



Air Force Engineering and Force Management



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8 August 2019



Overview



- Air Force Chief Engineer and Technical Authority
- Air Force Engineering Workforce
- Air Force Digital Engineering Enterprise
- Air Force Modular Open Systems Architecture
- Opportunities for Industry Insight



Chief Engineer and Technical Authority

SAF/AQR



- AF Engineering and Tech Authority for engineering policy, guidance, enterprise structure and processes
- Technical advisor to SAE on engineering, and Weapons System Cybersecurity
- Functional Manager for S&E Career Field

Engineering Workforce



- Assist Engineering Functional Manager
- CDE Outplacement
- Workforce Policy
- SEAC/STEMAC
- Assess health of engineer workforce
- Allocate FFRDC STE
- Strategic Comms
- Oversee AQR development programs
- Provide engineering workforce focus areas for recruit / retain
- Interface with SE Research and Tech Interchange Forums
- AF STEM Outreach
- EW/Cyber ROTC

Tech Advice to the Service Acq Exec / Systems Engineering Oversight



Technical Advice to SAE and AQ Capability Directorates

Digital Engineering, MBSE, Digital Thread/Twin, Product Lifecycle Mgr, Technical Data

Rapid Sustainment

Engineering Tools

Facilitate review/approval of acquisition and capability documents

AFRB preparation

Technical Risk Mgmt

Oversee Independent Tech Risk Assessments and Independent Technical Reviews

DoE Roundtable

Modeling & Simulation

AF M&S Tri-chair

Policy, Standards and Specialty



OPR for AF 62 series Policy Engineering Authority

Airworthiness

QA and Manufacturing Engineering/Tech Services

OCR for all other USAF policy, especially acq policy

ESOH Risk Acceptance

NEPA Compliance

Specialty Engineering Areas

Corrosion Cntl, Human Sys Int, Quality and Manufacturing, DMSMS, RM&A

Architectures

Standards

Modular Open Systems Architecture (MOSA)

Pick Lists

System Security Engineering



Cyber Resiliency for Weapon Systems (PEM)

Cyber Campaign Plan

Cyber Incident Rptg

Sec 1647

Software Development

Agile DevSecOps

SW Guidebook

Defense Exportability Features

Acquisition Intel

Program Protection Planning, PCTTF, Critical Prgm Info, JAPEC, JFAC, Data Protection, TSN, SCRM, COTS UAS



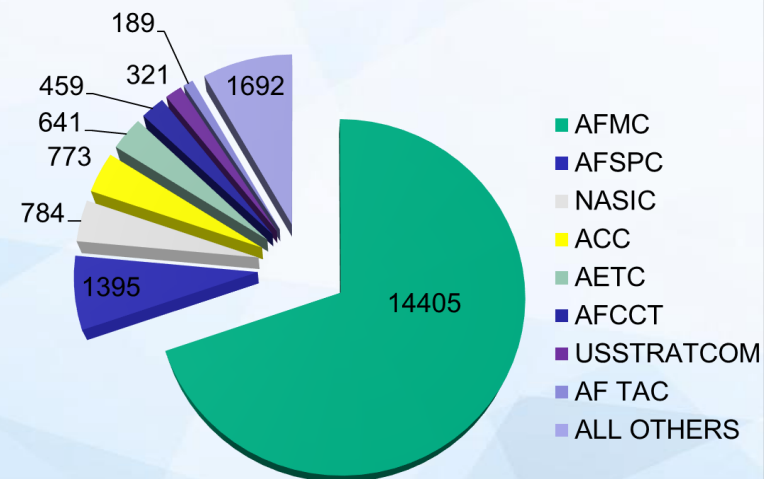
The AF Engineering Workforce



20,659 Person Engineering and Technical Workforce

- **Military**
 - 3,716 Military Engineers / 971 Scientists & Analysts (includes 420 in AFRES and 15 in ANG)
- **Civilians**
 - 12,818 in 19 Engineering/Technician series
 - 3,154 in 36 Scientist/Analyst series
- **Education Level**
 - 1,524 HS/GED/AA – 8,011 BS – 9,335 MS – 1,789 PhD

*15,113 are Acquisition coded



Military & Civilian S&E Workforce



VISION

To be a focused Engineering Enterprise with a culture of discipline and agility that enables warfighter success

MISSION

Provide superior technical expertise to plan, acquire, & sustain dominant warfighting capability through an efficient, effective and innovative Engineering Enterprise.

