Journeyman Hiring, and Six Month Developmental Assignments.

The Army does not require any additional authorities that are not currently assigned by Title 10 to support management of the acquisition workforce.

2.2.1 Defense Acquisition Workforce Development Fund (DADWF) for Hiring

In April 2009, the Secretary of Defense directed the growth of 20,000 defense acquisition workforce positions by FY15. The DOD (Carter-Hale Numbers) allocated 1,856 new hire positions to the Army Acquisition community, which were funded with Section 852 funds. The DAWDF funding is used to pay salary for new-growth positions, limited to the first two years. In cases where the number hired falls short of the number allocated, it is normally due to a hiring freeze. Table 2-1 provides FY09-14 Hiring authorities. For FY14, the engineering community was allocated funding to hire 18 civilians: 14 journeyman and 4 interns. For FY15, the engineering community is allocated funding to hire 133 civilians: 63 journeymen and 70 interns.

Table 2-1 Historical Section 852 Hires/Allocated

FY	Intern Positions				Journeyman Positions			
	SE		PSE		SE		PSE	
	Allocated	Hired	Allocated	Hired	Allocated	Hired	Allocated	Hired
FY09	14	14*	0	0	11	9	0	0
FY10	20	22*	0	0	0	13**	0	0
FY11	6	15	0	0	0	15	22	0
FY12	2	2	0	0	0	0	2	2
FY13	3	2	N/A	N/A	19	3	N/A	N/A
FY14	4	0	N/A	N/A	15	6	N/A	N/A
FY15	70	0	N/A	N/A	63	0	N/A	N/A

* In FY09 & FY10 – one intern departed early
** In FY10 three journeyman departed early

2.3 Impact of Budget Cuts

The Army needs to invest in the future force, and particularly in the network capabilities that allow future capability sets to perform as a combat multiplier. As Army systems are becoming increasingly complex, interconnected, and interdependent, these factors compound the challenges in equipping today's Warfighters. The DoD requirements and budget processes are optimized for funding and maximizing the performance of individual programs and systems. They are far less effective and efficient in integrating separate programs into a highly complex system-of-systems capability construct that provides capabilities greater the sum of the individual system. The individual programs are not funded to solve the larger network and integration problems which may extend beyond the scope of their immediate system requirement. The rigorous level of engineering and integration required to ensure that capabilities which span across sub-systems, systems, platforms, system of systems, formations, and all levels of the operating and generating force needs to occur early in the lifecycle of the system. System of Systems Engineering and Integration needs to be performed and funded early in the development process to ensure successful operational testing. Currently, the lack of sufficient events and resources to perform early integration and developmental test hinders our ability to identify and resolve technical issues early.

The ability to conduct System of Systems Engineering and Integration is hampered by the organization of budget programs into single system budget lines. Programs are funded to develop traceable warfighter capabilities and deliver systems that support those needs. Solving this issue requires dedicated resources to identify and trace System of Systems requirements, and then perform the engineering, integration, and testing to transform those requirements into capabilities. The development of common software applications which can be integrated onto multiple platforms requires funding for the applications that meet the physical constraints of the host platform, but are open and modular enough so the software can be common across the various systems, platforms, and formations. The continuing gap that needs to be addressed is funding the level of effort required to integrate networked capabilities into multiple systems, platform, and formations.

2.4 Workforce Positions in the Army

The Army Acquisition Workforce is not protected from mandated Department reductions; these have and will continue to affect the acquisition workforce. The ASA(ALT) has established guidance to minimize the impact of these reductions on specific acquisition critical skill sets such as SE. Organizational Commanders have operational control of their workforce, budget & structure and mandated reductions, and shape the workforce within existing constraints. Attrition in the SE community is generally not the problem, as we continue to maintain historical rates. The greatest challenge within the SE workforce is the ability to replenish losses and build an effective bench. The total number of acquisition workforce personnel assigned to Engineering positions decreased from 9,374 in FY13 to 8,986 in FY14. This is not a challenge unique to this acquisition career field as the entire Army acquisition workforce is experiencing a similar trend. Additionally, target hiring levels for civilian acquisition workforce personnel in the Engineering career field have been reduced due to the impacts described above. In the past, military coded Engineering positions were expected to remain steady; however, with Army-wide force reductions, military coded positions are reduced to two for FY16-19.

Table 2-2 Number of Systems Engineering Personnel

Total Number of Civilian and Military – Engineering Personnel		
FY	**Year Ending**	**US Army**
FY05	30-Sep-05	11,138
FY06	30-Sep-06	11,964
FY07	30-Sep-07	11,050
FY08	30-Sep-08	10,769
FY09	30-Sep-09	10,208
FY10	30-Sep-10	10,647
FY11	30-Sep-11	10,071
FY12	30-Sep-12	9,812
FY13	30-Sep-13	9,374
FY14	30-Sep-14	8,986

Table 2-2 Source of Data: Career Acquisition Personnel and Position Management Information System (CAPPMIS)

Table 2-3 Planned Personnel Growth

Planned Growth in Civilian and Military Acquisition-Coded Engineering			
FY	**Year Ending**	**Planned Growth**	**Projected End Strength**
FY15	30-Sep-15	-288	8,698
FY16	30-Sep-16	-2	8,696
FY17	30-Sep-17	0	8,696
FY18	30-Sep-18	0	8,696
FY19	30-Sep-19	0	8,696

Table 2-3 Source of Data: Department of the Army Fiscal Year 2014 Budget Estimates, Acquisition and Technology Work Force Manpower (PB-23), 31 August 2014. These numbers differ from overall SPRDE-Engineering numbers due to subtraction of personnel in the Science & Technology Manager Acquisition Career Field.

Table 2-4 Number of Non-Government SE Support Personnel

Total Number of Non-Government SE Support Personnel (FTEs)					
FY	**Year Ending**	**Product Service Code**			**US Army Total**
		R414	**R421**	**R425**	
FY10	30-Sep-10	1,142	1,026	8,119	10,287
FY11	30-Sep-11	868	1,037	12,001	13,906
FY12	30-Sep-12	590	1,246	11,197	13,033
FY13	30-Sep-13				16,130
FY14	30-Sep-14				Not Available Until Mid-2015

Table 2-4 Source of Data: Force Management System Website. U.S. Army FY13 contractor numbers reflect Reported Contractor FTEs calculated from direct labor hours reported in Enterprise-wide Contractor Manpower Reporting Application (eCMRA). Increase between FY12 and FY13 reflects a more comprehensive reporting strategy.

Acronym List

Acronym	Definition
A2	Acquisition Academy
A2R	Acquire to Retire
AAE	Army Acquisition Executive
ABC	Army Business Council
ABCT	Armored Brigade Combat Team
ACAT	Acquisition Category
ACP	Army Campaign Plan
AFES	Automatic Fire Extinguishing System
AGC	Army Geospatial Center
AGE	Army Geospatial Enterprise
AIAMD	Army Integrated Air and Missile Defense
AMC	Army Materiel Command
AMPV	Armored Multi-Purpose Vehicle
AMRDEC	Army Aviation and Missile Research Development and Engineering Center
AMSAA	Army Materiel Systems Analysis Activity
AO-OD	Always On-On Demand
APO	Army Program Office
AR	Army Regulation
ArCADIE	Army Common Architecture Development and Integration Environment
ARCIC	Army Capabilities Integration Center
ASA(ALT)	Assistant Secretary of the Army for Acquisition, Logistics and Technology
ASEF	Army Systems Engineering Forum
ASH	Armed Scout Helicopter
ATEC	Army Test and Evaluation Command
AVN	Aviation
BCT	Brigade Combat Team
BMC	Brigade Modernization Command
BOI FD	Basis of Issue Feeder Data
BQ	Bold Quest
C2P	Concept-to-Product
C3T	Command, Control and Communications-Tactical
C4ISR	command, control, communications, computers, intelligence, surveillance, and reconnaissance
CBD	Chemical and Biological Defense
CBM+	Condition Based Maintenance Plus
CCC	Cross Cutting Capability
CDD	Capability Development Document
CDRL	Contract Data Requirements List
CDS	Cross Domain Solution
CE	Computing Environment
CERDEC	Communications-Electronics Center of the Research, Development and

Acronym	Definition
	Engineering Center
CIO	Chief Information Officer
CIRCM	Common Infrared Countermeasures System
CM	Configuration Management
CM	Countermeasures
CMM	Capability Modernization Matrix
COE	Common Operating Environment
CP	Control Point
CRG	Center for Reliability Growth
CS	Capability Set
CS&CSS	Combat Support and Combat Service Support
CSB	Configuration Steering Board
CSM	Capability Set Management
CSMB	Capability Set Management Board
DA	Department of the Army
DACM	Director of Acquisition Career Management
DASD(SE)	Office of the Deputy Assistant Secretary of Defense Systems Engineering
DAU	Defense Acquisition University
DAWDF	Defense Acquisition Workforce Development Fund
DBS	Defense Business System
DCSE	Decision Centric Systems Engineering
DOD	Department of Defense
DP	Development Planning
E2E	End-to-End
ECP	Engineering Change Proposal
EIS	Enterprise Information Systems
EMD	Engineering and Manufacturing Development
ESPB	Engineering Standards and Process Board
EXORD	Execute Order
FACE	Future Airborne Capability Environment
FMECA	Failure Mode Effects and Criticality Analysis
FTE	Full-Time Equivalents
FY	Fiscal Year
GOSC	General Officer Steering Council
HMS-MP	Handheld, Manpack, and Small Form Fit – Manpack
HQ	Headquarters
HQDA	Headquarters, Department of the Army
IAMD	Integrated Air and Missile Defense
IAT	Independent Assessment Team
IATF	Integrated Architecture Task Force
IBCT	Infantry Brigade Combat Team
IEW&S	Intelligence, Electronic Warfare and Sensors
IFPC	Indirect Fire Protection Capability
IMS	Integrated Master Schedule
INCOSE	International Council on Systems Engineering

Acronym	Definition
IOC	Initial Operational Capability
IPT	Integrated Product Team
IRF	Integrated Requirements Framework
ISEP	Integrated Systems Engineering Plan
IT	Information Technology
JCIDS	Joint Capabilities Integration and Development System
JFAC	Joint Federated Assurance Center
JLTV	Joint Light Tactical Vehicle
JPEO	Joint Program Executive Officer
JPM	Joint Project Manager
JTIF	Joint Test and Integration Facility
JWARN	Joint Warning and Reporting Network
KP	knowledge point
LBRR	Lab-based Risk Reduction
LIRA	Long-Range Investment Requirements Analysis
LRIP	Low-Rate Initial Production
LVC-DE	Live, Virtual, Constructive-Distributed Environment
M	million
M&S	Modeling & Simulation
MAIS	Major Automated Information Systems
M-ATV	MRAP All Terrain Vehicle
MBSE	Model Based Systems Engineering
MC	Mission Command
MDAP	Major Defense Acquisition Program
MNVR	Mid-Tier Networking Vehicular Radio
MP	Mission Profile
MRAP	Mine Resistant Ambush Protected
MS	Missiles and Space
NCR	Network Capability Review
NDAA	National Defense Authorization Act
NDIA	National Defense Industrial Association
NDTE	Non-Destructive Test and Evaluation
NGA	National Geospatial-Intelligence Agency
NIE	Network Integration Evaluation
NSA	National Security Agency
NSRDEC	Natick Soldier Research, Development & Engineering Center
ODENN E14	On-Demand Environment Network and Net-centric Systems Event 2014
OMS	Operational Mode Summary
OSA	Open System Architecture
OSD	Office of the Secretary of Defense
PD	Purchase Description
PdM	Product Manager
PEO	Program Executive Officer
PIM	Paladin Integrated Management
PM	Program Manager

Acronym	Definition
PMO	Program Management Office
PNT	Positioning, Navigation and Timing
POM	Program Objective Memorandum
PoR	Program of Record
PPP	Program Protection Plan
R&D	Research and Development
R&M	Reliability and Maintainability
RAM	Reliability, Availability and Maintainability
RAM&S	Reliability, Availability, Maintainability, and Sustainability
RAM-C	Reliability, Availability and Maintainability – Cost
RDEC	Research, Development and Engineering Center
RDECOM	Research, Development and Engineering Command
RFP	Request for Proposal
RIAC	Reliability Information Analysis Center
RMWG	Reliability and Maintainability Working Group
S&T	Science and Technology
SBCT	Stryker Brigade Combat Team
SE	Systems Engineering
SE2T	Specialty Engineering Education and Training
SEP	Systems Engineering Plan
SERC	Systems Engineering Research Center
SLWG	Service Lead Working Group
SME	Subject Matter Expert
SMP	Soldier Modernization Process
SoS	System of Systems
SoSE&I	System of Systems Engineering and Integration
SoSEMP	System of Systems Engineering Management Plan
SRW	Soldier Radio Waveform
STRI	Simulation, Training and Instrumentation
SUT	Systems Under Test
T&E	Test and Evaluation
TAB	Technical Advisory Board
TARDEC	Tank Automotive Research, Development and Engineering Center
TMRR	Technology Maturation and Risk Reduction
TNG	Theater Net-Centric Geolocation
TRADOC	Training and Doctrine Command
TRL	Technology Readiness Level
UH	Utility Helicopter
USD(AT&L)	Undersecretary of Defense (Acquisition, Technology and Logistics)
VE	Value Engineering
VICTORY	Vehicular Integration for C4ISR/Electronic Warfare Interoperability
WIN-T	Warfighter Information Network-Tactical
WSR	Weapon System Review

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APPENDIX B

Department of the Navy
Systems Engineering Self-Assessment

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DEPARTMENT OF THE NAVY

Systems Engineering
FY14 Annual Self-Assessment Report

10 November 2014

Prepared by the Office of the Assistant Secretary of the Navy

(Research, Development and Acquisition)

Contents

Tables

EXECUTIVE SUMMARY

The Department of Defense (DoD) Deputy Assistant Secretary of Defense for Systems Engineering [DASD (SE)] is required to submit an annual report to Congress on the activities pursuant to subsections (a) and (b) of Public law 111-23 section 139. DASD (SE) tasked ASN (RDA) to develop the Naval Systems Engineering (SE) portion of this annual report. This document responds to the DASD (SE) request.

The Department of the Navy (DON) has always emphasized engineering excellence as part of its acquisition program management strategy. Tenets of the DON SE effort are to: 1) strengthen technical expertise and foster engineering excellence on DON acquisition programs; 2) evaluate all SE processes and practices from the perspective of holding those with the right knowledge, technical authority, and expertise responsible for the SE effort; 3) ensure robust technical risk identification and mitigation are accomplished; and 4) ensure that cost effective Systems Engineering analyses and Technical Reviews (SETRs) are in place to support program success. DON SE policy and processes are aligned with the goals of the DoD and DON Better Buying Power initiatives.

DON has previously reported significant improvement in DON SE policy, guidance, workforce development, and program support. Over the past seven years, DON has placed much emphasis on the development of common cross-SYSCOM SE and risk management policy and guidance; institutionalization of SE processes; SE workforce development strategies and the establishment of rigorous qualifications and training for SE Technical Authorities; the integration of critical specialty engineering analyses as part of the SE effort; SE and critical specialty engineering tool development and training; the development of a central on-line SE tool repository; engagement of SE Technical Authorities (TAs) in the derivation of warfighter requirements into engineering requirements, specifications, and technical base lining efforts; improving strategies for technical risk identification and risk mitigation; and the establishment of SETR and Gate criteria.

This report identifies progress for the planned improvement areas that were identified in the DON FY13 SE assessment for FY. Specifically, this report addresses efforts in DON continuous process improvement in Naval SE capability to include: 1) DON SE strategy; 2) Pre-Milestone (MS) A and Pre-MS B rigorous systems analysis and SE process; 3) reliability, availability, maintainability, and sustainability, as an integral part of design and development; 4) provision of evidence of progress against the FY14 areas for improvement identified in the FY13 self-assessment; and 5) identification of plans for addressing FY15 priority areas to continue to improve SE and development planning capability of the DON.

Additionally, this report assesses the SE workforce to include: 1) a listing of workforce development initiatives where progress has been made in FY14 and plans for improvement in FY15, (2) identification of additional authorities or resources needed to meet the experience and technical expertise of SE in DON, and (3) a complete listing of Engineering (ENG)-coded military and government personnel.

1 Progress and Plans for Improved Navy Department Systems Engineering Capability

1.1 Service-Level Systems Engineering Strategy

Engineering excellence is foundational to DON acquisition, in-service, and modernization programs. The DON strategy to deliver robust Systems Engineering (SE) capability is focused on the integration, standardization, and streamlining of SE and engineering policy, guidance, and processes to enhance mission effectiveness and reduce SE costs. DON SE goals and objectives to integrate, institutionalize, sustain, and improve SE capability have been established, and are focused on mission assurance, technical risk identification, mitigation, and technical risk management of Naval acquisition programs. Naval SE objectives and initiatives are cognizant of the need to reduce the cost of doing SE business. Integration of critical specialty engineering areas [e.g., reliability and maintainability (R&M), system security, information protection, system safety, open architectures, and interoperability of System of Systems (SoS)] into SE processes has been an important focus in FY14. All efforts to increase SE capability support four of ASN (RDA)'s Top Priorities:

- Get the requirements right
- Make every dollar count
- Perform to plan
- Rebuild the acquisition workforce

In late FY13, DASN (RDT&E) initiated a Systems Engineering Streamlining Initiative (SESI) to evaluate current SE processes and identify efficiencies, while enhancing sound technical, engineering, safety, and security risk management strategies. Tenets of the SESI are to: 1) strengthen technical expertise and to foster engineering excellence on DON acquisition programs; 2) evaluate all SE processes and practices from the perspective of holding those with the right knowledge and technical authority and expertise responsible for the SE effort; 3) ensure the right planning, technical risk assessments, and related SE technical risk management processes are accomplished; and 4) ensure cost effective Systems Engineering analyses and Technical Reviews (SETRs) are in place to support program success.

SESI FY14 efforts have resulted in significant changes in the way SE business is conducted in DON. SECNAVINST 5000.2, Chapter 6, Systems Engineering, is being rewritten to better reflect DODI 5000.02 Interim changes. SECNAVINST 5400.15, DEPARTMENT OF THE NAVY (DON) RESEARCH AND DEVELOPMENT, ACQUISITION, ASSOCIATED LIFE-CYCLE MANAGEMENT, AND LOGISTICS RESPONSIBILITIES AND ACCOUNTABILITY assigned Technical Authority (TA) in DON to the SYSCOM Commanders; therefore, DON is realigning DON signature authority (SA) for Systems Engineering Plans (SEPs). This action aligns responsibility for SEP development activities and review of quality and efficacy under the SYSCOM Commander's TA responsibilities. Although

SEP approval is being delegated to the SYSCOM Commanders, Naval SYSCOM SE processes will continue to be governed by DASN (RDT&E). Other SESI recommendations focused system security in design, critical thinking curriculum development for technical leaders, mission engineering strategies. Redundant and non-value added DON-requirements, for SE-related technical plans and activities were addressed in FY14 as well. These plans, activities, and processes are being reduced and eliminated where possible. Cross-competency plans, [e.g., Test and Evaluation Management Plan (TEMP), Program Protection Plan (PPP), Acquisition Strategy Plan (AS) and Life Cycle Sustainment Plan (LCSP)] are being compared for redundant language during cross-competency reviews.

The SESI issue identification, review, and recommendation process is now established as a successful schema for continual process improvement in the DASN (RDT&E) Systems Engineering Office (SEO). Processes to review Capabilities Requirement and Risk Analyses are being established to achieve the SEO objectives and drive investments to SE improvement activities in the SEO office.

1.1.1 Improving SE

Navy is proactively improving SE policy, guidance, processes, and support of Acquisition and In-Service programs' technical risk identification, mitigation and management efforts. The following paragraphs highlight a few of the areas of focus in FY14.

Integration of SE Critical Specialty Engineering Areas

Program efforts to integrate and amalgamate risk related to critical specialty engineering areas such as corrosion, reliability, system safety, HSI, I&I, etc., is part of the SE technical risk identification and SETR processes. One example of the DON efforts to integrate specialty engineering requirements into SE process is a collaborative team approach between Navy SE Integration and Interoperability (I&I) activities and NOSSA which are underway to support DASN (RDT&E). This effort is required to identify safety risks associated with Fratricide (Intercept of Friend or Non-Hostile) in the effective execution of fleet missions. This effort documents safety review criteria and defines a process to integrate weapons safety engineering into Mission Engineering which assist in the identification of gaps in requirements, acquisition personnel, policy, and processes. The team is concentrating on integrating Mission Engineering, Systems Engineering, and Software Systems Safety Engineering into the VCNO's I&I Activity and System of Systems (SoS) reviews using the standing Weapon System Explosives Safety Review Board (WSESRB) and its current processes.

In addition to the NOSSA effort, Mission Assurance Integrated Planning Teams (MA/IPTs) are in place on several DON programs. These MA/IPTs meet to identify and assess level risk across several critical specialty engineering areas to amalgamate the associated risk for programs. Once the risks are identified, the MA/IPT then strategized to identify required analyses and to formulate a common mitigation strategy to address risk across the set of engineering risk issues.

Standardization and Integration of SE Processes

The ongoing efforts of DASN (RDT&E) to establish standard SE processes across the Naval SYSCOMs, where possible, are coordinated with and supported by the Naval Systems Engineering Stakeholders' Group (NSESG), a collaborative team of Naval SYSCOM Chief Engineers and DASN (RDT&E). The NSESG oversees development and implementation of Naval SYSCOM SE-level policy and guidance.

Navy has efforts in many areas of Systems Engineering [e.g., Technical Requirements Derivation and Architectures (TRD&A), System Designer (SD), System Analyst (SA), System Integrator (SI), Validation and Verification (VV), Process Engineer (PE), etc.]. In addition, Navy has a strong SE oversight and governance activity at DASN (RDT&E) and ongoing efforts in continuous process improvement activities related to the development and streamlining of SE and related area policy, guidance and procedures. A couple of examples of standard guidance, processes, and SE business improvements are provided here.

Naval Systems Engineering Guide

As stated in the FY13 report, initial steps were taken to critically transform the Naval Systems Engineering Guidebook (NSEG) from a limited, hard copy format to an online interactive Guide focused on providing quick reference for users developing SE products and linked to acquisition phases using SETR events as the anchor. In FY14, DASN (RDT&E) and the NSESG collaborated on the launch of an on-line implementation of NSEG aligned to current SE, acquisition, and critical specialty engineering policy and guidance. The NSEG is being linked to DoD policy and guidance documents and on-line tools, and addresses SYSCOM specific requirements, best practices, SE and critical specialty engineering tools currently in use in DON.

The NSEG is the first online interactive SE guide for DON. The design and development team is working closely with the Defense Acquisition University (DAU) to ensure a compatible implementation, so the Navy NSEG links seamlessly with the DAU SE site. SharePoint designers have begun developing an interactive, web-based capability that leverages the design of the Milestone Document Identification (MDID) tool sponsored by the DAU as well as existing SE policies and guidance across the DON SYSCOMs. The NSEG Team will continue spiral development of content and online infrastructure in FY15.

Technical Standards

The DON Standardization Officer (NDEPSO) and the NSESG Standards Working Group supported DoD standardization initiatives to re-invigorate standards for systems engineering, configuration management, corrosion control and human systems integration. DON is participating in, or leading the Defense Standardization Council chartered working groups to

engage non-governmental standards organizations to identify, create and adopt commercial standards, where applicable.

Information Dominance and SE

DON is aggressively pursuing a multi-faceted approach to warfighting that ensures our information superiority in future conflicts. Navy information dominance (ID) is defined as the operational advantage gained from fully integrating the Navy's information capabilities, systems, and resources to optimize decision-making and maximize warfighting effects in the complex maritime environment of the 21st century. The U.S. Navy ID Roadmap of addresses near-term milestones for improving capabilities in: 1) assured command and control (C2); 2) battle space awareness; and 3) integrated fires.

Naval IT systems form the foundation for achieving the capability of ID, because they provide the medium for the transmission of information. Navy continues to refine the Executable Architecture Requirements Model (EXARM), which provides a SoS analytic framework to support fact-based decisions to support a SoS lifecycle. EXARM consists of four parts: people, processes, tools, and data.

Technology/Information Assurance

To support the Naval Information Dominance capability, the Chief of Naval Operations (CNO) and ASN (RDA) directed the NSESG to develop a cross-SYSCOM Information Technology/Information Assurance Technical Authority Board (IT/IA TAB). The IT/IA TAB reviews, adjudicates, and endorses IT/IA technical policies, processes, and standards to include technical standards and specifications, interface definitions, architectures, and certifications requirements.

Technology and Program Protection, Trusted Systems and Networks

OUSD (AT&L) SE Office and DoD Chief Information Officer (CIO) developed and published Defense Federal Acquisition Rule Supplement (DFARS) clause 252.204-7012, "Safeguarding Unclassified Controlled Technical Information," to provide a set of minimum national standards and structures for protection of DoD unclassified controlled technical information resident on or transiting through contractors' unclassified networks. Clause 252.204-7012 was implemented in November FY14. DASN (RDT&E) used the NSESG and the DASN (RDT&E) SE CONNECTS forum to advise SYSCOM SEs and the Naval SE community of PM and SE roles and responsibilities in system security engineering, identification of acquisition Critical Program Information (CPI), as well as program and information protection requirements.

DASN RDT&E is developing a Program Protection and System Engineering Toolkit that will provide resources for Program Managers and System Engineers to establish and build system

security throughout the life cycle and to focus on System Engineering application of program protection processes.

Agility

Naval SYSCOMs continue an aggressive Agile software development process, education, and implementation activity, which is being implemented by software-intensive programs. Agile educational training programs are being developed in conjunction with DAU to align SE processes and Agile processes.

Open Systems Architecture

In FY14, the Naval Acquisition Community completed the first year of its Open System Architecture (OSA) Strategy execution. A set of metrics was collected to baseline how OSA is being implemented across all ACAT and many non-ACAT programs. The Naval Open Systems Architecture Enterprise Team has stood up seven working groups who will establish new practices and guidance and, where necessary, recommend policies on implementing OSA. These working groups are: Technical Reference Frameworks, Affordable Design and Test, Rewards and Incentives, Open Business Models, Tools and Guides, Training, and Communication.

DASN RDT&E is also working with the Navy's sister services through the DoD OSA and Data Rights Team to improve OSA implementation and to promote effective competition. Guidance was developed by this team and published in FY14 to provide acquisition practitioners with a better understanding of how to develop an IP Strategy.

DASN (RDT&E) has continued to aggressively implement OSA practices, including development of consensus-based standards, examining innovative sources of new ideas and directly supporting Navy and Marine Corps programs. For example, an OSA Implementation Guidebook for Program Managers is under development. The quarterly OSA Report to Congress chronicles this evolution.

The Navy is beginning the process of harmonizing Systems Engineering activities with the Naval Open Systems Architecture strategy (https://acc.dau.mil/adl/en-US/695451/file/75899/OSABrochure.pdf). One of the key alignment points is to integrate the development of Technical Reference Frameworks being pursued by the OSA strategy with SE processes. The Navy is examining exemplar architectures for an evolution into a limited number of TRFs that will facilitate cross-platform enterprise reusability and product line engineering concepts. Those currently being investigated are the Future Airborne Capability Environment (FACE), the Submarine Warfare Federated Tactical Systems (SWFTS), the Consolidated Afloat Network Enterprise Services (CANES) and others.

Noise Protection and Abatement

The Hazardous Noise Working Group Co-Chaired by DASN (RDT&E) and DASN (Safety) has concentrated on improving acquisition and research programs. The Working Group is emphasizing acquisition strategies for low noise source components and systems and identifying noise control opportunities early in the acquisition process. MIL-STD 1474E (draft) is the noise requirement and is undergoing final adjudication of public comments to update noise limit design criteria, calculation models, and limits of acceptable noise levels. Release is scheduled for November 2014. The standards are being incorporated into the re-write of OPNAV INST 5100.23 (Safety Ashore) to be used for facility noise assessment. Noise modeling and noise abatement materials are being utilized by PEO Carriers to abate flight operations noise for aircraft carriers. The Office of Naval Research (ONR) Noise Induced Hearing Loss (NIHL) program provides the basic research to address engineering and medical issues.

1.2 Pre-Milestone A and Pre-Milestone B Rigorous System Analysis and SE Process

In FY14, the Navy continued to support OSD AT&L development-planning process improvement efforts, to ensure the right requirements are defined as early as possible in the JCIDS process. The Navy supported the efforts of the DASD (SE) Development Planning Working Group (DPWG) to incorporate Science and Technology (S&T) and the warfighter into the SE processes that occur prior to the Materiel Development Decision (MDD). DASN (RDT&E), the Office of Naval Research (ONR), and the DON System Commands (SYSCOMs) actively participated in the DASD (SE) DPWG. FY14 efforts resulted in documentation of the process that integrates S&T efforts with acquisition efforts prior to a MDD.

SE support processes are being created to establish critical specialty engineering requirements prior to program initiation or milestone review to evaluate programs for statutory and regulatory systems. Highlights of these efforts are discussed in Section 1.4 of this report. These efforts help the requirements community to better understand the requirements generation process and support requirements transition to the material developer. Automated workflow processes and configuration management are in place and provide a mechanism for comment and review of new program requirements accepted by the SYSCOMs. Through assigned requirements transition leads, additional engineering studies are performed to analyze alternatives and evaluate the results through Alternative Systems Reviews leading to rigorous SETRs and repeatable processes.

Many examples of SE support processes exist across Naval SYSCOMs and Naval Warfare Systems Centers (NWSCs). In addition to the SE effort in JCIDs processes highlights in Section 1.4 of this report, the Framework Assessing Cost Technology (FACT) capability at MARCORSYSCOM, an example of a newly developed DON SE tool, is highlighted below.

Framework Assessing Cost Technology (FACT)

MARCORSYSCOM has developed FACT, a decision support toolset that integrates disparate data bases and facilitates collaborative analyses. FACT provides the platform to conduct dynamic risk and trade space analysis. (e.g., tradeoffs between performance vs costs related to acquisition and the lifecycle or between performance and reliability).The FACT tool provides trade space and cost analysis for senior Marine Corps leadership during development of proposed requirements and during acquisition and contracting strategy phases. FACT was applied during the development of the next generation ACV requirements in FY14. The tool was also instrumental in aiding MARCORSYSCOM in development of a systems engineering process to implement the Energy Key Performance Parameter for new acquisition efforts.

Ordnance Safety Considerations in Early Processes

Lessons learned from NOSSA's deployment of safety engineers to support Central Command in Afghanistan and Iraq indicate that weapon systems are being used by multiple Services and the environments in which they are tested and evaluated need to be inclusive of the real world environments which they will be exposed. One example is the Navy electromagnetic environments for Army lead items. NOSSA provides system safety comments to ensure that system capabilities can be executed safely across lifecycle operations. NOSSA is also providing JCIDS review comments for Integration and Interoperability (I&I) safety to ensure that capabilities to avoid fratricide are included in architectures, and that the integrity of data transfers within an SoS context are considered.

1.3 Reliability and Maintainability Engineering as an Integral Part of Design and Development

In FY14, the Navy continued to develop and evolve processes to implement USD (AT&L)'s Reliability Analysis, Planning, Tracking, and Reporting requirements as per Interim DoD Instruction (DoDI) 5000.02, released in November 2013. R&M Engineering (R&ME) planning is summarized in the SEP document that is required by SECNAV Instruction for all ACAT levels.

Department-wide R&ME improvement is the focus of a combined effort with the DON R&ME lead, the SE community, and reliability engineering workforce. A DON R&ME working group and SYSCOM reliability engineering communities of practice meet regularly to work on standardizing R&ME processes, tools, and R&ME workforce development strategies. Results from those efforts include: an R&M appendix that is being prepared for the NSEG; an update to DoD and DON requirements of several legacy reliability engineering courses that had not been used for years; regular delivery of those courses to the SYSCOMs and Warfare Centers; procedural level guidance and standard work packages for reliability engineering; and deployment of R&M toolsets on the Naval Systems Engineering Resource Center (NSERC).

The Navy prepares nearly all of the R&ME Data Item Descriptions (DIDs). Several DIDs have been updated or created to provide uniform contracting data requirements for all of the DoD. Cross-functional cooperation with SE and sustainment leads is also increasing to the mutual benefit of the programs and the workforce.

All of the DON SYSCOMS are working to improve their R&ME effectiveness; some are further along than others. Each has different challenges based on their product areas, workforce skills and the extent to which they implemented previous acquisition reforms that transferred the responsibility for R&ME to the contractor.

The DON R&ME lead continually works with the SYSCOMs engineering and program staffs to increase the effectiveness of their reliability engineering efforts. Current support activities include: the rollout of the Defense Acquisition Executive Summary (DAES) reliability growth reporting that required individual assistance to meet the due dates, DAB and Gate Review preparations that required the coordination of various programs, and support and guidance to project offices to present platform level R&ME planning and an T&E strategy that is effectively articulated.

Naval programs that have been underway for years, sometimes more than a decade, continue to struggle with expectations of R&ME activity that was not required prior to issuance of the DTM 11-03. DON has a challenge in implementing the DoD R&ME processes, which are focused on the design effort, on DON programs that are primarily integrating hardware that is already designed (COTs and GOTS). To address this problem, DON R&ME lead is working with SYSCOMS and programs helping them implement an effective failure reporting, analysis, and corrective action system (FRACAS).

DON will continue to work in FY15 on the improvement of R&ME through the identification of existing training packages, common processes, procedural level guidance, policies, tools, and on the mentoring the R&ME workforce and SEs embedded within program offices.

1.4 SE Requirements During the JCIDS Process and in Contract Requirements for each MDAP

In FY14, the Navy continued to support development-planning processes, so that the right requirements are defined as early as possible in the JCIDS process. The Navy supported the efforts of the DASD (SE) DPWG to incorporate S&T and the Warfighter into the SE processes that occur prior to the MDD.

The DON SYSCOM SEs provide technical expertise to requirements developers early in the acquisition process and support mission thread analysis, functional analysis and the development of system views. In FY15, more emphasis will be placed on SE engagement in architecture development and on building a highly skilled mission engineering cadre.

DON SYSCOMS are initiating a Systems Engineering support process to evaluate programs for statutory and regulatory systems engineering requirements prior to program initiation or milestone review. This process will provide for risk-based tailoring of systems engineering requirements for new programs in accordance with the tenets of Better Buying Power.

MCSC has established a Requirements Transition Team (RTT) to coordinate with Headquarters, Marine Corps in the development of requirements. The RTT is tasked with certifying that only valid capability statements or requirements documents are accepted by MCSC for action. The RTT is also the coordinator for matters associated with building the Marine Corps Enterprise Integration Plan (MCEIP), which establishes capabilities-based priorities for each fiscal year and coordinates enterprise capability development and investment planning for the Marine Air Ground Task Force (MAGTF) and supporting establishment. The RTT works closely with the requirements and test community and then integrates appropriate MCSC engineering analysis and support prior to delivery of the final requirements.

As stated earlier in this report, NAVSEA's Naval Ordnance Safety and Security Activity (NOSSA) actively monitors JCIDS documentation in support of both the Deputy Director for Force Protection, Joint Staff (J8) and OPNAV N81 for review to ensure that the capabilities outlined in the documentation meet the Joint warfighting environments in which weapon systems are expected to operate.

NAVAIR engineering department has implemented a significant re-organization to support the creation of the Mission Engineering and Analysis Department and has created an Enterprise Team (ET) to implement Integration and Interoperability (I&I) as an organizational element in the SYSCOM. The ET is charged with the task of understanding mission-level requirements, in the context of system level Program of Record requirements. An improved Mission Level understanding of systems integration design issues will facilitate the delivery of Integrated Warfighting Capability at reduced cost.

The ET contains the necessary Systems Engineering, Analysis, Test, Evaluation and Logistics competencies to execute Technical Authority at the Mission Level. The ET will drive workforce requirements across the NAVAIR competency structure for Mission Level engineering expertise. Mission Level expertise will be utilized at both the Program of Record (POR) execution level of the organization, and in support of Requirements and Resource decision-making within the Department of the Navy.

The SE functions of the ET are focused on the necessary products used to govern the technical design of systems contributing to mission capabilities as called for in the Required Operational Capabilities / Projected Operational Environment (ROC/POE). The ET will focus on the interaction of People, Equipment and Training required to deliver both kinetic and non-kinetic effects.

Navy has also revised acquisition, SE and Acquisition Strategy policy and guidance to state that contracting officers shall incorporate the requirements of developing draft engineering and logistics planning documents in their acquisition planning for ACAT I, IA, II,III and IV programs prior to Request for Proposal (RFP) release.

1.5 DON Specific Identified Area(s) of Progress and Improvement

Throughout this report, Navy has established that it has a robust SE effort across all SYSCOMs and is improving policy, guidance, and processes led by the DASN (RDT&E) SE effort. Navy is addressing areas of SE capability, capacity, and readiness in a proactive, managed strategy and has made great strides in 2014. Further efforts for continuous process improvement and workforce development strategies to include investment in Critical Thinking for Technical Leaders curriculum and Systems Engineering Competency Model development are in place.

In FY14, the Navy has accomplished major milestones in SE streamlining and improvement. The following list highlights a few of the efforts in support of SE excellence:

- Initiated SE Streamlining and SE integration strategies for critical specialty engineering areas
- Stood up the DASN (RDT&E) SE CONNECTS forum, a continuous communication forum between DASN (RDT&E), programs, SEs and Naval Warfare and Systems Center engineers to address new requirements, policy, guidance and best practices
- Shared lessons learned across the SYSCOMs on the early development of DoDAF products in support of Pre-MS A analysis at the June 2014 meeting of the NSESG
- Engaged programs, security entities, and Systems Engineering across the SYSCOMS to build awareness of security and cyber requirements and to establish roles and responsibilities for SE, system security engineering, information assurance, and program protection planning.
- Continued development of the Naval Enterprise Architecture Repository (NEAR) and demonstrated the tools utility through “use cases”
- Conducted Mission Level Assessments and Evaluations (MLA&E) to support acquisition decisions by defining and making traceable SoS interdependencies, defining the Government trade space to be worked, and aligning material solution(s) with the required doctrine, organization, training, materiel, leadership and education, personnel, and facilities (DOTMLPF) changes
- Emphasized government ownership of technical baselines and authoritative architectures
- Continued investment in SE and M&S tools and training
- Established cross coordination practices with PM competency to improve value perception of SE
- Published updates to the SETR checklist for several critical specialty engineering areas on the Navy Systems Engineering Resource Center site for easy access/use by programs and SEs

- Published contact information for Naval TAs on NSERC to promote cross-SYSCOM communication and collaboration and facilitate IPT planning
- Contributed to development of DoD, Naval, SE, and Configuration Management (CM) military addendums for industrial SE standards and guidance.
- Participated on Mil-Standard 882, DEPARTMENT OF DEFENSE STANDARD PRACTICE FOR SYSTEM SAFETY, and Mil-Standard 1474, Impulse Noise Hazard Prediction update teams

1.5.1 DON Identified Areas of Progress and Improvement for FY14

Navy identified several plans for FY14 in our FY13 report. The planned FY14 activities and status are provided here.

- **FY14 Planned Action:** DASN (RDT&E) will continue SESI efforts. The overall goal of the SESI is to identify efficiencies in current SE processes.

  End of FY14 Status: Duplicative SE documents have been eliminated, thereby reducing administrative burden on DON Programs. SE processes have been streamlined and communications have been improved. Delegation of signature authority on SE documents was initiated with one DON SYSCOM and is expected to continue as SYSCOMs demonstrate proficiency and consistent quality in their SE documents and processes.

- **FY14 Planned Action:** The SESG will be revising the following policies to incorporate lessons learned from integrating SE efforts across the SYSCOMs :

  - Technical Standards Policy for Naval SYSCOMs
  - Engineering and Technical Authority Policy for Naval SYSCOMs
  - Risk Management Policy for Naval SYSCOMs
  - Systems Engineering Policy for Naval SYSCOMs

  End of FY14 Status: The following policies were reviewed and revised by the SESG in FY14:

  - Technical Standards Policy for Naval SYSCOMs – SYSCOM concurrences complete
  - Engineering and Technical Authority Policy for Naval SYSCOMs – Updated and published
  - Risk Management Policy for Naval SYSCOMs – In review and adjudication process
  - Systems Engineering Policy for Naval SYSCOMs – In draft process; to be reviewed in FY15

- **FY14 Planned Action:** The Naval Systems Engineering Technology Review (SETR) Guidebook will be incrementally revised and web links to the I&I SETR criteria will be added to this Guidebook.

End of FY14 Status: Several critical specialty engineering area SETR criteria, to include I&I, have been published on NSERC. The NSEG design team is working issues to ensure these criteria are linked to the NSEG.

- **FY14 Planned Action:** DASN (RDT&E) R&ME staff will be working with SPAWAR on the Failure Reporting and Corrective Action System (FRACAS) process that is required throughout the life cycle.

  End of FY14 Status: Complete. Continuing improvement effort expected in FY15.

- **FY14 Planned Action:** SPAWAR will continue to examine development of Technical Warrant Holders (TWH) in light of emergent technologies and new product lines related to IT and IA, as well as its existing Command, Control, Communications, Computer, and Intelligence (C4I), Enterprise Information Systems, and Space Systems areas of SE development.

  End of FY14 Status: An IT/IA Technical Advisory Board (TAB) has been stood up and is producing the policy, guidance, standards, and processes needed to manage evolving information systems and cybersecurity threats.