With an enterprise-wide mission and vision that seeks a culture of discipline and agility to enable warfighter success

- **RECRUIT**
 - **AF STEM Outreach & Recruiting**
 - K-12 and beyond
 - SMART, PAQ, PCIP
- **DEVELOP**
 - **CDE**
 - ELDI
 - Career Broadening
- **RETAIN**
 - Education With Industry (EWI)
 - FFRDC
 - MITRE, Aerospace, RAND, UARCs



Acquisition Technical Advice



- Technical Advice to the SAE and Systems Engineering Oversight
 - Participate in Program Milestone reviews, acquisition documentation, and technical meetings
 - Independent Technical Risk Assessment (ITRA) - oversight and/or participation
 - Facilitate review/approval of capability docs (support JROC as required)
- Enables continuous assessment & health reporting of SE activities to influence acquisition decisions for SAF/AQ Priority Programs (ITRA, SEP, AFRB, ASP, CSB)
- Ensure SAE/PEO/PMs/CEs are informed based on best available technical planning and independent assessments of technical base
- Coordinates/plans DoE roundtable meetings – communicates high level engineering considerations to lead engineers in the acquisition communities
- Major initiative support (i.e., contract language, small business initiatives, forum awareness)
- Translation/awareness of AFI and other policy (i.e., “business rules”)

Convey BEST technical advice to the SAE on acquisition programs’ technical and engineering integration risk



Enable Digital Engineering Across the Enterprise



DoD Digital Engineering Strategy

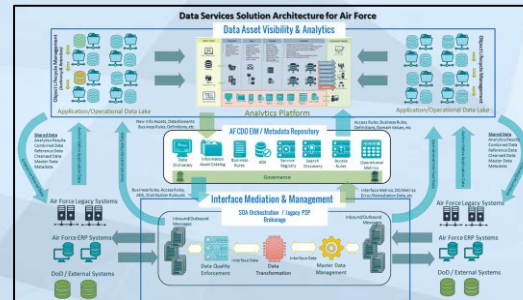
Digital Engineering

An integrated digital approach that uses authoritative sources of systems' data and models as a continuum across disciplines to support lifecycle activities from concept through disposal

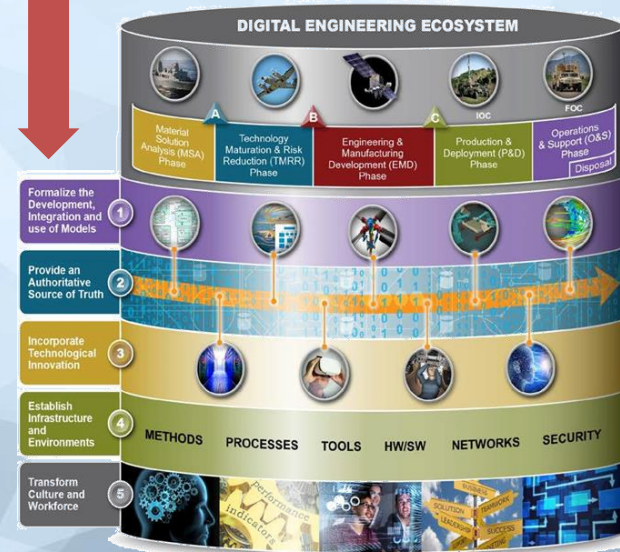
- 1 Formalize the **development, integration and use of models** to inform enterprise and program decision making
- 2 Provide an enduring **authoritative source of truth**
- 3 Incorporate **technological innovation** to improve the engineering practice
- 4 Establish supporting **infrastructure and environments** to perform activities, collaborate, and communicate across stakeholders
- 5 Transform a **culture and workforce** that adopts and supports Digital Engineering across the lifecycle



Air Force Data Strategy



Air Force Data Solution Architecture





AF Digital Engineering Enterprise Office (DEEO)