- **FY14 Planned Action:** The revised Naval System of Systems Engineering Guide (NSoSEG) will be issued**.**

  End of FY14 Status: The NSoSEG was revised and is currently pending DASN (RDT&E) review and approval.

- **FY14 Planned Action:** EXARM lessons learned will be available.

  End of FY14 Status: In FY14, EXARM was used to provide mission-based analyses for several N81 ID-focused studies and to develop ID inputs to the Integrated Capability Plans and Portfolio Health Assessments provided to N2N6 and N9I to address ID warfighting gaps.

- **FY14 Planned Action:** DON will become the DoD Executive Agent for the Science, Mathematics, and Research for Transformation (SMART) Program

  End of FY14 Status: DON has completed staffing and preparations for becoming the DoD Executive Agent for the SMART Program. Transition is in a holding pattern awaiting OSD delegation.

- **FY14 Planned Action:** DON will continue to participate in the Navy Acquisition Intern Program/ Navy Acquisition Development Program (NAIP/NADP), Science, Mathematics And Research for Transformation (SMART) Scholarship for Service Program, and Pathways programs.

End of FY14 Status: DON put a strategic focus on the SMART Cohort selection [the DASN (RDT&E) limited candidate selection to career fields critical to the department]. DON continued to participate in the NAIP/ NADP, SMART and Pathways programs.

- **FY14 Planned Action:** The SE Career Competency Model (SEECM) will be validated through the Office of Personnel Management (OPM) uniform guidelines.

  End of FY14 Status: Progress was made towards the SECCM being validated through Office of Personnel Management (OPM), however, the validation has not as yet been completed. Required actions and validation completion is on track for FY15.

- **FY14 Planned Action:** SYSCOMS will provide feedback on SECCM.

  End of FY14 Status: Complete.

- **FY14 Planned Action:** Key Leadership Position (KLP) Qualification Board project will be implemented to qualify personnel to fill mandatory ENG KLP.

  End of FY14 Status: DON continues to comply with OSD policy for Critical Acquisition Positions (CAPs) and KLPs. DASN (RDT&E) oversees the development and designation of ENG KLPs across the Naval enterprise in support of implementing USD (AT&L)'s KLP policy, and oversees SYSCOMs' work to develop cadres of employees qualified for future KLP opportunities

2 Systems Engineering Workforce

2.1 Workforce Development Initiatives – Rebuilding the Acquisition Workforce

In support of ASN (RDA)'s priority of rebuilding the acquisition workforce, the FY 14 DON workforce development strategy centered on training, education, and certification. DASN (RDT&E) conducts yearly leadership development for the SE workforce through the Executive Leadership Development Program (ELDP); selects senior engineers to attend a 9-month Fellowship program sponsored by the MITRE Corporation; and sponsors a cohort of eight students, from across the Naval enterprise, to participate in the Joint Executive Engineering Management (SEM) distance learning master's degree program offered by Naval Post Graduate School in partnership with Massachusetts Institute of Technology's Educational Consortium for Product Development Leadership in the 21st Century (PD21).

2.1.1 Hiring, Retaining, and Developing the Workforce

DON workforce development includes hiring, retaining, and developing a world class technical workforce through educational consortia, scholarships, graduate outreach, internal specialized training activities, accelerated development programs, tuition assistance for advanced degrees,

monetary incentives, and rotational and career broadening assignments. Some specific examples include:

- NAIP/ NADP – This program is executed by the Director, Career Acquisition Management via the Naval Acquisition Career Center to hire and train the acquisition workforce. In FY 14, this program hired a total of 223 engineering (ENG) career field professionals; 197 entry level individuals and 26 associates.
- Science, Mathematics And Research for Transformation (SMART) Scholarship for Service Program – DON was expected to become the DoD Executive Agent for the SMART Program in FY 14, but this will now occur in FY15. For the FY14 SMART Cohort selection, DASN (RDT&E) prioritized career fields aligned with DONs Mission Critical Occupations and workforce priorities (nuclear engineering and cybersecurity related occupations) and provided guidance to sponsoring facilities on documenting their strategy to provide mentorship, track student academic process, and document student contributions to the workforce.. These actions will contribute to selecting the best candidates to feed the pipeline of DONs future scientists and engineers.
- Naval Innovative Science and Engineering (NISE) Program – This program implements Section 219 legislation and serves in part, to fund activities that improve the capacity of Naval laboratories to recruit, retain, and develop personnel with needed scientific and engineering expertise. This program includes several hundred projects, technical publications, and patent actions every year. NISE also enables advance degrees and provides technical training to scientists and engineers in the Naval laboratories.

In FY14, DON also continued to participate in the Pathways programs and continued to be engaged in outreach and educational initiatives in the areas of Science, Technology, Engineering, and Mathematics (STEM) in grades K-12. Notable efforts include: Marine Corps Systems Command (MARCORSYSCOM) worked in conjunction with the Naval Surface Warfare Center (NSWC) Dahlgren and ONR to host the 4th Annual Robotics Camp, where middle school students in the Quantico and San Diego areas learned about STEM fields of study; MARCORSYSCOM also participated in the nation's largest Science & Engineering Festival at the Washington Convention Center in April 2014.

DON continues to comply with OSD policy for Critical Acquisition Positions (CAPs) and KLPs. DASN (RDT&E) oversees the development and designation of ENG KLPs across the Naval enterprise in support of implementing USD (AT&L)'s KLP policy, and oversees SYSCOMs' work to develop cadres of employees qualified for future KLP opportunities.

Examples of Training Activities

DON continues SE training tailored to specific domains and product areas to improve knowledge, skills, and abilities (KSAs) of workforce members using specific SE concepts and processes. For example, Standard Work Packages (SWP) and training courseware define the

work activity associated with the creation of a comprehensive SEP. As previously mentioned, several legacy RM&E courses that had not been used for years were updated to today's references, requirements and toolsets and successfully delivered.

Examples of Educational Opportunities

DON workforce development continues to include many employees' taking classes toward degrees at various colleges and universities according to local organizational needs. The Master of Science in Systems Engineering (MSSE) program from NPS continues to be an example of the technical advanced degrees available to DON's technical workforce.

DON also continues to accommodate the development of employees who want to take graduate-level courses without pursuing a graduate degree, by offering graduate-level courses through partnerships with various educational institutions based on local organizational needs. NPS now offers a Lead Systems Integrator (LSI) certificate; this 4-course curriculum was designed to provide graduate-level courses to prepare engineers to assume positions as LSIs.

DASN (RDT&E) has also initiated development of a "Critical Thinking for Technical Leaders" curriculum. The curriculum consists of four 4-hour case-study mini courses to be delivered quarterly in 2015 and the first mini course is in final development. The Defense Acquisition University is supporting this initiative.

Systems Engineering Career Competency Model

The Naval Systems Engineering Career Competency Model (SECCM) is part of the DASN (RDT&E) strategic initiative to strengthen the technical workforce. In FY14, a subject matter expert (SME) team was formed with participants from across the Naval enterprise, to conduct a baseline review of the SECCM. This baseline review harmonized the model into a single and coherent model.

In FY14 the Office of Personnel Management (OPM) agreed to review the SECCM for validation under the *Uniform Guidelines on Employee Selection Procedures*. The review will ensure that the most rigorous policies and standards governing human resources practices are met, enabling full use of the SECCM for all human resources functions. A Navy-led working group partnered with the Office of the Secretary of Defense (OSD), sister Services, and the Missile Defense Agency (MDA) to assist in conducting the analysis. This validation is expected to be completed during the third and fourth quarters of FY15.

2.2 SE Workforce Resourcing

The President's budget is sufficient to support planned programs. As systems engineers with over 30 years of experience retire, they are often replaced with systems engineers with less than 10 years of experience. This loss of experience and the growing inability to hire the next

generation of SEs inhibits the ability of SYSCOMs to maintain and sustain an experienced SE workforce. To work through these challenges in support of programs, SYSCOMS are streamlining processes and relationships, implementing workforce development tools, and mentoring younger SEs.

2.3 Department of the Navy SE Workforce

Table 1 depicts the total number of Civilians and Military Acquisition ENG Personnel. Table 2 provides the planned growth in civilian and military acquisition-coded ENG. The information contained in these tables is influenced by factors such as SYSCOMs priorities, available funding, sequestration, hiring freezes, and allocation of workforce reductions to meet OSD's operating budget strategy over the FYs 2015-2019 Future Years Defense Program.

Table 1. Total Number of Civilian and Military Acquisition ENG

Fiscal Year	Year Ending	Navy*
FY05	30-Sep-05	16,886
FY06	30-Sep-06	16,688
FY07	30-Sep-07	16,804
FY08	30-Sep-08	16,576
FY09	30-Sep-09	18,085
FY10	30-Sep-10	19,270
FY11	30-Sep-11	19,325
FY12	30-Sep-12	19,498
FY13	30-Sep-13	19,589
FY 14	30-Sep-14	19,797

* US Navy and US Marine Corps personnel on board at end of year, including DAWDF-funded employees. Source: Director Acquisition Career Management (DACM).

Table 2. Projected End Strength in Civilian and Military Acquisition-Coded ENG

Projected End Strength in Civilian and Military Acquisition-Coded ENG		
Fiscal Year	**Year Ending**	**US Navy**
		Projected End Strength*
FY15	30-Sep-15	20,120
FY16	30-Sep-16	20,039
FY17	30-Sep-17	19,928
FY18	30-Sep-18	19,729
FY19	30-Sep-19	19,679
* US Navy Projected End Strength reflects US Navy and US Marine Corps workforce requirements plus planned DAWDF-funded workforce. Sources: President's Budget FY 15 Exhibit 23 and Department of Navy DAWDF Hiring Plan.		

Table 3 summarizes the contracted systems engineering support delivered to the Navy during FY13. This data was reported to Congress by DoD in an effort to improve visibility into and accountability of contracted services in accordance with title 10, U.S.C, section 2330a. The Inventory of Contracts for Services reflects input from the Military Departments.[1] The data was extracted from the Inventory of Contracts for Services database using the following Product Service Codes[2, 3] to denote systems engineering effort.

R414 (Support- Professional: Systems Engineering Services)

R421 (Support- Professional: Technical Assistance)

R425 (Support- Professional: Engineering/Technical)

Table 3. Contracted Systems Engineering Support to the Military Departments as Reported by DoD to Congress

Fiscal Year	Year Ending	US Navy[4]
FY12	30-Sep-12	16,416
FY13	30-Sep-13	16,738

[1] Source: Defense Procurement and Acquisition Policy (DPAP) website http://www.acq.osd.mil/dpap/cpic/cp/acquisition_of_services_policy.html.
[2] Source: U.S. General Services Administration Office of Government-wide Policy, Federal Procurement Data System Product and Service Codes Manual, August 2011 Edition (Effective Date: October 1, 2011), pp. 103, 217.
[3] Both R414 and R421 were end-dated and merged into PSC R425; legacy data retained effective October 2011.
[4] US Navy FY13 contractor numbers reflect Derived Contractor FTEs calculated from labor factors provided by Army.

This summary reflects the latest information available as of publication of this Annual Report; FY14 contracted services data will not be provided to Congress until mid-2015 in accordance with the requirements of sections 235 and 2330a of title 10, U.S.C.

These numbers are based on product service codes and do not provide position-specific information such as acquisition job functions that might confirm that these Full Time Equivalents (FTEs) reflect high-value systems engineering support. These numbers may also represent positions supporting Research and Development, Test and Evaluation, or other areas. In addition, selection of product service codes occurs locally at the individual contract level and may result in differing interpretation of contract work content across the Military Departments and activities. Although contractors are encouraged to parse contract task orders to reflect multiple functions (i.e., product service codes), this requirement is enforced at the local contracting activity and program level. These numbers represent the best available approximation of the actual contracted systems engineering support level of effort.

3 Summary of Navy Planned Areas for Improvement in FY15

1. DASN (RDT&E) will continue ongoing efforts to maintain good order and discipline, and maintain appropriate governance and oversight of Naval SE efforts

- Continue to streamline internal DON SE policy, guidance and establish standard SE processes across the naval SYSCOMs, where possible
- Continue to build the needed SE and critical specialty engineering references, guidelines, policies, and analysis tools and make these available on-line. Implement the DON Systems Engineering online guide
- Integrate emergent DON SE references such as cross-SYSCOM SE, Risk Management, and TA policies and guidance
- DASN (RDT&E) will continue to govern a quality DON SE effort

2. DASN (RDT&E) will continue to deploy quality SE support for:

- Naval programs in the areas of mission thread analysis, integration and interoperability and architecture development
- Robust technical risk identification, mitigation, and management support

3. DASN (RDT&E) will continue to field a highly qualified and experienced technical workforce

- Continue development and deployment of Critical Thinking for Technical Leaders curriculum
- Complete validation of the SECCM to the uniform guidelines for employee selection
- Continue the intake and development program for the engineering workforce, working through the chain of command

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APPENDIX C

Department of the Air Force
Systems Engineering Self-Assessment

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Headquarters United States Air Force

Department of Defense Systems Engineering FY 2014 Annual Report

Prepared by the Office of the Assistant Secretary of the Air Force (Acquisition)

1060 Air Force Pentagon
Washington DC 20330-1060

November 2014

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Air Force FY 2014 Systems Engineering Self-Assessments

1 Progress and Plans for Improved Service Systems Engineering Capability

1.1 Service-Level Systems Engineering Strategy

The U.S. Air Force (AF) FY 2014 Systems Engineering (SE) major strategy enhancements focused on three initiatives: Air Force (AF) Engineering Enterprise (EE), Technical Authority Implementation, and Own the Technical Baseline (OTB). These three initiatives, plus the work being done in reliability, availability, maintainability, and sustainability; Early Systems Engineering/Development Planning; corrosion control and prevention; human systems integration; standardization; environment, safety, and occupational health; system security engineering; and defense exportability all contribute to the Air Force efforts to achieve affordable programs, especially when considering life cycle costs.

The Air Force EE chaired by the Deputy Assistant Secretary of the Air Force (Science, Technology, and Engineering) (SAF/AQR) formalized a strategic vision to address the demands of a fast-changing warfighter environment. The underlying theme was that engineering in the Air Force must fully support the effort to plan, build, and sustain affordable warfighter systems. A crucial step to effectively handle the challenge posed by the current strategic environment was to codify the role of SAF/AQR as the Air Force Chief Engineer and Technical Authority. In parallel, SAF/AQ initiated OTB with a goal of the government becoming a more informed decision maker by obtaining the right data and information to establish, trade-off, verify, change, accept, and sustain functional capabilities, design characteristics, and quantified performance parameters. These three initiatives collectively address the demands of complex engineering systems over their life cycle.

Air Force Engineering Enterprise (EE)

The EE is defined as the network of interdependent engineers, scientists, and technical managers; processes; and supporting infrastructure providing Air Force mission capability by shaping requirements and providing technical leadership for research, development, test, manufacturing, deployment, sustainment, and disposal of Air Force systems and systems-of-systems. It includes members from Air Force Headquarters and the Implementing Commands, Air Force Materiel Command (AFMC) and Air Force Space Command (AFSPC). The EE reinforces the Air Force concept of a highly technical service built on a foundation of engineering discipline and expertise, as well as a culture of innovation, competency, and integrity. The Air Force EE established a governance

structure (see Figure 1) that provides leadership and guidance for the strategic planning process, as well as oversight and accountability of the implementation activities. It is composed of senior Air Force advisory and senior engineering leadership members who guide the actions necessary to achieve strategic priorities. There are three levels in this structure: 1) the Senior Advisory Council; 2) the EE Executive Council (EEEC) and; 3) the Priority Champions. The Senior Advisory Council, chaired by SAF/AQ includes the Executive Directors from AFMC and AFSPC, acts as a deliberative body that guides the Air Force engineering strategic approach, and provides executive perspective on budget, people, and resourcing. The EEEC is chaired by SAF/AQR and includes the directors from the engineering staffs of AFMC and AFSPC's Space and Missile Systems Center (SMC), as well as the Air Force Senior Leader (SL) for SE. The EEEC is the primary EE decision body and is responsible for implementing a comprehensive and actionable strategic planning approach. This strategic approach includes the core priorities for the transformation of the EE. Each priority is led by a general officer-level Priority Champion, who is responsible for developing goals, establishing goal teams, and leading the implementation process.

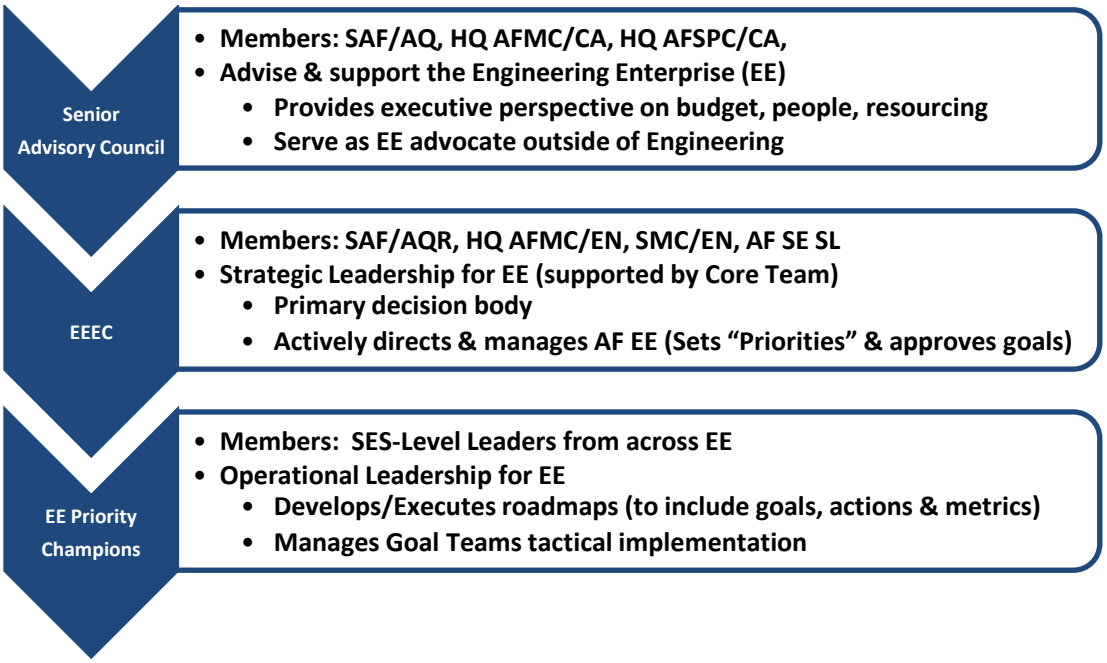

Figure 1: Air Force Engineering Enterprise Governance Structure

The attached ten year Air Force Engineering Enterprise Strategic Plan (2014-2024), signed by both the Secretary of the Air Force and Chief of Staff in the summer of 2014, documents a clear course for the future of the Air Force Engineering Enterprise. The

Strategic Plan describes how leadership will develop strategic direction down to actions and implementation and includes a description of the required planning documentation as well as the battle rhythm for all engineering strategic planning activities. The Strategic Plan spans ten years and will be revisited every four years to ensure alignment with Air Force, Department of Defense (DoD) and national strategic objectives. It contains the EE priorities established by the EEEC. To implement the priorities, an operational-level EE Roadmap, now in final stages of coordination for publication, describes the goals in greater detail and provides a high-level overview of the objectives. The roadmap spans four years and be revisited every two years to ensure alignment with the Strategic Plan. Finally, EE action plans when completed will describe the objectives in further detail and provide near-term, actionable tactics for achieving the objectives. The action plans will span two years and be revisited annually to ensure alignment with the Roadmap. The detailed tasks defined in each action plan will be the basis for measuring progress towards accomplishing the objectives, goals, priorities, and ultimately the EE mission. The four EE strategic priorities include:

1. Refine Air Force engineering enterprise governance, roles and responsibilities, and supporting policy,
2. Enable high-quality engineering decisions and seamless communication,
3. Improve engineering rigor through technical information management and standardization, and
4. Address engineering workforce issues, including core competencies, structure, development, and assignments.

These four priorities, detailed in the EE Strategic Plan, seek to provide Program Managers (PMs) the technical competencies needed to execute successful development and sustainment programs. This is done by improving the engineering workforce available to Program Managers.

Technical Authority Implementation

The Headquarters Air Force Mission Directive for SAF/AQ establishes SAF/AQR as: the Air Force Science and Technology (S&T) Executive; Air Force Chief Engineer and Technical Authority; Air Force Standardization Executive and; Functional Manager for the Scientist and Engineer (S&E) Career Field. As the Air Force Chief Engineer and Technical Authority, SAF/AQR has several responsibilities for technical oversight and support of Major Defense Acquisition Programs (MDAPs). SAF/AQR supports the program execution chain (see Figure 2) as the Air Force Chief Engineer by providing technical advice to the Service Acquisition Executive (SAE). This advice guides pre-acquisition investment decisions and continues throughout the program acquisition lifecycle.

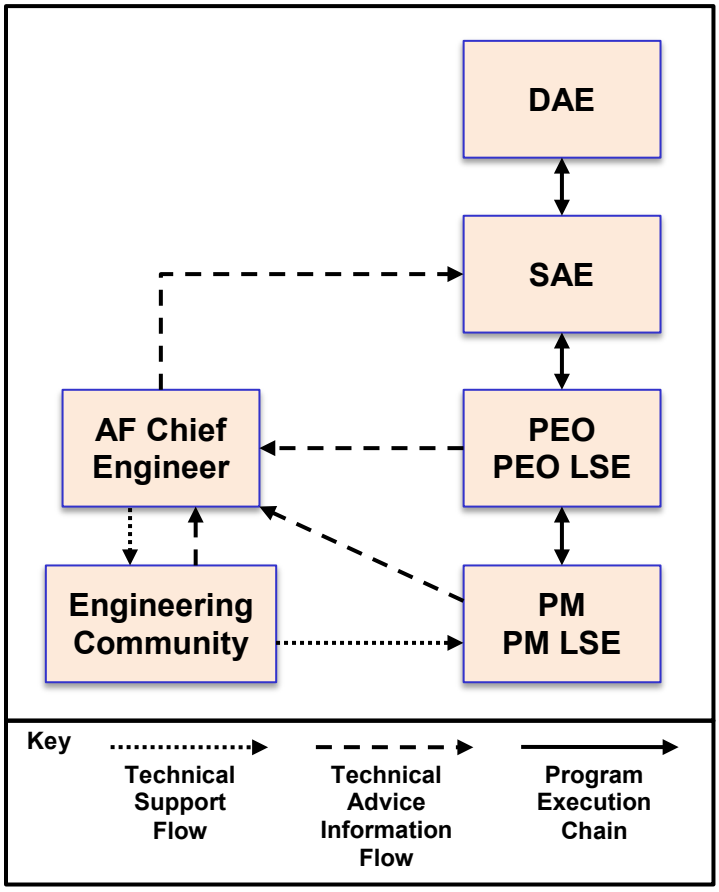

Figure 2: Air Force Chief Engineer and the Program Execution Chain

A key means for providing this advice is meeting with Program Executive Officer (PEO) Lead Systems Engineers (LSEs) and Program Office LSEs to discuss technical issues prior to SAE-chaired reviews. SAF/AQR established a PEO LSE Roundtable to

periodically discuss issues of interest and conducted two PEO LSE Roundtables in FY 2014. Topics included coordination and discussion on SE topics including the Air Force EE, technical authority, OTB, and other items. SAF/AQ revitalized SE oversight and support of programs by publishing a Memorandum in FY 2014 addressed to the PEOs, AFMC, and AFSPC primarily defining SAF/AQR's role as the Air Force Chief Engineer and Technical Authority (see Figure 3). In that role, SAF/AQR has responsibility to provide: technical advice to the SAE for pre-acquisition investment decisions, at major milestones, and throughout the acquisition lifecycle; provide technical support to PEOs and PMs in the execution of successful acquisition programs; oversee Air Force EE policy and guidance; direct external technical assessments of programs, as needed; and engage Implementing Commands and Center-level engineering offices to support program reviews, technical reviews, and independent review teams. Specifically, SAF/AQR:

1. Meets with the PEO LSE, PM LSE, and representatives from the Center-level engineering offices to discuss the technical status of a program prior to SAF/AQ-chaired meetings. These meetings typically include Air Force Review Boards, Configuration Steering Boards, and Acquisition Strategy Panels. This activity facilitates the exchange of technical information to support SAF/AQR's responsibility to provide technical advice to the SAE during program reviews.
2. Requires Center-level engineering offices support programs throughout the lifecycle and participate in the nine principal formal technical reviews for ACAT I, non-delegated ACAT II, and special interest programs (ACAT II and III programs as needed) and provide objective feedback to the PM, PEO, and SAF/AQR based on those technical reviews. This process is designed to provide SAF/AQR with ongoing insight into Program Office technical issues without imposing additional workload on Program Offices. This process avoids SAF/AQR having to routinely conduct external technical assessments of a program above and beyond the normal technical reviews conducted by each Program Office.
3. Directs external technical assessments only if technology maturity, manufacturing readiness, or other technical issues pose critical cost, schedule, or performance risks to a program. These assessments are designed to identify sources of technical risk; formulate handling/mitigation plans; collect objective feedback and provide results and recommendations to the PM, PEO, SAF/AQR, and Milestone Decision Authority (MDA). PMs support these assessments.
4. Supports the Office of the Secretary of Defense (OSD)-chaired technical assessments such as Program Support Assessments (PSAs). On behalf of and when required by SAF/AQR, Center-level engineering offices will provide subject-matter experts to supplement OSD teams.

After publication of the memorandum, SAF/AQ integrated the contents of the Memorandum into AFI 63-101/20-101, *Integrated Life Cycle Management*, to institutionalize the changes.

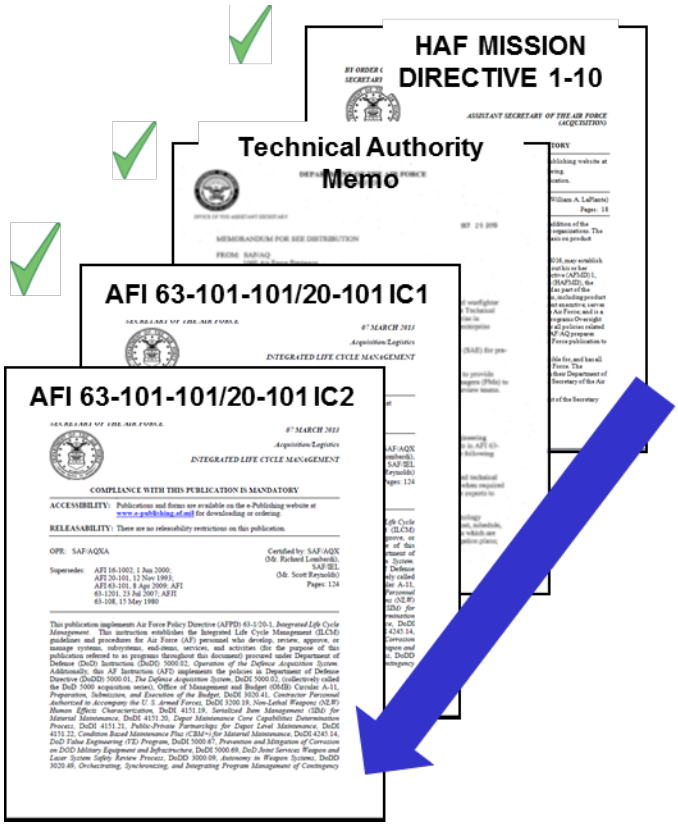

Figure 3: Technical Authority Lineage

Technical execution and oversight of lower level ACAT programs, including Systems Engineering Plans (SEPs) and Technology Readiness Assessments (TRAs), is delegated to the PEO.

In the field, the Air Force Space Command (AFSPC) Space and Missile Systems Center (SMC) engineering directorate fully implemented Cadre staff systems engineering support to programs. This practice, which dedicates engineering staff to each mission directorate (Global Positioning System, Space-Based Infrared System, etc.), has been formalized into agreements between the respective organizations, outlining their desired and expected staff support requirements. The existing agreements with the mission directorates have been upgraded to include lists of requirements from each ACAT program in the directorate. The intent is to ensure Center-level staff representation at key management and technical meetings in order to provide advice and reach-back to engineering specialty

subject matter experts (SMEs) to assist Program Offices in effectively and efficiently meeting their milestone and technical review requirements.

SMC has drafted an implementation plan that further defines the framework for the Center-level SEP which includes roles, responsibilities, schedules, process updates, and a communications plan for ensuring expectations management across the stakeholder community, including SAF/AQ and DASD(SE). The Center-level SEP will document common processes and is intended to gain efficiencies and standardizations in SE planning and approaches across the Center.

SMC has also stood up a dedicated Software Advisory Group, whose purpose is to ensure mission success by assisting Program Offices with software technical expertise on best practices, guidelines, policies, and standards. SMC has been leveraging the Aerospace (FFRDC) network to develop and maintain a program schedule and software issues database, which includes sharing lessons learned across programs that will enable transfer of historical knowledge to optimize planning, execution, and monitoring of software systems. The group plans to continue expanding its support to Program Offices while putting additional focus on addressing software policy and guidance shortfalls at the Center in the near term.

In FY 2014, SMC launched an investigation on the efficacy of the current Operational Transition process. The objective of the initiative is to review and assess policy and application of operational transition processes and activities required to deploy and integrate system(s) or system increments into SMC programs and operational units. As a result, SMC successfully institutionalized several processes that foster improved practices to better prepare programs for successful operational transition. These include standardized DT&E/OT&E policies and improved materiel fielding planning and execution. Additionally, there is an on-going evaluation of the impact of operating concepts, requirements, and acquisition documentation to successful operational acceptance, and potential opportunities to improve synergy between the development and operational communities.

Own the Technical Baseline (OTB)

In FY 2014 the Air Force Service Acquisition Executive (SAE), SAF/AQ, established five (5) priorities. One of them--OTB, was assigned to SAF/AQR. OTB is the Air Force's desire to apply technical baseline knowledge to be an informed decision maker. OTB has been socialized with the engineering community and Directors of Engineering (DOE) for all PEOs. FFRDC MITRE is assisting with OTB implementation. OTB will be piloted on a small set of programs early in the acquisition lifecycle and will baseline more established ACAT I programs

OTB seeks to reverse the 1990s acquisition reform trend of deferring technical decision-making to the prime contractor in favor of a collaborative relationship in which the government owns the knowledge and is the decision maker. OTB's goal is enabling the government to be a smart buyer of weapons systems. OTB requires that the government understand: acquisition program system design and interfaces; system models; performance data; data rights and open architectures; cost actuals and; technical risks and mitigations. OTB requires knowledge of the contractual technical baseline attributes (see Figure 4) that are owned by the government for a given program. OTB will require an appropriately sized organic workforce with sufficient knowledge to maintain control of the technical baseline augmented by a skilled network of FFRDCs and contractors with competencies across critical technical areas. SAF/AQ has tasked SAF/AQR to implement OTB.

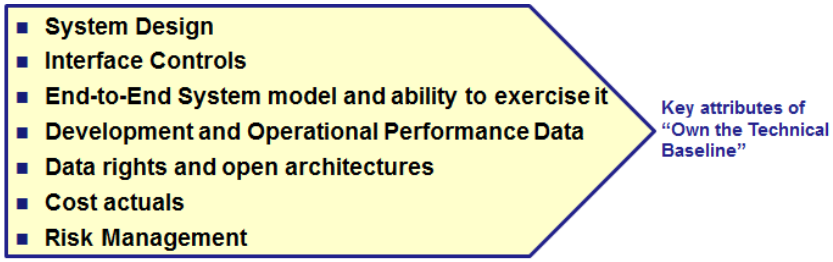

Figure 4: OTB Key Attributes

OTB has two top level goals

1. Informed program decision-making through appropriate knowledge of the technical baseline to enable improved program performance.
2. Staff current & future programs with appropriate level of technical expertise.

FY 2015 Objectives

1. Release of EE Roadmap
2. Release of the EE Action Plans
3. Publish AFI 63-101/20-101 IC-2
4 Provide initial OTB pilot and baseline results to AQ

Affordability

Affordability is an emphasis of the Service Acquisition Executive (SAE) and is contained within his priority - "continue to get high priority programs right and keep on track." The Air Force is focusing on Early Systems Engineering and Developmental Planning to structure programs early on, thereby ensure affordability. The process starts with the Early Systems Engineering analysis of mission requirements through SAF/AQR's participation in the Air Force Requirements Review Group (AFRRG) (see Section 1.4). The potential solution space to meet the requirements is explored both economically and technically through the development of Concept Characterization and Technical Descriptions (CCTDs). The cost capability analysis is informed by sound engineering analysis that starts as early as the development of CCTDs and continues refinement through to the development of acquisition strategies. In addition, program managers and chief engineers continually emphasize affordability through early identification of risk, testing that stresses the importance of design of experiments, and the increased emphasis on designing reliable systems (see Section 1.3); preventing and controlling corrosion (see Section 1.5); integrating human factors (see Section 1.6); use of non-governmental engineering standards (see Section 1.7); eliminating environment, safety, and occupational health hazards or reducing the risks of mishaps when hazards cannot be eliminated (see Section 1.8); improving hardware and software assurance (see Section 1.9); and incorporating defense exportability features (see Section 1.10). All of which contributes to the development, testing, fielding, and sustainment of more economically supportable weapon systems. One of the key contributions to affordability these design considerations can make is avoidance of costly redesigns or other mitigations driven by problems encountered when trying to operate and maintain fielded systems. By effectively integrating these design considerations into the system development, potential issues (risks) can be identified, assessed, and eliminated or mitigated prior to fielding.

Summary

The majority of SAF/AQR's SE initiatives evolved around the three main SE strategies: the Air Force Engineering Enterprise; Technical Authority implementation; and Own the Technical Baseline. Collectively, they address the dynamics of a fast-changing warfighter environment through insightful SE design and management addressing the complex and changing engineering environment.

1.2 Pre-Milestone A and Pre-Milestone B Rigorous Systems Analysis and Systems Engineering Process (Pub. L. 111-23, title I, Sec. 102(b)(1)(B)(i))

Policy Changes

In its continuing efforts to streamline SE policy development, SAF/AQR established the engineering enterprise policy working group (EE PWG). The EE PWG provides the venue to champion engineering policy and guidance requirements produced from strategic leadership initiatives, policy studies (e.g., Rapid Improvement Events, Tiger Teams, Red Teams, etc.), and cross-organizational working groups. The EE PWG provides a framework to ensure continued improvement of Air Force SE policy and guidance while avoiding unnecessary policy proliferation and churn.

The Air Force updated Air Force Policy Directive (AFPD) 16-10, *Modeling and Simulation*, to codify and align the responsibilities for the Air Force Three pillar Modeling and Simulation (M&S) governance structure. The three Air Force M&S pillars are life cycle management, analytics, and testing/training. AFPD 16-10 is in coordination and expected to be published by January 2015.

Air Force Space Command (AFSPC) Space and Missile Systems Center (SMC) has actively engaged with Program Offices early in the Materiel Solution Analysis Phase, especially in the area of frequency selection. This is particularly important since choosing unallocated frequencies could result in major cost increases and schedule delays. Using the spectrum application tool EL-CID, along with early spectrum planning, SMC reduced by 50 percent, the time needed to obtain spectrum certification approval (DD-1491) from the *National Telecommunications and Information Agency.*

SMC has also continued to support Better Buying Power initiatives that are focus on reducing costs and right-sizing mission assurance posture. Last year SMC released guidance on mission assurance tailoring, it is now being expanded to ground systems and demonstration/experimental projects; thereby ensuring engineers are equipped to handle the broad range of programs and projects that they will encounter. These efforts are intended to provide overarching guidance for space systems engineering and mission assurance requirements beginning at the earliest stages of acquisition, and are designed for government personnel.

Modeling and Simulation

SAF/AQR collaboration with DASD (SE) increased, through the Acquisition Modeling & Simulation Working Group which seeks to improve the application of M&S in acquisition management. These efforts include engaging with the acquisition community to highlight

focus on aspects of M&S in the Joint Capabilities Integration and Development (JCIDS) and Planning, Programming, Budgeting, and Execution (PPB&E) processes. The objective is to assess capabilities, reduce acquisition time, reduce risk, and decrease overall costs to Department of Defense.

The Air Force worked in close collaboration with DASD (SE) developing the digital system model and its physics-based instantiation--the digital thread. It will support key decision points across the lifecycle by leveraging the current inventory of existing data, models, and algorithms. Reusing program data across the lifecycle, and across multiple programs, promotes affordability. The Air Force is actively developing strategic plans to develop repeatable processes and refined toolsets which follow the Cost versus Capability Analysis (CCA) methodology.

SMC has initiated a working group to study the utility of Model Based Systems Engineering (MBSE) tools and applications for Space programs starting with a Technical Interchange Meeting bringing together government, FFRDCs, and select MBSE tool vendors. The goal is to reach agreement on: a common definition for MBSE; discuss corporate approaches and experiences and; pave a way-ahead for standard Center-wide selection and application processes during lifecycle system acquisition.

Value-Added Decision Analysis - Cost Capability Analysis

Air Force Materiel Command (AFMC) provided Lessons Learned from working with six (6) SECAF-directed CCA pilot programs. The 300-page Lessons Learned report established the foundation for eight (8) Implementation Recommendations for institutionalizing the practice of CCA throughout the Air Force. The eight recommendations fell into the broad categories of: Timing and Decisions; Processes/Policy; Personnel; Tools and Training and; Industry Involvement. The Implementation Recommendations were approved by the Integrated Life-Cycle Management Executive Forum on 13 Jun 14 and several actions have been taken since then. Policy change recommendations have been submitted: proposed courses of action to better integrate requirements and acquisition decision-making have been shared; CCA training courses are being developed and; a standardized CCA process is being written. Furthermore, industry involvement with CCA has been added to Round 2 of "Bending the Cost Curve." Many of the actions taken to implement CCA directly support BBP 3.0 initiatives such as *Achieve Affordable Programs*; *Build Stronger Partnerships Between Acquisition, Requirements, and Intelligence Communities*; *Control Life Cycle Costs* and; *Incentivize Innovation in Industry and Government*.

Air Force Research Laboratory (AFRL) SE Contributions

SAF/AQR recognizes AFRL as an important contributor to rigorous system analysis and SE to reduce high-risk acquisition. AFRL develops and matures technology options for transition into Air Force weapon and support systems. Successful technology demonstrations and transition of those technologies is critical to the success of Air Force acquisition. AFRL leadership is addressing warfighter gaps means using a disciplined early-SE process, coupled with early Manufacturing Technology involvement, provides the foundation for programs to transition with requisite technical maturity. AFRL has Science and Technology (S&T) Chief Engineers (CEs), with strong SE background and program office experience, in each of the Technology Directorates. These AFRL S&T CEs ensure SE activities are incorporated in all major technology demonstration efforts. The AFRL Instruction 61-104, *Science and Technology (S&T) Systems Engineering (SE),* identifies provides streamlined SE process and best practices required of the AFRL technology programs.

FY 2015 Objectives

1. AQR will continue to mature the digital thread concept. Pilot programs will be identified to participate and assist in defining the artifacts for digital thread.
2. AFMC will establish a CCA team at Air Force Life Cycle Management Center (AFLCMC) and SMC.
3. AFMC will roll out CCA training curriculum.
4. AFMC will complete the standardized CCA process.

1.3 Reliability, availability, maintainability, and sustainability as an integral part of design and development (Pub. L. 111-23, title I, Sec. 102(b)(1)(B)(ii))

The Air Force has collaborated with DASD (SE), the other Defense Services, and the major organizations within the Air Force to ensure RAM is addressed holistically throughout the lifecycle of product or system as well as ensuring the proper visibility at every level of leadership. In doing so, the Air Force is ensuring the appropriate practices, processes, and policies are in place to guarantee long term sustainability of our current and future weapon systems.

The Air Force continued to implement several initiatives as part of a Service-wide strategy to better equip the engineering workforce and improve the performance of RAM activities within Air Force acquisition programs. Activities include:

1. As part of its major reorganizations during FY 2014, the Air Force moved the Secretariat office responsible for Logistics, SAF/IEL, from SAF/IE (Installations, Environment, and Logistics) to SAF/AQ (Acquisition) to become SAF/AQD. SAF/IE has been renamed Installations, Environment, and Energy to highlight the Air Force's efforts to ensure energy sustainability. Moving the SAF logistics lead into SAF/AQ will more effectively integrate all aspects of system lifecycle management, to include systems engineering. The Air Force's Product Support Enterprise Vision (PSEV) identifies Product Support Engineering as a major capability. The PSEV requires key engineering specialists, such as Reliability, Maintainability, Quality, Manufacturing, etc., become involved early in the process of developing Air Force weapon systems to ensure affordability and sustainability throughout its useful life.

2. AFLCMC is using its annual R&M Programs Health Assessment to assess the overall health of Air Force RAM programs. This assessment is provides insight to the health of a program's processes, products and expertise. A separate survey provides the Program Office's Reliability-Centered Maintenance (RCM) initiatives for risk-based Programmed Depot Maintenance strategies (i.e. Condition-Based Maintenance, maintenance scheduling from reliability based statistical failure distribution analysis, etc.). The R&M Program Health Assessment and RCM initiatives gap analyses are key in determining the focus of future strategic efforts related to Air Force RAM programs.