- Newly established AF DEEO, led by Mr. Jeff Mayer, Hanscom AFB, with team located at WPAFB and SAF/AQRE Pentagon
- The AF DEEO is engaged in several activities that will provide both immediate applicability and lay the groundwork to build and evolve our systems over time
 - Establishing the USAF Digital Engineering Center for Innovation and Training located at the Russ Research Center in Beavercreek, OH
 - This facility will serve as an initial consortium of USAF, Ohio University, Purdue University, University of Tennessee Chattanooga, Anautics Inc., and Sabel Systems administered by the Strategic Partnership Global Institute
 - Significant expansion of high speed networks across AF bases to utilize the Defense research and Engineering Network (DREN)
 - Hanscom, Hill, Tinker, and Eglin AFB's
 - Increase ability to share information, utilize centralized storage, and execute data analytics at the speeds necessary for real-time decision making



Some AF Digital Engineering Examples



- Ground-Based Strategic Deterrent (GBSD)
 - Implementing MBSE tools and practices from ground zero, to obtain “Knowledge Dominance,” and is the AF’s first PLM pilot for acquisition
- A-10 program leveraged DE and PLM
 - Used MBSE for repair a/c and quickly return to operational status, saving maintenance time
 - A-10 engineers used digital models to repair a wing after a bird strike
 - AF Engrs produced a precise part; Sq a/c mechs installed part w/o any add’l adjustments
- The B-52 Re-Engine program rapid prototyping project
 - Conducted a “digital fly-off” between power plants (engines), used digital M&S to compare fuel efficiency, maintenance requirements, and performance
- KC-46 Aircrew Training System (ATS)
 - Required access to computational fluid dynamics data to support flight testing
 - Instead of mailing hard drives, ATS used the AF’s HPC resources to move the data
- DE and MBSE in SMC Acquisition—Protected Tactical Enterprise Service (PTES) RFP
 - PTES team developed an integrated Sparx Enterprise Architect / Dynamic Object Oriented Requirements System (DOORS) MBSE model of the PTES system containing all of the PTES requirements, as well as detailed technical structural / data / and activity models



Product Lifecycle Management (PLM)



Vision: Enable Digital Enterprise Ownership of the Technical Baseline of systems, sub-systems, and end items over their lifecycle

Mission: Provide an enterprise capability that integrates lifecycle management processes through the creation, access, management and control of product data

PLM will enable:

- Product Data Management (PDM) Capability
- Process Management and Workflow Capability
- Data Authoring and Computer Aided Design (CAD) Capability
- Requirements Management Capability
- Implement Structured Bill Of Materials (BOM) Management
- Model-based Technical Data Package (MTDP)
- MIL-STD-31000B
- Engineering Data Management Office (EDMO) Transformation



Product Lifecycle Management (PLM) Systems collect and organize product data.



AF Open Architecture

...path forward



- Criticality of MOSA highlighted in NSS, NDS, AF Strategic Master Plan, Congressional language, and a memo signed by the service secretaries
- Three Keys to success:
 - [Open consensus-based standards](#) to which compliance can be verified
 - [Incentives](#) to use them
 - [Knowledge](#) and skills to employ them
- Stricter MOSA requirements in ongoing AFI63-101 rewrite ([incentives](#))
- SAE memo on recommended contractual considerations ([incentives](#))
- SAE mandated OMS/UCI, endorsed SCARS, UAI mandate in staffing, assessing emerging standards for similar mandates ([standards](#))
- New DAU course on MOSA published Spring of 2019, ongoing talks with AFIT to implement MOSA considerations in training ([knowledge](#))
- Established Open Architecture Management Office (OAMO) 1 Jan 2019 to manage AF open standards, coordinate with other standards bodies, and provide SPO outreach ([standards/knowledge](#))