3. In order to better assess contractor analysis of RAM related requirements, AFLCMC is improving its capabilities for independent assessment of concept weapon system mission effectiveness. AFLCMC's Engineering Resilient Systems

task establishes methodology assessing how multiple different weapon system design attributes impact mission effectiveness for various missions. This is a first step in properly correlating RAM-related requirements and trade space during requirements development and will facilitate more precise RAM-related requirements definition in future contracts for MDAPs. AFLCMC plans to integrate this capability with already well developed methodologies for assessing cost and then expanding this capability to incorporate sustainability.

4. AFLCMC has created Individual Development Plans to ensure that R&M Trainees receive the appropriate specialized education they need to support RAM requirements for Air Force programs. A small number of interns enter the R&M track each year and upon completion will be deployed to various Program Offices within the Center. These individuals work in small programs supported by Center experts and will progress to larger, more complex programs as skills mature. In addition, several candidates from other engineering disciplines have been selected to cross train into Reliability Engineering and will follow a similar path as the interns.

5. The Air Force expanded the Service-wide R&M Working Group to include SMEs from Acquisition, Test & Evaluation, Maintenance, Policy, Analysis, and Academia. These SMEs work together to optimize Air Force policies and practices as they relate to current and future RAM initiatives. An online collaboration environment has been created to facilitate this collaboration and there are currently plans to open this site to the RAM community at large. AFLCMC's Product Support Engineering Division hosts quarterly meetings with representatives from the R&M community to identify and address R&M issues.

6. SAF/AQR implemented the Certification & Accreditation process for a standard suite of software tools to be used by Air Force R&M SMEs. This process enables Program Offices to acquire the tools needed to satisfy the planning and analysis requirements outlined in Directive Type Memorandum 11-003. Standardization of tools allows SMEs from multiple programs to collaborate on common activities, share lessons learned, and exchange expertise more freely. Several new R&M Tools have been certified and incorporated into the Air Force Evaluated Products List which allows users to purchase and utilize the tools they need.

7. The Air Force is reviewing current internal policies and guidance to ensure consistency with new mandates from OSD. AF/A4L is still working the update to the RAM policy for fielded systems through a revision of AFI 21-118, *Improving Air and Space Equipment Reliability and Maintainability*. In addition, SAF/AQR

is working on updates to AFI 63-101/20-101, "*Integrated Life Cycle Management*" to improve RAM policy. The Air Force is also working to convert the *Air Force RAM Guidebook* to an Air Force Pamphlet.

8. AFLCMC Systems Analysis Division has enhanced the Logistics Composite Model Toolkit (LCOM ATK) to better support decision-makers across the enterprise. LCOM ATK is the premier M&S tool for investigation of RAM issues and effects. Enhancements include direct calculation of system availability in direct support of mandated RAM reporting requirements. Additional enhancements underway include linking RAM metrics with affordability estimates to support a systematic and quantitative assessment methodology supporting design, development, test, and sustainment.

9. Using DAWDF funding provided by SAF/AQH, the Air Force Institute of Technology continues to provide a series of courses training program managers, test managers, program office engineers and reliability subject matter experts in reliability and reliability growth to promote a proactive approach of designing reliability into the system up front as well as reliability growth planning, tracking and assessment methods and best practices.

SAF/AQR and Air Force R&M SMEs have worked with, and will continue to work with, a number of MDAPs to review and improve their requirements, planning, and contractual strategies for R&M-related activities and deliverables. AFLCMC/EZP has established an R&M Center of Excellence to more effectively assist Programs with R&M efforts thereby improving the standard of quality with acquired systems and services.

FY 2015 Objectives

1. The Air Force will continue to leverage standards and guidance from both government and industry sources. The Air Force is exploring an update to GEIA-STD-0009, "*Reliability Program Standard for Systems Design, Development, and Manufacturing*," which has not been updated since 2009. The Air Force is also involved with the development of AIAA 102.2.4,"*Performance-Based FMECA"*, which is intended to take the place of canceled MIL-STD-1629, "*Procedures for Performing a Failure, Mode, Effects and Criticality Analysis*".
2. The Air Force will continue its efforts to implement a common Information Technology and Knowledge Sharing infrastructure which includes data systems and analysis tools to ensure R&M Engineers have the best resources available for making informed decisions and tradeoffs. The Air Force has identified and approved commercial data products for use, and will seek funding to purchase

enterprise licenses. However, Program Offices will be able to purchase the licenses separately, until centralized funding can be obtained.

1.4 Systems Engineering Requirements During the JCIDS Process and in Contract Requirements for each MDAP (Pub. L. 111-23, title I, Sec. 102(b)(1)(B)(iii))

Policy Changes

Concept Characterization and Technical Descriptions (CCTDs) document the results of the early Air Force Systems Engineering analyses of the pre-program planning activities exploring alternative approaches to meeting warfighter needs. The primary FY 2013 Air Force policy concern regarding SE in the JCIDS process was the lack of a requirement for the CCTD documents to be inputs to Analysis of Alternative (AoA) study planning. The revision to AFI 10-601, "*Operational Capability Requirements Development*," published by the Air Force in November 2013, included that requirement. This change effectively eliminated the last of the Air Force Development Planning (DP) policy gaps.

The AFMC "*Request for Proposal (RFP) Technical Content*" engineering guide published in 2013 addressed the SE requirements applicable to Non-Developmental Items (NDI).

Pre-planning Team and the Air Force Requirements Review Group (AFRRG)

In order to improve the affordability and technical feasibility of programs, it is essential that the requirements community and the acquisition community collaboratively develop potential solutions to operational capability needs. Air Force decision-makers must have objective technical assessments of the viability and risks associated with these potential solutions prior to making decisions to proceed.

Air Force accomplishes this by having the SAF/AQRE Pre-planning Team participate in the AFFRG. The AFRRG is designed to inform the Air Force Requirements Oversight Council (AFROC) by reviewing all Air Force requirements documents and AoA concepts prior to their submittal to the AFROC for approval. Since 2013, the AFRRG has met regularly to help the AFROC avoid poorly defined and potentially unaffordable and/or unattainable requirements. The Pre-planning Team seeks to ensure a tight linkage between requirements, technology maturity, and accomplishment of sufficient early SE to inform cost and capability analyses to enable the AFRRG to accomplish this goal.

The Pre-planning Team reviews all requirements documents for affordability and technical feasibility. In addition, the Pre-planning Team reviews the early developmental planning documents: CCTDs and AoA study plans. Often, the Pre-planning Team works

with Program Offices on potential acquisition strategies and program schedules in preparation for an AFRRG meeting.

During 2014, the Pre-planning Team reviewed thirty-five (35) program documents and studies (i.e., Initial Concept Documents (ICD), CCTD, AoA study plan/guidance, Concept Development Documents (CDD) and Concept Production Documents (CDP)). These included: Joint Surveillance and Target Attack Radar System (JSTARS) Recapitalization, Ground-Based Strategic Deterrence (GBSD), Space Based Infrared System (SBIRS) Follow-on, Military GPS User Equipment (MGUE), F-15 Eagle Passive/Active Warning Survivability System (EPAWSS), and Presidential Aircraft Recapitalization (PAR).

Development Planning (DP)

The Weapon Systems Acquisition Reform Act (WSARA; Public Law 111-23) directed reinstatement of DP across the DoD. The Air Force DP effort includes both Early SE and Science & Technology (S&T) involvement in the Capabilities Planning Process. The SAF/AQRE Pre-planning Team leads the Early SE and SAF/AQRT leads the S&T support to the Capabilities Planning Process.

As described above, the SAF/AQRE Pre-planning Team's activities are focused on support to the AFROC and AFFRG processes for reviewing and assessing programs in the Capabilities Planning Process. The Pre-planning Team supports new acquisition activities by providing DP guidance on SE's role in CCTDs, ICDs, AoA study plan/guidance, and CDDs.

SAF/AQRT and the Air Force Research Laboratories (AFRL) are also actively engaged in Air Force DP activities. AFRL has representation at all levels of the Air Force DP governance structure. DP efforts approved through the governance structure include personnel from AFRL on execution teams providing technical expertise and ensuring S&T needs associated with an effort are properly identified and communicated.

In order to assess the effectiveness of its DP Early SE and S&T activities, in FY 2014 SAF/AQR sponsored the Air Force Studies Board (AFSB) of the National Research Council of the National Academies of Science to conduct an independent review and assessment of the Air Force's approach and execution of DP and to provide recommendations for improvement. The AFSB just recently published its report "*Improving Effectiveness and Efficiency of U.S. Air Force Pre-Acquisition Development Planning*." The Air Force is reviewing the findings and considering necessary process and policy changes necessary in FY 2015 to implement the report's recommendations on how the Air Force can improve its DP efforts.

SAF/AQH continues to provide DAWDF funding for the Air Force Institute of Technology Introduction to Developmental Planning Course developed as part of the Air Force's renewal of DP activities.

FY 2015 Objectives

1. AQR will continue to support the AFRRG and improve the process as needed.
2. AQR will take steps to improve DP after reviewing the AFSB report's recommendations to determine how best to proceed with implementation.

1.5 Area of Identified Progress and Improvement: Corrosion

Air Force efforts to reduce the effects of corrosion are starting to pay off. Rising corrosion costs from the previous decade have slowed and there is strong indication of a "bending of the cost curve." Based on draft results of a study received from the Director of Corrosion Policy and Oversight (CPO) in the Office of the Secretary of Defense, the corrosion share of aircraft maintenance costs that grew from 19.4% to 25% of total maintenance from FY 2006-FY 2010 has plateaued and may have even dropped slightly this year (see Figure 5).

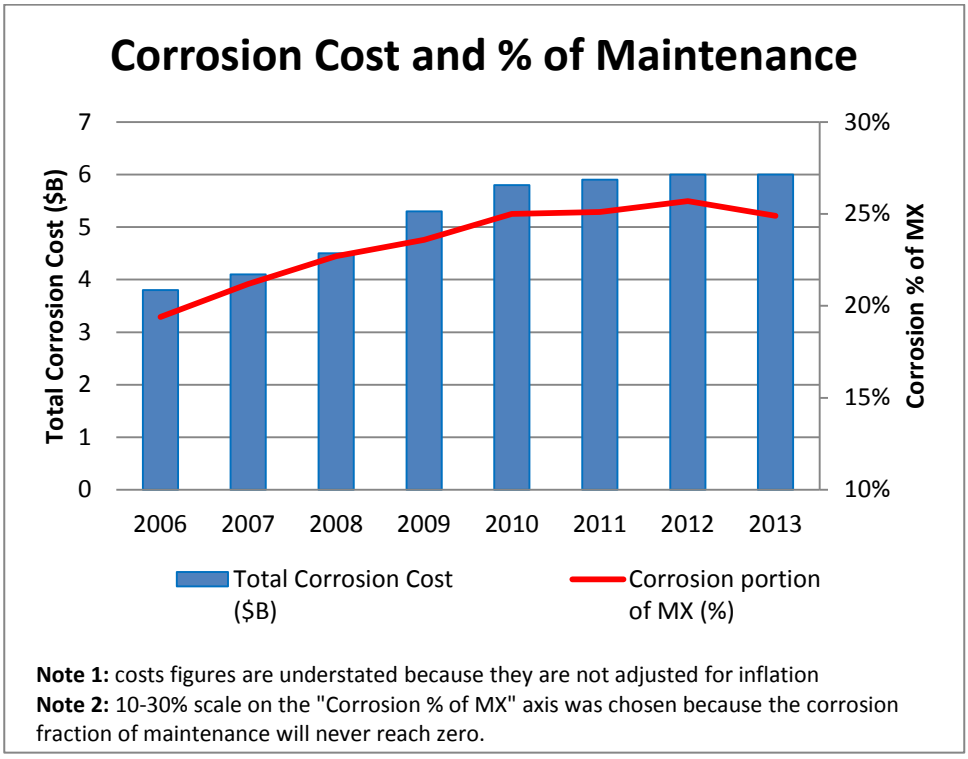

Figure 5: Annual cost of corrosion and corrosion share of maintenance curves

The Air Force Corrosion Control and Prevention Executive (CCPE) attributes this positive trend to several synergistic effects:

- Increased enterprise-level engagement to improve awareness through the CPC Strategic Plan, emphasis on the CPC Annual Report, an active CPC Working Group, and other communication and outreach;
- Focused attention from MAJCOMs and weapon system managers and engineers on instructions, technical orders, Corrosion Prevention and Control Plans, Corrosion Prevention Advisory Boards, and Aircraft Structural Integrity Program reviews to energize CPC efforts; and
- Improved depot and field-level processes that increased wash cycles frequency for aircraft in severe corrosion environments, the application of Corrosion Preventative Compounds (CPCs), implementing gaskets, seals, and other barriers to reduce galvanic corrosion; and increased inspections for early detection of corrosion.

In 2014, the CCPE released a new Air Force Corrosion Strategic Plan to better align goals, objectives, and metrics with the DoD corrosion strategy and provide a roadmap for continued success. In addition, Air Force experts continue to collaborate with the other Services on several corrosion-related standardization documents. Finally, the Air Force CPC Working Group (CPCWG) gained momentum as a forum for corrosion collaboration, education, and community awareness.

Research and development investments were also a key factor in addressing corrosion. Air Force Research Laboratory collaborated with public universities and other joint Service laboratories to further understanding of corrosion modeling, material science, coating performance, and the relation between accelerated lab test data and field data.

1.6 Area of Identified Progress and Improvement: Human Systems Integration

As previously reported, in response to the Air Force Scientific Advisory Board's recommendation from the F-22 Aircraft Oxygen Generation Quicklook Study, SAF/AQ, AFLCMC/CC, and AF/SG chartered a High Performance Team in 2012 to re-energize Air Force acquisition emphasis on Human Systems Integration (HSI). Twelve (12) of the action plans developed by this team are complete, one is expected to be completed in first quarter of FY 2015, and work continues on two others with longer implementation schedules. As a result of the action plans, the Air Force established and filled an O-6 billet, Special Advisor for Human Systems Integration, in the Air Force Life Cycle Management Center (AFLCMC) Engineering Directorate, Wright-Patterson Air Force Base, OH. The incumbent will facilitate, collaborate, and coordinate expert HSI support for AFLCMC program offices.

Additionally, the AFRL 711 Human Performance Wing (HPW) established relationships with key Program Executive Officers (PEOs) and Program Managers (PMs) and has placed HSI practitioners in key programs. The 711 HPW is also working to increase support earlier in Air Force acquisition programs.

SAF/AQ published Air Force Pamphlet, AFPAM 63-128, "*Guide to Integrated Life Cycle Management,*" with a new chapter on HSI, as well as checklists and terms.

The Air Force continues to improve and advocate for HSI by use of its partnership with joint, government, industry, and academic forums. The Joint HSI Standard Working Group, chartered by the Defense Standardization Council, is completing an Analysis of Alternatives for options to establish an HSI standard to improve the process of getting HSI on contract.

The newly completed Air Force Institute of Technology Intermediate Human Systems Integration course, SYS 269, was validated (beta offering) in November 2013. SAF/AQH provided DAWDF funding to develop this course. The course was presented eight (8) times during FY 2014 and attended by a total of 92 students. The three-day course expanded HSI familiarity through interactive classroom instruction and hands-on exercises.

Reviews of ACAT I Systems Engineering Plans continue to show improvement in HSI planning documentation.

1.7 Area of Identified Progress and Improvement: Standardization Program

Air Force standardization activities in 2014 are a continuation of efforts initiated with DASD (SE) and the other Military Departments in mid-2010 through the Defense Standardization Program and Defense Standardization Council (DSC) to address a DoD need for SE standard practices that can be used as requirements documents on contracts to help ensure robust SE efforts on programs. Joint service working groups were formed to assess existing systems engineering technical documentation in the areas of SE, Technical Reviews and Audits (TR&A), configuration management (CM), Logistics Support Analysis (LSE), and Manufacturing. The Air Force continues as lead service for three: SE; TR&A, and Manufacturing. All three of these non-government standards are on-track to be published by end of calendar year 2014. Additionally, the Navy-led, Air Force-supported, CM nongovernment standard is also scheduled for 2014 publication.

Air Force has also made considerable progress updating active, overage Defense Standardization Program documents; this activity has DSC interest. Our "percent complete" value ascended from 12 percent in January 2014, to 44 percent in September 2014.

In field implementation activities, a joint SMC and Air Force Materiel Command (AFMC) Air Force Life Cycle Management Center (AFLCMC) team has prepared a common standard technical process document that more tightly couples risk management activities, the conduct of Systems Engineering Technical Reviews, and an assessment of the consequences of incomplete technical review entry and exit criteria. The joint document is entering the coordination process to gain approval by the centers leadership. Upon approval, formal issuance is anticipated in by December 2014.

SMC also continues to revise and update key standards used on space programs. For example, a significant update to the environmental test standard for space and launch vehicles was published in FY 2014. SMC-S-016, "Test Requirements for Launch, Upper Stage, and Space Vehicles," dated 5 Sep 14 serves as the current baseline for program test tailoring. SMC-S-016 is the culmination of numerous technical reviews with Government, FFRDC, and industry. It incorporates test lessons learned, options, and best practices based on acquisition program feedback and experience since the issue of MIL-STD-1540D, "Product Verification Requirements for Launch, Upper Stage, and Space Vehicles," dated 1999. If authorized through the appropriate approval authority, SMC will submit SMC-S-016 as MIL-STD-1540E to replace MIL-STD-1540D.

SMC is in the final coordination process to publish an SMC Instruction on Configuration Management (CM) to institutionalize CM best practices and provide standardized

requirements for SMC ACAT I and II programs across the portfolio. SMC developed this instruction in accordance with the best practices described in the DAG (Defense Acquisition Guide), MIL-HDBK-61A;"*Configuration Management Guidance,*" and considered the current draft EIA-649 consensus standard on configuration management, currently in final balloting by the DSC or the DSP. Final coordination is taking place across the Center, and the document is expected to enter the publication process to achieve promulgation beginning in November 2014.

SMC continues to review, interpret, update, and implement national, DoD, and Air Force spectrum policy, regulations, and standard practices. The SMC Spectrum Management Office (SMO) developed a Spectrum Operating Instruction. It outlines the SMO processes that enable an SMC program office to obtain spectrum support for a spectrum dependent system. SMC also provided training, instructions, and a template to assist a program office with its Spectrum Supportability Risk Assessment (SSRA). The SSRA captures regulatory, technical, and operational requirements for a spectrum dependent system throughout its acquisition life cycle. While performing an SSRA in FY 2014, a Program Office discovered a potential self-interference to its system's multi-frequency configuration. As a result of this early discovery, they were able to make quick modifications, thus saving significant debugging and integration time. SMC has provided several training sessions on SSRAs at its quarterly working group meetings and has closely worked with Program Offices on their SSRAs. Currently, SMC is working with Air Force Spectrum Management Office to finalize the SSRA approval process for ACAT and non-ACAT programs.

1.8 Area of Identified Progress and Improvement: Environment, Safety, and Occupational Health (ESOH) Management

SAF/AQR is the Air Force lead on the DoD Acquisition ESOH Integrated Product Team (IPT) chaired by the Deputy Under Secretary of Defense for Installations and Environment (DUSD (I&E)). This IPT is responsible for the ESOH content of DoDI 5000.02 and the Defense Acquisition Guidebook (DAG). The IPT is also responsible for two Defense Acquisition University (DAU) courses, CLE009 "*ESOH in Systems Engineering*" and CLR030 "*ESOH in JCIDS*." The IPT updated both DAU courses in 2014. The IPT also maintains the ESOH content of the DAU's Acquisition Community Connection knowledge sharing website. The IPT is the DoD lead for MIL-STD-882E, "*Standard Practice for System Safety*," and represents the DoD with the Aerospace Industries Association (AIA) for revisions and updates to National Aerospace Standard (NAS) 411, "*Hazardous Materials Management Program*."

The Air Force plays a lead role for DUSD (I&E) in ensuring that the ESOH content in these documents is fully consistent with the current Acquisition Systems Engineering policy and guidance. For instance, the Air Force identified the opportunity to exploit the Systems Engineering Plan (SEP) guidance to streamline the content of the SEP and the required Programmatic Environment, Safety, and Occupational Health Evaluation (PESHE) document while placing greater emphasis on ensuring ESOH decision making was data driven. The latest versions of the DoDI 5000.02 and DAG direct programs to place the ESOH management planning information in the SEP and the data generated by the analyses done in executing the planning in the PESHE. This avoids duplication of effort, ensures that ESOH planning is in place for the Technology Development and Risk Reduction (TMRR) phase (in the Milestone A SEP), and that the data necessary to assess the efficacy of a program office's ESOH management is available for review at Milestones B and C.

DoD published MIL-STD-882E in 2012 and it includes the optional Task 108, "*Hazardous Materials Management Plan*," that, if placed on contract, requires defense program offices and their contractors to prioritize efforts to eliminate or reduce hazardous material (HAZMAT) usage by establishing a formal list of HAZMAT that will be managed. The objective is to focus DoD and contractor resources on managing only those HAZMAT that have a reasonable likelihood of being utilized in the development, operations, and maintenance of a DoD system or that DoD needs to be aware of in the event of new information about the hazards associated with a material or when DoD is disposing of the system. The list is to be placed on contract with materials categorized as either “Prohibited,” “Restricted,” or “Tracked” with varying degrees of management required for each category. In 2013, the IPT worked with the AIA to completely revise

NAS 411 to align it with Task 108 and provide industry with detailed implementation guidance for Task 108. In addition, the IPT and AIA developed a supporting document, NAS 411-1, "*Hazardous Materials Target List*," that provides a proposed list of HAZMAT categorized as "Prohibited," "Restricted," or "Tracked" that DoD Program Offices and DoD Contractors can adopt for use or modify when managing HAZMAT in accordance with MIL-STD-882E, Task 108 or NAS 411. The IPT and AIA agreed upon seventy-seven (77) HAZMATs that should be either in the Prohibited or Restricted categories and AIA published both NAS 411 and 411-1 on 30 September 2013. In 2014 the IPT focused on preparing a proposed list of HAZMAT for the "Tracked" list in NAS 411-1. Beginning from a list of 1,007 HAZMATs compiled by various federal regulatory agencies, the IPT has down-selected to 379 materials that are relevant to DoD system development, operations, maintenance, or disposal. The AIA is currently reviewing the list with the goal of publishing an update to NAS 411-1 once the IPT and AIA reach agreement on the Tracked HAZMAT list.

The IPT is also working with the AIA to ensure consistency of the MIL-STD-882E Task 108 and NAS 411 approaches with the new International Aerospace Environmental Group initiative, the Aerospace and Defense Industry Declarable Substances List (AD-DSL). International aerospace and defense industry corporations, their customers and regulators will benefit from AD-DSL because it will provide a standard and uniform method to communicate product material composition information and data. This is being done in response to the expanding international regulatory HAZMAT restrictions. The AD-DSL list of materials will include a form for providing the data to customers, an electronic data exchange format, and a governance process.

SAF/AQR is the Government Liaison for the ESOH Committee of the National Defense and Industry Association (NDIA) Systems Engineering Division. Following several months of planning and coordination, SAF/AQR hosted an ESOH track including nine presentations at the 2013 NDIA SE Conference. The Committee also completed preparations for the ESOH track at the 2014 SE Conference. The 2014 track includes 11 ESOH presentations for the October 2014 NDIA Systems Engineering Conference.

SAF/AQR also led the effort to develop the HSI and ESOH Handbook for Pre-Milestone A JCIDS and Systems Engineering Activities Handbook published in November 2013. The goal of the Handbook is to help HSI and ESOH practitioners provide appropriate inputs to JCIDS capabilities documents and AoA related activities. The Handbook focuses only on Post-CBA through MS A activities where HSI and ESOH practitioners can influence system capabilities performance criteria and help discriminate between alternative materiel solutions.

AFSPC SMC continued to review, interpret, and update national, DoD, and Air Force space debris mitigation policy, regulations, and standard practices. An SMC Instruction (SMCI) and directorate-level Operating Instruction were developed for space debris mitigation and reporting. The SMCI was approved in July 2014 and directs Program Managers for satellite Program Offices to work with launch providers to achieve total mission compliance with debris regulations. SMC developed instructions and templates to assist programs with the development of Space Debris Assessment Reports (SDARs). The SMC functional staff office engages with program offices early to ensure all analysis is complete and the SDAR package appropriately documents space debris hazards in accordance with national and Air Force policy. SDARs are required throughout the life cycle of the program as part of flight worthiness criteria. SMC developed a compliance roadmap briefing to present its plans to achieve full compliance with National Space Policy by 2020. This briefing was sent to SECDEF in the CY 2015 Exception to National Space Policy block request. SMC has incorporated SE standard procedures to perform trade-space assessment of launch vehicle design changes and mission design changes necessary to allow for compliant upper stage and satellite disposal. The first of these mission trades was used to make the WGS-8 mission compliant by releasing the spacecraft below its operational orbit so that upper stage disposal would be in compliance.

The SMC Spectrum Management Office has implemented much of DoD and Air Force guidance regarding systems' use of the electromagnetic spectrum. As commercial demand for frequency spectrum increases and US regulatory agencies attempt to implement new federal government policies to make more spectrums available to commercial entities, spectrum is becoming an increasingly scarce and precious resource. Access to spectrum is subject to regulatory, operational, and technical constraints; all of these constraints affect technical solutions that result from applying the SE process. SMC has required space programs to document their current and proposed use of spectrum, subject to these types of constraints, in Spectrum Supportability Risk Assessments. Upon identification of spectrum supportability risks and the steps needed to mitigate them, SMC integrates these risks and mitigation steps into the SE process where technical solutions are identified, tracked, and managed at an enterprise level.

1.9 Area of Identified Progress and Improvement: System Security Engineering (SSE)

SSE is the functional discipline within systems engineering that ensures security requirements are included in the engineering analysis with the results being captured in the Program Protection Plan (PPP). In FY 2014 the Air Force focused on several major initiatives in this new emphasis area.

SAF/AQXA leads Air Force Integrated Weapon and Cyber Security Initiative for SAF/AQ. The core of this activity is the effort to integrate Cyber Security and Program Protection Planning, as well as the activities across other functional communities to improve resiliency and mission assurance. In support of this effort, SAF/AQ is working on the following initiatives.

- Clarified implementation of the DFARS clause 252.204-7012 with DoD CIO and SAF/AQC, Contracting, to ensure both the sufficiency and the protection of contractor data which may have been extracted as part of a data breach. The Air Force has implemented standard contracting methods to require an assessment of unclassified Critical Technical Information (uCTI) of breached contractor networks, in accordance with regulatory and statutory direction.
- Co-developed, with SAF/GCQ, a briefing on acquisition security and cybersecurity that was presented at a conference of the Air Force Legal Service, resulting in a critical understanding of legal complexities surrounding cybersecurity threats, attack surfaces, and means to both maintaining a technological advantage over the adversary and ensuring warfighter mission systems and networks are resilient.
- Identified need to begin outlining a significant update to Air Force Pamphlet 63-113, "Program Protection Planning for Life Cycle Management," during coordination with OSD on revisions to DoDI 5200.39, "Critical Program Information (CPI) Protection within the Department of Defense." The updated guidance will encompass not just traditional program protection, but also touch points and risk dependencies a Program Manager must consider when managing a program throughout the system lifecycle.
- Formalized Air Force processes supporting the Trusted Systems and Networks (TSN) initiatives. This includes the following activities.
    - In support of DASD (SE), improved the proposed curriculum for two (2) Defense Acquisition University modules (ENG 160 and ENG 260) on Program Protection and TSN.
    - Enhanced existing processes between acquisition and sustainment to reduce the risk of malicious insertion of Information and Communications Technology (ICT) components by tracking ICT components, testing of replacement parts, involving Defense Logistics Agency, and outlining requirements in core acquisition and sustainment documents.

  - Updated direction to AFMC and AFSPC that will improve program submissions of DIA Threat Analysis Center (TAC) Requests for Information (RFI). Improvements included pushing responsibility for quality checks down to the MAJCOM staff, while keeping overall prioritization at the Air Force level;
  - Made substantive contributions to the GAO Review of Trusted Defense Systems in response to House Report 113-446 in the FY 2015 NDAA.
- Investigated the utility and feasibility of a Life Cycle Security cost estimating tool. SAF/AQ completed a study to define a program protection planning cost estimating model, recognizing that costs have traditionally been spread throughout several program functional areas and therefore not easily accounted for or tracked within that program. While the task was complicated by the lack of available program protection-specific cost data, thereby limiting performance of data analytics, SAF/AQ was able to collect Subject Matter Expert estimates of program protection planning activities to determine Critical Program Information (CPI) and Critical Components (CC), but not the actual costs of implementing countermeasures. The study identified alternatives for addressing inputs/outputs for a cost model, including calculating the cost of performing analysis to determine CPI and CCs within program protection planning. It also provides recommendations that will help ensure program protection data is identified, collected, and reported within Government program offices and defense contractor facilities, and facilitate the development of improved methodologies for estimating program protection planning and implementation. Specific security cost areas considered included: Personnel Security, Physical Security, Software Assurance, Cybersecurity, Supply Chain Risk Management, Anti-Tamper, Foreign Disclosure/Agreements, Dial Down Functionality, Industrial Security, Operations Security, Training, Information Security, Transportation Management, and Communications Security. This, and future efforts, directly support SAF/AA's plan to develop a "Cost of Security" cost-accounting model and the HAF/A4 "Cost of Logistics" effort that established the relationship between logistics costs incurred and aircraft availability.
- Supporting the SAF/CIO A6 transition from DoD Information Assurance Certification and Accreditation Process (DIACAP) to the Risk Management Framework (RMF) by codifying the alignment of RMF activities with the Acquisition Life Cycle. While SAF/CIO-A6 is leading the Air Force's transition to RMF, SAF/AQ is ensuring that program offices are postured to sufficiently support authorization decisions under this new process. The final goal will be to align authorization decision authority with the operational users of the system, in line with DoDI 8510.01, "*Risk Management Framework for DoD Information Technology*." Initial implementation is focused on revising AFI 33-210, "*Air Force Certification and Accreditation Program*," as well as adequately referencing this implementation in core acquisition policy. The resulting

policy demonstrates alignment of the RMF process with key events throughout the life cycle and will reinforce the draft OUSD (AT&L) Cybersecurity Implementation Guidebook for Acquisition Program Managers.

- Codifying the relationship between Service Development and Delivery Process and a tailored acquisition process for Defense Business System. SAF/CIO A6 published Air Force Manual (AFMAN) 33-402, "*Service Development and Delivery Process*," documenting the requirements process for Defense Business Systems. In response, SAF/AQ is staffing an AFMAN which establishes tailored acquisition processes to meet user requirements based on risk in order to rapidly deliver capability incrementally.

SAF/AQXA leads, with support from SAF/AQRE, the Air Force participation in the efforts to stand up a Joint Federated Assurance Center (JFAC). Essentially, the JFAC is a federation of Service Providers (SP) that Program Offices can contact for assistance. JFAC can also help ascertain if there is a DoD SP that can provide requested assistance. Interim DoDI 5000.02, "*Operation of the Defense Acquisition System*," and DoDI 5200.44, "*Protection of Mission Critical Functions to Achieve Trusted Systems and Networks*," require program offices to include software assurance (SwA) and hardware assurance (HwA) as part of program protection planning throughout the acquisition life cycle. In response to Section 937 of the National Defense Authorization Act (NDAA) for FY 2014, DoD chartered the JFAC to support trusted defense system needs and ensure the security of software and hardware developed, acquired, maintained, and used by the Department. SAF/AQX is the Air Force representative to the JFAC Steering Committee, the executive body directing the DoD JFAC efforts. SAF/AQXA is the Air Force representative to the JFAC Advisory Working Group. SAF/AQXA and SAF/AQRE provide Air Force representatives to the Hardware Assurance (HwA) and the Software Assurance (SwA) Technical Working Groups (TWGs). The immediate goal is to achieve an FY 2015 JFAC Initial Operating Capability when there will be a JFAC Coordinating Center (CC) activated to facilitate support to DoD Acquisition Program Offices by a variety of HwA and SwA Service Providers (SPs).

The Air Force has already sponsored two JFAC-related projects: The Air Force Institute of Technology is performing Career Field Training Gap Analysis aimed at identifying existing acquisition functional area training, sources, scope, and availability, in order to develop a framework for SwA training requirements as well as gaps and deficiencies. The second effort, managed by the Air Force Life Cycle Management Center is developing a list of existing SwA capabilities and services available within the Air Force to support JFAC operations. In addition, Air Force supports the JFAC by developing, maintaining, and offering software and hardware vulnerability detection, analysis, and remediation

capabilities in support of programs and activities across the Military Departments, Defense Agencies, and other DoD organizations. This includes the following:

- Collaboration across Science and Technology acquisition, Test and Evaluation, and sustainment efforts to ensure that SwA and HwA capabilities and investments are effectively planned, executed, and coordinated.
- Advocating for existing and developing Air Force capabilities and contributions in HwA and SwA.
- Documenting how the Air Force is developing, adopting, and sustaining best practices and processes and applying them during the development, acquisition, and procurement of software and hardware.
- Providing Air Force HwA and SwA SP capabilities to other DoD users through the JFAC.

As part of the field implementation of the SwA and HwA improvement efforts, the AFSPC SMC continued to apply a robust PPP approach to all PEO Space programs with two ongoing initiatives. The first initiative is the development and implementation of a comprehensive PPP template addressing each protection tenet (e.g. Cyber threats, anti-tamper planning, etc.). The second initiative is a center-wide Threat Assessment Center reporting process that addresses the identification and validation of specific supply chain threats. These two initiatives have equipped program managers and security engineers with both guidance and tools to develop effective PPPs, including mitigation strategies. SMC also created a systems acquisition lifecycle protection tool for National Security Systems, which identifies required activities across the lifecycle that are required for program protection plans, security classification guides, information assurance compliance, and supply chain risk management strategies.

SMC also created a Supply Chain Risk Management (SCRM) Integrated Planning Team to establish center-wide processes and procedures needed to comply with DoDI 5200.44. These processes and procedures will ensure that all SMC programs understand and implement SCRM practices. Initial work has been completed on the SCRM reporting and mitigation processes and procedures as well as initial integration with existing parts, material, and processes measures that may potentially mitigate the supply chain risk. Additionally, the infrastructure required to report SCRM issues to the community of interest has been identified. The SMC SCRM effort will also address building the processes and procedures necessary to implement SCRM practices throughout the lifecycle of SMC programs.

SMC is developing a plan to implement Defensive Cyberspace Operations (DCO) in order to improve cybersecurity resiliency on space mission systems. Components of the implementation plan include a methodology to determine the cyberspace defensive gaps,

identification of industry and government services that are able to provide cyberspace defense and a plan to match space mission system DCO gaps with effective defensive services. The planning is coupled with guidance on how to implement DCO concepts throughout the acquisition lifecycle.

SMC is developing a framework to collect, analyze and track metrics to provide situational awareness of the enterprise cybersecurity posture, and enterprise cybersecurity issues. Additional objectives of implementing the framework are to identify enterprise-level cybersecurity trends and investment opportunities, and provide actionable, prioritized recommendations to remedy cybersecurity issues. Implementation of the framework is scheduled to begin mid FY 2015.

SMC developed transition guidance to assist space mission systems with the transition to the Risk Management Framework (RMF) for DoD Information Technology. The guide assists program offices in selecting National Institute of Standards and Technology security controls using the process documented in security categorization and control selection procedures for NSS systems. The guidance also references numerous other resources available to ease the transition to RMF including the RMF Knowledge Service and the Enterprise Mission Assurance Support Service.

The AFMC Information/Program Protection Process Guide integrates processes (e.g., program protection planning, operations security, unit security program management) for managing risk of advanced technology from foreign collection, design vulnerability, or supply chain exploit/insertion. In addition, the guide streamlines coordination processes of required documentation, and provides points of contact to assist in the vulnerability analysis and risk mitigation strategies.

1.10 Area of Identified Progress and Improvement: Air Force Support for the OSD Defense Exportability Features (DEF) Initiative

Since FY 2012, the Air Force has been supporting and tracking four MDAP programs participating in OSD's DEF pilot program study. With activities ranging from feasibility studies to technical design work, these programs have provided valuable insight into the level of effort required to incorporate DEF initiatives as well as the benefits that can be achieved through exportability and international cooperation.

In FY 2014, two programs completed their efforts to incorporate DEF into system designs: MQ-9 Reaper unmanned aerial vehicle and AGM-158 Joint Air to Surface Standoff Missile (JASSM). Both of these programs completed the necessary work with funding from their respective international partners and did not require additional funds from the DEF program. Despite their funding independence, these programs continue to support the importance and value of the DEF pilot program study. MQ-9 will be submitting its closeout report by the end of FY 2015 to include a detailed description of required efforts, resources, and schedule, as well as the anticipated return on investment. JASSM, though completing DEF design initiatives on the baseline program, is now looking into options for extending its efforts into its next phase, the JASSM-ER program.

The remaining two programs, Small Diameter Bomb II (SDB-II) and 3Dimension Expeditionary Long-Range Radar (3DELRR), performed feasibility studies that focused on their respective technical abilities to achieve exportability, estimates of required resources, export market identification, and return on investment potential. SDB-II kicked off their study in September 2014 and is continuing with DEF resources through FY 2015. The 3DELRR program completed its study in FY 2014 and has included DEF design production within its current contract. With funding also provided by the DEF program, these efforts are set to begin in 2Q FY 2015.

2 Systems Engineering Workforce

2.1 Workforce Development Initiatives

Air Force SE workforce initiatives continued to support goals established by the Service Acquisition Executive (SAE) in the 2009 Air Force Acquisition Human Capital Strategic Plan as well as the goals set by OSD (AT&L) under Better Buying Power 2.0 to improve the professionalism of the total acquisition workforce. The judicious use of FY 2008 NDAA Section 852 DAWDF-funded employment incentives, such as student loan repayment and first duty station move, has enhanced the Air Force's ability to attract highly qualified recent graduates and experienced journeymen. However, the Air Force continues to experience shortfalls in centralized force renewal hiring programs due to reductions in O&M funding. In response to this need, the Air Force developed a detailed plan for replenishment hiring using DAWDF. This would augment O&M funding to ensure sufficient numbers of recent graduates are hired as current employees advance, separate, or retire from the acquisition workforce. This plan also proposed to continue offering student internships potentially leading to future acquisition careers.

An SE skills taxonomy was developed under the oversight of the Engineering Enterprise Strategic Plan working group that is aligned with the draft Engineering Enterprise Strategic Plan Roadmap. The taxonomy is developed to follow the OSD and OPM guidance on competencies for the engineering enterprise across the Centers in AFMC and AFSPC.

In 2014, the Air Force expanded its use of social media as part of its branding and enterprise recruiting strategies for its acquisition workforce. Tailored to the unique challenges of each of its acquisition product, sustainment, and test locations, this DAWDF-funded effort included development and maintenance of recruiting websites, enterprise-wide advertising, and other recruitment materials and tools.
In 2013, the Air Force completed the first study of the state of health of the civilian and military STEM workforce. In 2014, the Air Force updated this study and found noticeable improvements in the age distribution of the workforce under 40 years old. More emphasis was placed on hiring entry level employees by supporting student hire programs, and expanding the application of Acquisition Personnel Demonstration Program policies to a larger number of Air Force organizations. Following a detailed examination of the Air Force Laboratory Personnel Demonstration Project (Lab Demo) and the Civilian Acquisition Workforce Personnel Demonstration Project (Acq Demo), the Air Force began a concerted effort in 2014 to expand the adoption of the Acq Demo across the entire Air Force acquisition enterprise.

> Also in 2014, the SecAF released the second generation of its Science, Technology, Engineering, and Math workforce strategy, Bright Horizons 2.0. It establishes objectives to ensure the vitality of the STEM workforce to 2018 and beyond. AFMC/EN and AFSPC/EN continue to provide a focused workforce development and assignment process across the Air Force to provide highly qualified and capable SEs to our customers and stakeholders as required. This effort includes consciously grooming our SE and DP workforce from the moment they are recruited throughout their entire career. Competency managers will orchestrate mentoring, succession planning, and development assignments of individuals to accomplish this goal using core competencies as the measure of success.

The Air Force will use DAWDF to provide targeted retention incentives (Student Loan Repayment, and Retention Allowances) as needed to preserve critical skills and expertise such as experienced Systems Engineers. In addition, the Air Force will use DAWDF resources to respond rapidly as training and development gaps are identified. For example, a new initiative will send several S&E civilians to the US Army Operations Research Systems Analysis Military Applications Course. DAWDF funding continues to support civilian Tuition Assistance, and continuing professional education courses at the Air Force Institute of Technology targeted at providing Systems Engineering with Specialty Engineering skills, such as Human Systems Integration, Developmental Planning, T&E, Technology Readiness Assessment, and Manufacturing Readiness Assessment. DAWDF funding is helping ensure the continued availability of assignment-specific and professional currency courses despite significant reductions in MAJCOM O&M budgets for training. DAWDF funding is also helping to make available civilian advanced degrees in STEM.

2.2 SE Workforce Resourcing

Preliminary assessments of the hiring freeze, sequestration, and furloughs are being developed but the long-term impact of FY 2014 financial constraints on the SE workforce is inconclusive at this time. The initial indications are that total Air Force SE workforce separation rates remain below the rates for the total Air Force. The FY 2013 retention rate for engineers is the highest rate since FY 2009. Two possible explanations are offered. First, highly skilled engineers may require more time to search for and land the right job. Second, many engineers may be holding out for a VERA/VSIP buy-out. However, stringent constraints on O&M funding for new hires and supporting developmental PCS moves may adversely affect both succession planning and retention.

Following extensive analysis in FY 2014, in FY 2015 the Air Force will begin to execute the expansion of KLPs to ACAT I functional lead positions, including Chief Engineers.

The Air Force requires continuation of the DAWDF and Science, Mathematics, and Research for Transformation (SMART) programs to ensure effective execution of acquisition workforce improvement initiatives for recruiting, hiring, training, and retention to support knowledge transfer and workforce replenishment. The Air Force is exploring the potential of expanded Direct Hire Authority for members of the acquisition workforce, similar to that available for S&Es under Lab Demo.

2.3 Department of the Air Force SE Workforce

Table 1: Systems Engineering Workforce in the DoD

Reported for Military Department Systems Engineers and DASD(SE)					
Total Number of Civilian and Military Acquisition Engineering Personnel					
Fiscal Year	Year Ending	US Army	US Navy	US Air Force	DASD(SE)
FY05	30-Sep-05			6,505	
FY06	30-Sep-06			6,237	
FY07	30-Sep-07			6,162	
FY08	30-Sep-08			6,429	
FY09	30-Sep-09			7,197	
FY10	30-Sep-10			7,625	
FY11	30-Sep-11			8,514	
FY12	30-Sep-12			8,649	
FY13	30-Sep-13			8,518	
FY14	30-Sep-14			8,475	

Planned Growth in Civilian and Military Engineering									
Fiscal Year	Year Ending	US Army		US Navy		US Air Force		DASD(SE)	
		Planned Growth	Projected End Strength	Planned Growth	Projected End Strength	Planned Growth	Projected End Strength	Planned Growth	Projected End Strength
FY15	30-Sep-15					180	8,690		
FY16	30-Sep-16					-48	8,642		
FY17	30-Sep-17					-92	8,550		
FY18	30-Sep-18					-88	8,462		
FY19	30-Sep-19					-17	8,445		

Total Number of Non-Government Systems Engineering Support Personnel (FTEs)					
Fiscal Year	Year Ending	US Army	US Navy	US Air Force*	DASD(SE)
FY12	30-Sep-12			10,547	
FY13	30-Sep-13			10,186	

*Obtained from summing DPAP codes R414, R421, and R425

ATTACHMENT

AIR FORCE
ENGINEERING ENTERPRISE
STRATEGIC PLAN
2014-2024

AIR FORCE ENGINEERING ENTERPRISE STRATEGIC PLAN 2014 - 2024

FOREWORD

To fulfill its mission, it is imperative the United States Air Force successfully execute joint warfighter operations across the air, space, and cyberspace domains. Our support of these operations requires developing, fielding, and sustaining weapon systems and equipment that provide tactical and strategic superiority to our warfighters across all three domains.

In the more than 60 years that have passed since the Air Force's founding, our engineers and scientists continue to lead the world in the development of those cutting-edge weapon systems vital to the security of our nation and its allies. The ability of the Air Force to deliver superior weapon systems to the warfighter strengthens our sacred trust with national leadership and with our fellow citizens. Air Force technological achievements are based upon the ingenuity of our engineering and scientific workforce, which repeatedly unites with the operational community, industry, and academia to deliver game-changing systems, and systems-of-systems, while achieving a balance between cost, schedule, and performance.

Amid ever-changing threats and today's fiscal realities, Air Force engineers and scientists continue to fulfill their duty to our nation and to the warfighter. Although our talents are strong, the sheer dynamics of the fast-changing global environment demand we harness the necessary tools and technologies to continue improving the way we execute our mission. With this strategic plan, a clear course is charted for the future of the Air Force Engineering Enterprise.

I approve this strategic plan as a guide for Air Force engineers and scientists and their leadership, as they continually push innovation to deliver affordable war-winning capabilities for future decades.

Deborah Lee James
Secretary of the Air Force

Mark A. Welsh III
General, USAF
Chief of Staff

EXECUTIVE SUMMARY

This Air Force Engineering Enterprise Strategic Plan is designed to address the demands of a fast-changing warfighting environment by delivering a strategic vision and governance structure for the entire Air Force Engineering Enterprise (EE).

The Air Force Engineering Enterprise is the network of interdependent engineers, scientists, and technical managers; processes; and supporting infrastructure providing U.S. Air Force mission capability by shaping requirements and providing technical leadership for research, development, test, manufacturing, deployment, sustainment, and disposal of Air Force systems and systems-of-systems.*

Since 1947, the Air Force has been a highly technical service, built on a foundation of engineering discipline and expertise, as well as a culture of innovation, competency, and integrity. As the options provided by technology have increased, the world's political climate has become much more complex. When combined with budgetary pressures, this climate demands greater vigilance by the Air Force. The new Air Force engineering vision and mission established in this plan provides a guiding star for the engineering enterprise response to these challenges.

Vision: To be a focused engineering enterprise with a culture of discipline and agility that enables warfighter's success.

Mission: Provide superior technical expertise to plan, acquire, and sustain dominant warfighting capability through an efficient, effective, and innovative engineering enterprise.

At the direction of the Secretary of the Air Force (SecAF), the engineering enterprise has established a strategic governance structure to attain this vision. Through this governance structure, the Air Force engineering senior leadership has identified four priorities for implementation across the enterprise:

Priority 1: Refine engineering enterprise governance, roles and responsibilities, and supporting policy

Priority 2: Enable high-quality engineering decisions and seamless communication

Priority 3: Improve engineering discipline through technical information management and standardization

Priority 4: Address engineering enterprise workforce issues, including core competencies, structure, development, and assignments

The vision, mission, and priorities outlined in this strategic plan, led by the strategic governance structure, provide a framework for what will be a relentless pursuit of engineering efficiency and excellence.

****The EE does not include installation or medical support activities.***

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1.0 STRATEGIC ENVIRONMENT

The capability of the United States to win wars hinges on its ability to sustain its technological edge over emerging, highly adaptable, asymmetric threats and to optimize services for joint operations. It must also possess the ability to authoritatively counter the host of nations pursuing the latest military capability, from roadside explosives to weapons of mass destruction.

This leads to a dramatic increase in system and system-of-systems complexity, creating an increasingly difficult and multifaceted engineering challenge. Additionally, our nation faces real fiscal challenges that constrain the funding of future warfighting capabilities. Simultaneously, the Air Force is experiencing a loss of technical expertise in key areas as the workforce ages and fiscal realities hinder our ability to effectively recruit and retain engineers and scientists. The Air Force must continue its tradition of a solid and responsive engineering foundation by supporting a professional workforce that employs structured engineering practices with discipline and integrity to find affordable and innovative solutions to warfighting challenges.

> ***"Only through the efforts of Airmen who have led the way in integrating military capabilities across air, space, and cyberspace—even as their numbers have become significantly smaller—has our nation maintained its airpower advantage."***
>
> ***USAF Posture Statement 2013***

2.0 OVERVIEW OF STRATEGIC PLANNING

The Air Force engineering leadership, consisting of the most senior engineering Air Force professionals, has developed an Air Force Engineering Enterprise strategic planning model and established a governance structure to address the challenges of our strategic environment. The strategic planning model defines how leadership will develop strategic direction down to actions and implementation. This includes a description of the required planning documentation as well as the frequency of relook/refresh for all engineering strategic planning activities. The Air Force EE governance structure provides leadership and guidance for the strategic planning process, as well as oversight and accountability of the implementation activities.

2.1 Strategic Planning Model

This strategic plan spans ten years and will be revisited every four years to ensure alignment with Air Force, Department of Defense (DoD), and national strategic objectives. The EE strategic planning model in Figure 1 illustrates the components of its strategic planning efforts.

The EE vision and mission serve as a guiding star to the enterprise and provide a unified direction for strategic planning. Taking the vision and mission into account, as well as the current state of Air Force engineering, the engineering leadership identified priority areas for improvement that capture the heart of the enterprise's strategic-level focus. These EE priorities and associated goals are documented in this plan.

To implement the priorities, an operational-level EE Roadmap will describe the goals in greater detail and provide a high-level overview of the objectives required to meet those goals. The Roadmap, signed by the Assistant Secretary of the Air Force for Acquisition (SAF/AQ), will span four years and be revisited every two years to ensure alignment with the strategic plan. Priority goals will describe how the EE priorities, mission, and vision will be realized.

Finally, EE action plans will describe the objectives in further detail and provide near-term, actionable tactics for achieving those objectives. The action plans, signed by the Deputy Assistant Secretary of the Air Force for Science, Technology and Engineering (SAF/AQR), will span two years and be revisited annually to ensure alignment with the Roadmap. The detailed tasks defined in each action plan will be the basis for measuring progress towards accomplishing the objectives, goals, priorities, and ultimately the EE vision.

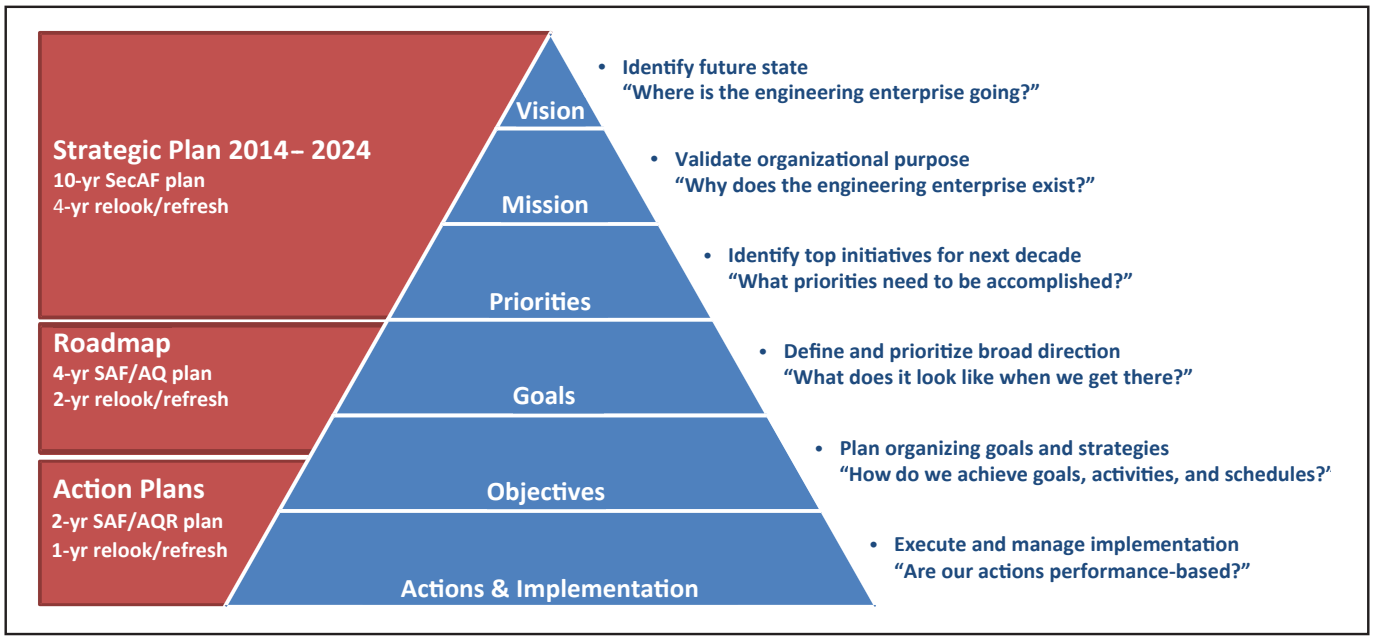


Figure 1 – Air Force Engineering Enterprise Strategic Planning Model

Figure 2 – AF Engineering Enterprise Governance Structure

2.2 Governance Structure

The Air Force EE governance structure provides leadership and guidance for the strategic planning process, as well as oversight of, and accountability for, the implementation activities. It is composed of senior Air Force advisory members and senior engineering leadership members who guide the actions necessary to achieve the priorities. There are three levels in this structure shown in Figure 2: 1) the Senior Advisory Group, 2) the EE Executive Council (EEEC), and 3) the EE Priority Champions.

The Senior Advisory Group, which is chaired by SAF/AQ and includes the Air Force Materiel Command Executive Director (AFMC/CA), the Air Force Space Command Executive Director (AFSPC/CA), and the Air Force Chief Scientist (AF/ST), advises and supports the EEEC. The Senior Advisory Group acts as a deliberative body that guides the Air Force engineering strategic approach and provides executive perspective on budget, people, and resourcing.

The Air Force EEEC, chaired by SAF/AQR, is the primary EE decision body and is responsible for implementing a comprehensive and actionable strategic planning approach. The EEEC also includes the AFMC Director of Engineering and Technical Management (AFMC/EN) and the Space and Missile System Center Director of Engineering (SMC/EN) as well as the Air Force Systems Engineering Senior Leader (AF SE SL). The EEEC is chartered to establish the EE priorities and develop the EE Roadmap, to include the goals which are necessary to achieve the priorities. It conducts annual reviews to assess the progress, execution, and effectiveness of the action plans.

Each priority is led by a general officer-level Priority Champion, who is responsible for developing goals, establishing goal teams, and working with commanders and supervisors to lead the implementation process. Each Priority Champion develops an action plan, ensuring it contains feasible and executable tactics for achieving its goals. The Priority Champions also ensure the action plans are aligned with the Roadmap and the overall EE strategic plan.

This governance structure provides leadership and guidance for the strategic planning process, as well as oversight and accountability of the implementation activities.

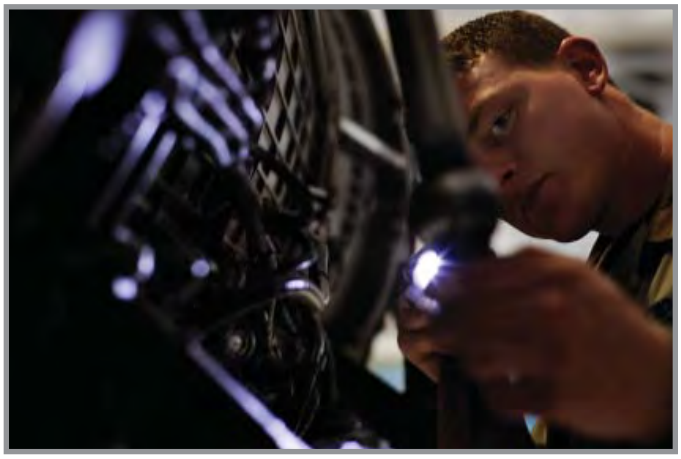
3.0 AIR FORCE ENGINEERING ENTERPRISE STRATEGY

The unifying theme at the foundation of this strategy is that engineering efforts in the Air Force must fully support the effort to plan, build, and sustain effective, affordable systems in support of the joint warfighter. The EE must add value to the Air Force by providing sound technical judgment and expertise from a highly skilled workforce. The implementation of this strategy is crucial to achieving Acquisition Excellence as called out in the Air Force Strategic Plan, October 2008.

The EE encompasses a wide array of expertise, knowledge, tools, processes, standards, practices, facilities, and analytical capabilities. This enterprise impacts the entire range of systems employed by the Air Force, including all of our aircraft, satellites, launch vehicles, command and control systems, cyber systems, weather systems, air defense systems, air traffic control systems, force protection systems, armaments, nuclear weapons, intelligence, surveillance, and reconnaissance systems, as well as the test systems, ancillary systems, IT systems, and the ground and support equipment that accompany them. The facilities and environment in which the Air Force EE operates, and its statutes and regulations, require great depth and breadth of knowledge. This complexity requires personnel with skills in all of the technical, engineering, and scientific disciplines to include hardware; software; communications; environment, safety, and occupational health (ESOH); quality; and security.

The Air Force Engineering Enterprise is the network of interdependent engineers, scientists, and technical managers; processes; and supporting infrastructure providing U.S. Air Force mission capability by shaping requirements and providing technical leadership for research, development, test, manufacturing, deployment, sustainment, and disposal of Air Force systems and systems-of-systems.

Through disciplined implementation of the strategic planning model and governance structure defined in this plan, the engineering leadership has developed a new vision, mission, and supporting priorities to provide strategic focus and direction for the diverse engineering enterprise.



3.1 Vision

To be a focused engineering enterprise with a culture of discipline and agility that enables warfighter's success.

3.2 Mission

Provide superior technical expertise to plan, acquire, and sustain dominant warfighting capability through an efficient, effective, and innovative engineering enterprise.

3.3 Priorities

The Air Force EEEC, with the support of the senior advisory group and the engineering enterprise, has identified these four priorities:

Priority 1: Refine engineering enterprise governance, roles and responsibilities, and supporting policy

Priority 2: Enable high-quality engineering decisions and seamless communication

Priority 3: Improve engineering discipline through technical information management and standardization

Priority 4: Address engineering enterprise workforce issues, including core competencies, structure, development, and assignments

The priorities focus the enterprise on achieving its stated vision. An explanation of each priority with the associated goals is provided in the following sections.

3.3.1 Refine Engineering Enterprise Governance, Roles and Responsibilities, and Supporting Policy

> ***"Innovation is what we're all about—we always have been."***
>
> ***General Mark A. Welsh***
> ***Chief of Staff of the Air Force***

The EE must refine its roles and responsibilities, and its approach to executing those responsibilities, in order to operate within the current environment of reduced budgets, reduced manpower, new organizational constructs, and increased Congressional expectation to provide engineering confidence in all weapon system engineering processes.

A crucial first step in effectively handling the challenges posed by this strategic environment is to properly align the EE and reassess the roles and responsibilities of its members to respond to the increasingly complex issues related to weapons systems in any phase of the lifecycle. In addition, the large number of engineers and scientists supporting air, space, and cyberspace (including research, pre-program planning, lifecycle management, operations, and support) must be equipped to implement the EE activities and enable successful acquisition and sustainment of those weapons systems.

A key element of this priority is to establish and codify the process by which Air Force EE policies are created. Establishing such a process will afford the enterprise's leadership the opportunity to determine the most efficient and least prescriptive method for implementing direction. It will also provide them the opportunity to comply with higher levels of direction using non-policy approaches. Overall, such a process will eliminate redundant or conflicting policy while reducing the internal workload of managing multiple levels of policy.

Goals:

- ***Standardize roles and responsibilities of EE organizations and key positions.*** This will include revitalizing the Air Force Technical Authority process

to provide programs with unbiased, analytical overview and support. A functioning Technical Authority increases the value of the engineering perspective, keeps technical programmatics on track, and adds to program success at all levels.

- ***Focus and manage the EE portfolio of policy and process.*** This will include creating an engineering policy formulation process and policy architecture that efficiently produces succinct, usable policy for the enterprise. Such policy will focus on the value-added insight required for increased program support.

3.3.2 Enable High-Quality Engineering Decisions and Seamless Communication

As the Air Force Chief Engineer, SAF/AQR provides timely and effective engineering insight to Air Force leadership, including the Service Acquisition Executive. While budgets are decreasing, the Air Force faces an increasing number of adversaries who are acquiring or developing the means to challenge it. Therefore, we must devote attention to comparing the benefits of increased operational effectiveness (that is, warfighter utility) with the costs of achieving new capabilities. Early systems engineering can help the Air Force optimize its investments and own the technical baseline to avoid pitfalls of latent cost, schedule, and performance issues. Most importantly, care needs to be taken to evaluate enterprise solutions holistically, rather than continuing to promote stove-pipe approaches.

> ***"Faced with compounding fiscal challenges, we must make prudent choices to ensure the Air Force continues to preserve our nation's airpower advantage."***
>
> ***USAF Posture Statement 2013***

It is imperative that the EE infuse technical insight earlier into the requirements process by developing analytical tools capable of providing "trade space" analysis across a system's lifecycle. The Air Force's

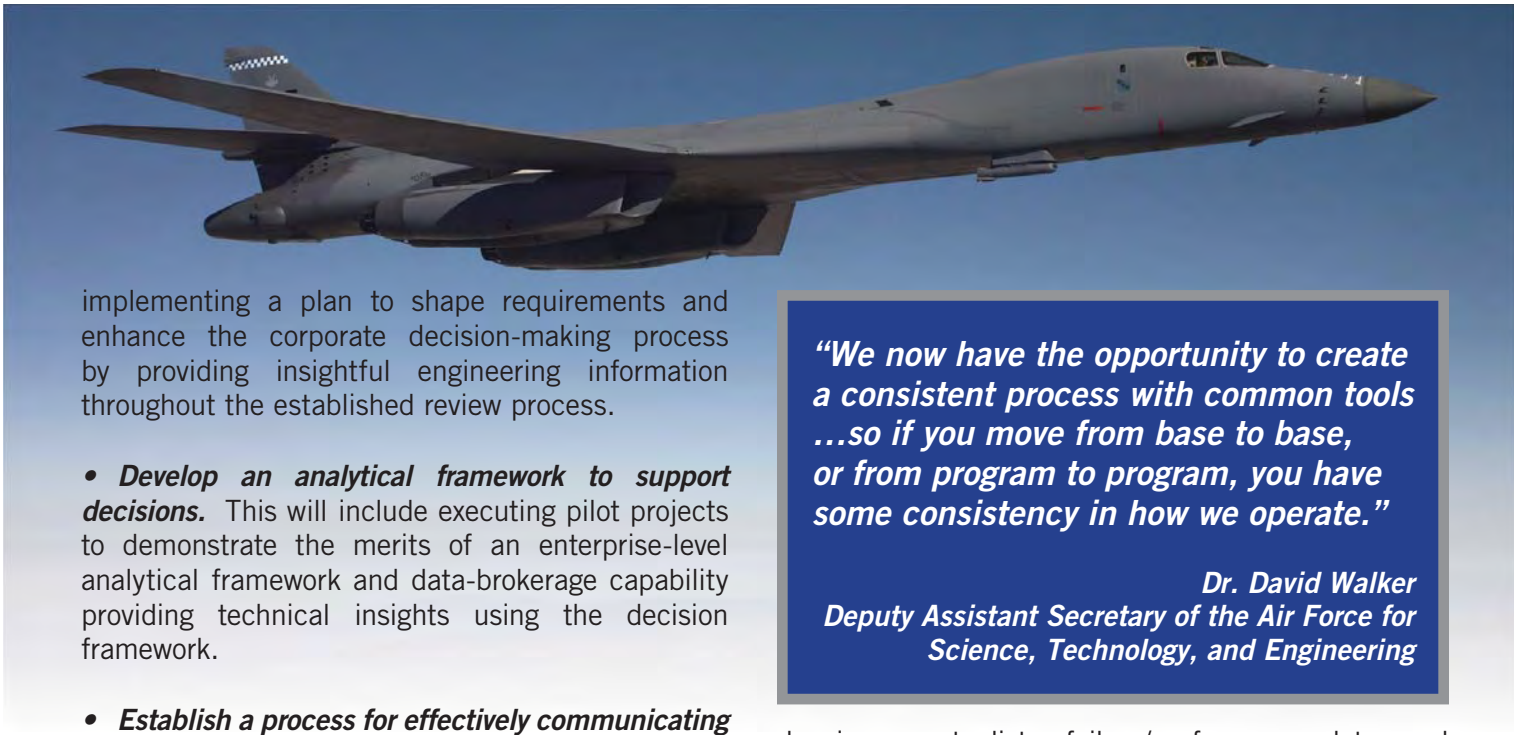
current suite of analytic tools are narrowly focused and not well suited to large trade-space analysis. Also, these analytical approaches are sometimes deficient in regards to operator-in-the-loop, cyber, command and control, acquisition intelligence, and system-of-system interactions. A systematic approach to analysis will be established that integrates technologies and operations, rather than relying on narrowly-focused performance evaluations that do not sufficiently incorporate operational insights or enterprise optimization.

Additionally, the Air Force Engineering Enterprise needs to improve and expand upon its internal communications. The vast engineering enterprise spans research, development, test and evaluation, operations, and sustainment. However, these individual functions are often isolated from each other, both geographically and analytically. Various forums currently exist to enable cross-communication and information exchange to a limited degree, but they must be optimized. In addition, we must pursue and enforce the use of common tools and data where possible to aid in our collaboration initiatives.

The ability to collaborate across the enterprise will be a catalyst for significant improvements in all engineering processes. Tremendous efficiency is gained when concepts, data, models, alternatives, and technologies are readily exchanged across the engineering enterprise. Therefore, comprehensive enterprise communication is a key not only to innovation, but also to effectiveness in engineering efforts.

Goals:

- ***Formalize role of engineering in the decision framework.*** This will include developing and



implementing a plan to shape requirements and enhance the corporate decision-making process by providing insightful engineering information throughout the established review process.

• ***Develop an analytical framework to support decisions.*** This will include executing pilot projects to demonstrate the merits of an enterprise-level analytical framework and data-brokerage capability providing technical insights using the decision framework.

• ***Establish a process for effectively communicating across the engineering enterprise.*** This will include developing and employing a concept of operations to improve collaboration and exchange of information both horizontally and vertically across the enterprise.

> ***"We now have the opportunity to create a consistent process with common tools …so if you move from base to base, or from program to program, you have some consistency in how we operate."***
>
> ***Dr. David Walker***
> ***Deputy Assistant Secretary of the Air Force for Science, Technology, and Engineering***

3.3.3 Improve Engineering Discipline through Technical Information Management and Standardization

One of the keys to effective lifecycle management is the ability to make knowledge-driven decisions. The engineering enterprise is particularly dependent on a vast array of technical data and information to perform day-to-day functions and enhance its knowledge base. However, the Air Force currently lacks an enterprise approach for obtaining, maintaining, and using this vital technical information. It must better manage and govern technical data to ensure its engineering enterprise is effectively supporting the delivery of critical warfighting capabilities.

The engineering enterprise workforce must have the capability to access and protect the technical information that will help engineers and scientists execute their program responsibilities. This information can include specifications, best practices, process guides, technical reports and orders, drawings, parts lists, failure/performance data, and much more. Making quality engineering decisions also depends on having immediate access to these various forms of engineering data in a useful format. As Air Force systems become more complex, the tools and ability to search and assimilate these vast amounts of information into actionable decision material must also evolve. Our geographically diverse and dispersed engineering enterprise must also have the means to effectively collaborate. A common set of tools will enhance workforce portability from program to program, provide for consistent access to decision support tools, and better enable more disciplined use of technical information.

Specifications and standards are another essential component of the technical information used to ensure quality in development and sustainment operations. In this post-acquisition reform era, the Air Force must revitalize implementation of, and participation in, the Defense Standardization Program (DSP). The DSP is an important tool for enabling consistent application of best practices, implementation of interface standards, acquisition of parts that meet performance requirements, and creation of efficient engineering activities across the lifecycle. It should be noted that standards managed within the DoD Information Technology Standards Registry have already been mandated and are managed through a joint committee.

Goals:

- ***Revitalize and formalize management and use of technical data.*** This will include revitalizing and formalizing the management and use of Air Force technical data and information to improve the quality of engineering products and decisions.

- ***Develop a management plan for an Air Force portfolio of specifications and standards.*** This will include developing an implementation plan consistent with the DSP.

- ***Create an Air Force engineering knowledge management capability.*** This will include creating a web-enabled knowledge management capability that helps the engineering enterprise workforce to access and deposit information, while also fostering collaboration efforts.

3.3.4 Engineering Enterprise Workforce Issues - Core Competencies, Structure, Development, and Assignment

The Air Force is a technologically-driven service that prides itself on the ability of its engineering enterprise workforce to meet the ever-increasing challenges of the 21st Century. Indeed, a key to the Air Force's success is its technological superiority over any adversary. On the other hand, highly technical companies have their own challenges remaining competitive in their markets. In doing so, they will provide strong competition to the DoD in recruiting and retaining top engineering and scientist talent. Therefore, the Air Force must constantly invest in the development and retention of its EE workforce.

One of the most important issues facing the enterprise is addressing the core technical competencies needed for the workforce of the future. This will be accomplished by establishing a common taxonomy for workforce needs. The taxonomy will help build a common framework at the center, command, and Air Force levels for allocating engineers and scientists and determining future manpower needs. Once the framework is established, and engineers and scientists are aligned to technical disciplines and competencies, the Air Force must ensure the framework is sustained and balanced. To accomplish this, the Scientist and Engineer functional manager, SAF/AQR, will oversee this core competency management framework/ process using the Scientist and Engineer Advisory Council (SEAC) as the governing body. The workforce activities of this council will additionally leverage the efforts of groups such as the Science, Technology, Engineering, and Mathematics Advisory Council (STEMAC) and the Air Force Science, Technology, Engineering, and Mathematics (STEM) Workforce Strategic Roadmap (Bright Horizons) to ensure there are no duplication of efforts among them. Tools and processes will be employed to develop, recruit, educate, and train an efficiently balanced workforce of program office, maintenance, supply chain, and support office engineers and scientists. For instance, a staffing deployment process would allow the development of specific career tracks for highly

> ***"Recruiting and developing high quality, innovative Airmen who leverage technology to rethink military operations to achieve strategic objectives will remain a fundamental tenet of the United States Air Force."***
>
> ***USAF Posture Statement 2013***

skilled, experienced individuals as well as providing an agile workforce because engineers and scientists will be allowed to cross over into more than one technical discipline or core technical competency throughout their career. This will allow a more widely experienced and educated workforce to draw on for current and future Air Force needs.

Also, a process will be created to manage the technical careers of the engineering enterprise workforce and to identify resource requirements and sources to support career-broadening moves. An essential element of this process will be to construct an efficient way to connect a manpower need, for example in a program office, with the right technical competency, regardless of geographical location.

Finally, the EE will create a development path for promising individuals that ensures their development as leaders in the career field. The Air Force needs a core set of technical experts and leaders who can provide the very best technical advice for the acquisition, test, deployment, and sustainment of the world's best air, space, and cyberspace systems.

Goals:

- ***Develop and manage an Air Force EE core competencies taxonomy (to include specialty engineering disciplines).*** This will include developing an Air Force EE competency taxonomy to 1) increase Air Force leadership insight into all engineering enterprise workforce strengths, weaknesses, and gaps; and 2) increase effectiveness of all EE workforce hiring, development, and succession planning efforts, including education, training, mentorship, and experience.

- ***Refine Center staff workforce development responsibilities and define structure for program offices.*** This will include standardizing workforce development core mission areas across AF Major Commands and Centers, standardizing critical position duty titles, and determining program-office manpower requirements based on the unique complexity and workload drivers for each program office.

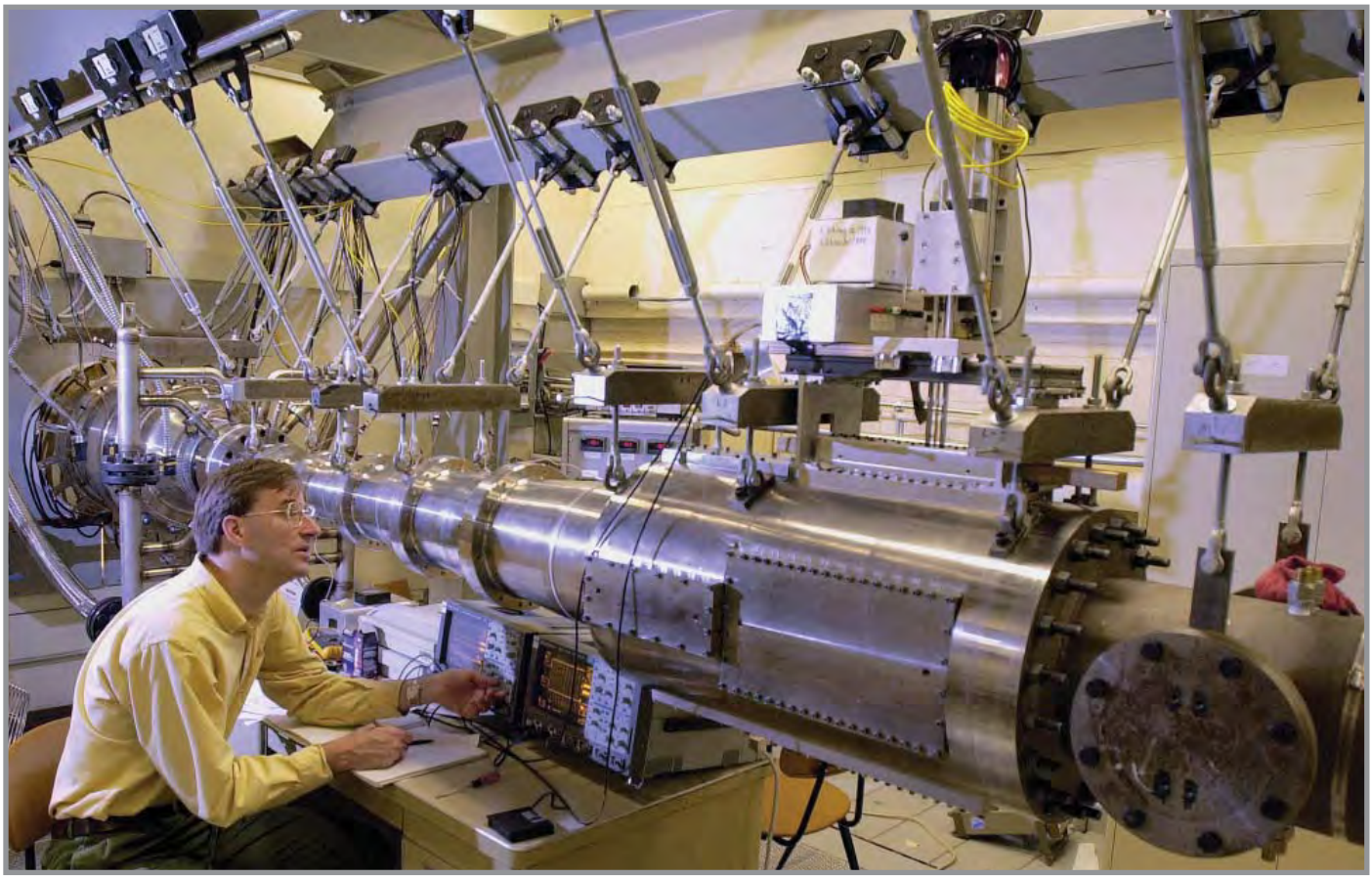
- ***Focus workforce development and assignments to provide a highly qualified and capable workforce.*** This will include preserving Air Force core technical competencies by performing competency gap assessments and managing critical skill development, career assignments, education, training, and succession planning for engineers and scientists.

4.0 Way Ahead

The Air Force Engineering Enterprise is comprised of a tremendous team of professionals providing a solid foundation of integrity, discipline, and innovation. With a shared motivation to increase its ability to provide technical advice and information at critical points in the lifecycle of weapon systems, the EE will help ensure the Air Force remains the best in the world.

This strategic plan charts the way forward for the enterprise to reach its desired end state of establishing a governance structure with clearly defined roles and responsibilities supportive of the acquisition process and anchored by integrated and executable policy; providing sound technical judgment to program managers and expert technical advice to decision makers; delivering standardized engineering tools, processes, and technical information management practices to create consistency across all engineering functions throughout the lifecycle; and fostering a highly qualified and capable engineering workforce of technical experts and leaders supported by a process that matures the very best into decision makers of the future.

The vision, mission, priorities, and goals outlined in this plan provide a framework for what will be a relentless pursuit of engineering efficiency and excellence. The next step in this journey is to develop and implement the Roadmap and action plans which will guide Air Force engineers and scientists to achieve the vision of the engineering enterprise.



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Acronyms

ACAT	Acquisition Category
ADM	Acquisition Decision Memorandum
AFI	Air Force Instruction
AFLCMC	Air Force Life Cycle Management Center
AFMC	Air Force Materiel Command
AoA	Analysis of Alternatives
APB	Acquisition Program Baseline
AS	Acquisition Strategy
AS	Air Segment
ASA(ALT)	Assistant Secretary of the Army for Acquisition, Logistics, and Technology
ASN(RDA)	Assistant Secretary of the Navy for Research, Development, and Acquisition
AT	anti-tamper
AT&L	Acquisition, Technology, and Logistics
C4	command, control, communications, and computers
CCA	Cost versus Capability Analysis
CCC	cross-cutting capabilities
CCR	call completion rate
CCR	Critical Change Review
CDD	Capability Development Document
CDR	Critical Design Review
CE	chief engineer
CJCSI	Chairman of the Joint Chiefs of Staff Instruction
COE	Common Operating Environment
COTS	commercial off-the-shelf
CPD	Capability Production Document
CPI	critical program information
CSB	Configuration Steering Board
DAB	Defense Acquisition Board

DAES	Defense Acquisition Executive Summary
DAG	Defense Acquisition Guidebook
DAPS	Defense Acquisition Program Support
DASD(SE)	Deputy Assistant Secretary of Defense for Systems Engineering
DASN(RDT&E)	Deputy Assistant Secretary of the Navy for Research, Development, Test, and Evaluation
DAU	Defense Acquisition University
DAWDF	Defense Acquisition Workforce Development Fund
DAWIA	Defense Acquisition Workforce Improvement Act
DFARS	Defense Federal Acquisition Regulation Supplement
DID	Data Item Description
DoD	Department of Defense
DoDI	Department of Defense Instruction
DON	Department of the Navy
DPAP	Defense Procurement and Acquisition Policy
DPWG	Development Planning Working Group
DTM	Directive-Type Memorandum
EMD	Engineering and Manufacturing Development (phase)
ENG	Engineering (career field)
ESLOC	equivalent source lines of code; effective source lines of code
ESOH	environment, safety, and occupational health
FAR	Federal Acquisition Regulation
FDD	Full Deployment Decision
FRP	Full-Rate Production
FTE	full-time equivalent
FY	fiscal year
GFE	Government-furnished equipment
GIDEP	Government-Industry Data Exchange Program
GOTS	Government off-the-shelf
HSI	human systems integration

HwA	hardware assurance
IA	information assurance
ICD	Initial Capabilities Document
ICD	Interface Control Document
IEEE	Institute of Electrical and Electronics Engineers
IIPT	Integrating Integrated Product Team
IMS	Integrated Master Schedule
IOC	Initial Operational Capability
IOT&E	Initial Operational Test and Evaluation
IPR	In-Process Review
IPT	Integrated Product Team
ISR	intelligence, surveillance, and reconnaissance
JCIDS	Joint Capabilities Integration and Development System
JFAC	Joint Federated Assurance Center
JROC	Joint Requirements Oversight Council
KLP	Key Leadership Position
KPP	Key Performance Parameter
KSA	Key System Attribute
LRIP	Low-Rate Initial Production
LSE	lead systems engineer
M&S	modeling and simulation
MAIS	Major Automated Information System
MDA	Milestone Decision Authority
MDA	Missile Defense Agency
MDAP	Major Defense Acquisition Program
MDD	Materiel Development Decision
MS	milestone
MSA	Materiel Solution Analysis (phase)
NAR	Non-Advocate Review

NAVAIR	Naval Air Systems Command
NAVSEA	Naval Sea Systems Command
NDAA	National Defense Authorization Act
NDIA	National Defense Industrial Association
NM	Nunn-McCurdy
NPS	Naval Postgraduate School
NSEG	Naval System Engineering Guidebook
NSESG	Naval Systems Engineering Stakeholders Group
O&S	Operations and Support (phase)
OIPT	Overarching Integrated Product Team
ORD	Operational Requirements Document
OSA	open systems architecture
OSD	Office of the Secretary of Defense
P&D	Production and Deployment (phase)
PARM	participating acquisition resource manager
PDR	Preliminary Design Review
PEO	Program Executive Office
PM	program manager
PMO	Program Management Office
PPP	Program Protection Plan
PQM	Production, Quality, and Manufacturing
PRR	Production Readiness Review
PSA	Program Support Assessment
R&M	reliability and maintainability
RAM	reliability, availability, and maintainability
RAM	rockets, artillery, and mortars
RAM-C	reliability, availability, maintainability, and cost
RDT&E	research, development, test, and evaluation
RFP	request for proposal

S&T	science and technology
SAF/AQ	Assistant Secretary of the Air Force for Acquisition
SAF/AQR	Deputy Assistant Secretary of the Air Force (Science, Technology, and Engineering)
SAG	Senior Advisory Group
SAR	Selected Acquisition Report
SDR	System Design Review
SE	systems engineering
SE WIPT	Systems Engineering Working Integrated Product Team
SEP	Systems Engineering Plan
SERC	Systems Engineering Research Center
SESG	Systems Engineering Stakeholders Group
SETR	Systems Engineering Technical Review
SFR	System Functional Review
SIPRNet	Secret Internet Protocol Router Network
SLOC	source lines of code; software lines of code
SMC	Space and Missile Systems Center
SoS	system of systems
SoSE&I	System of Systems Engineering and Integration
SPAWAR	Space and Naval Warfare Systems Command
SPRDE	Systems Planning, Research, Development, and Engineering
SRCA	systemic root cause analysis
SRR	System Requirements Review
SSE	system security engineering
STEM	science, technology, engineering, and mathematics
STRI	Simulation, Training and Instrumentation
SwA	software assurance
SYSCOM	Systems Command
T&E	test and evaluation
TD	Technology Development (phase)

TDP	Technical Data Package
TDS	Technology Development Strategy
TIM	technical information meeting
TMRR	Technology Maturation and Risk Reduction (phase)
TPM	Technical Performance Measure
TRA	Technology Readiness Assessment
TRADOC	Training and Doctrine Command
TRL	Technology Readiness Level
TRR	Test Readiness Review
TSN	trusted systems and networks
TTCP	The Technical Cooperation Program
UAS	unmanned aircraft system
USD(AT&L)	Under Secretary of Defense for Acquisition, Technology, and Logistics
USD(I)	Under Secretary of Defense for Intelligence
USSTRATCOM	United States Strategic Command
WIPT	Working Integrated Product Team
WSARA	Weapon Systems Acquisition Reform Act

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