AF Open Architecture

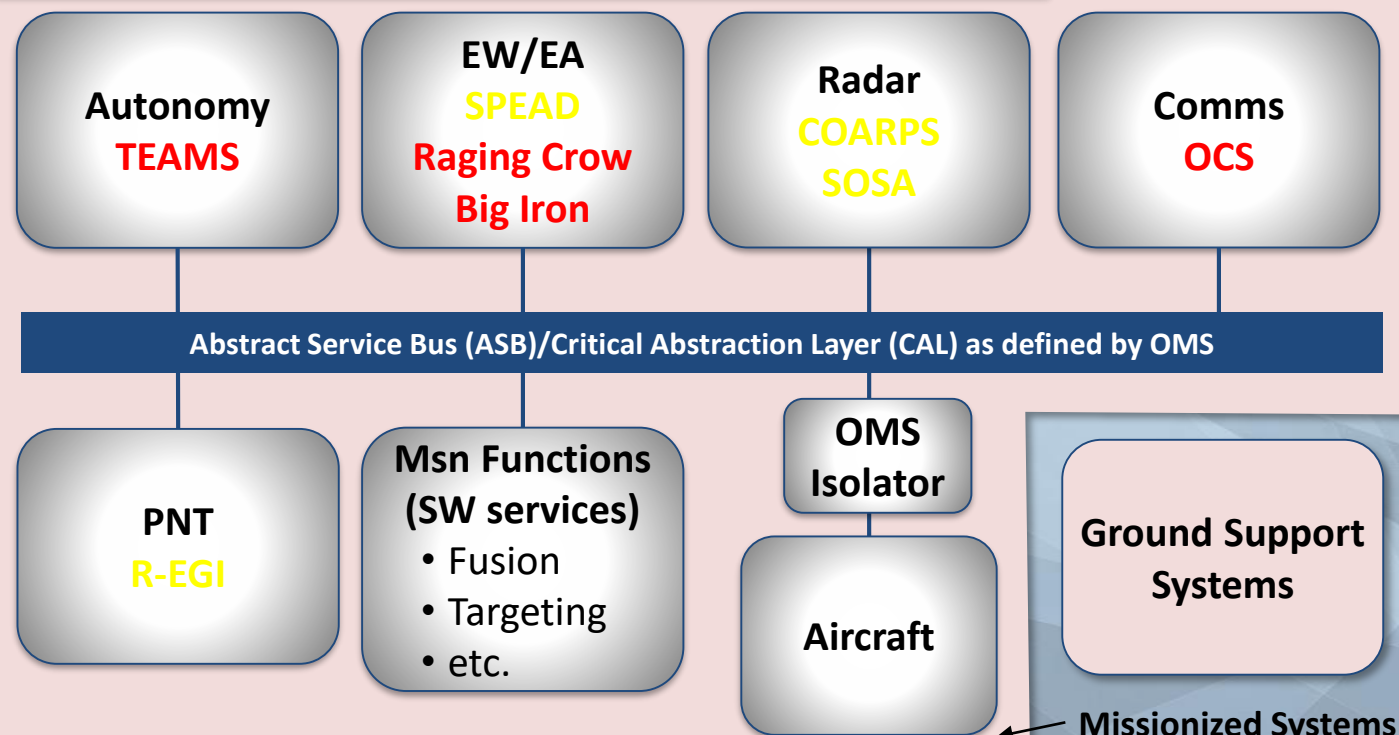
...path forward



- ✓ **OMS/UCI Foundation**
- ✓ **Align emerging consensus standards**
- ✓ **Manage open standards and architectures with OAMO**
- ✓ **Design in an MBSE Environment; automate the process; and enable early, dynamic, and continuous analysis**
- ✓ **Improves Interoperability**
- ✓ **Enables Innovation**
- ✓ **Enables cost/schedule savings**
- ✓ **Enhances competition**
- ✓ **Enables Technology Refresh**

<div>Agile</div> <div>Architectures</div> <div>Standards</div>	
Standard	TRL
OMS/UCI	9
Universal Armament Interface (UAI)	9
Future Airborne Capability Environment (FACE)	8
Sensor Open Systems Architecture (SOSA)	6
Scalable Payload for EA Development (SPEAD)	6
Common Open Architecture Radar Program Specification (COARPS)	5
Resilient – Embedded GPS/INS (R-EGI)	4
Open Communication Subsystem (OCS)	3
Teaming-Enabled Arch for Manned-Unmanned Systems (TEAMS)	2
Simulator Common Arch Requirements & Standards (SCARS)	2
Big Iron	1
Raging Crow (unfunded)	1

Air Force Reference Architecture (GRA) for Avionics





Challenges Ripe for Attention



- Cyber Security
- Evolving the culture
- Evolving Data Standards
- Tool Interoperability
- Linking MBSE across the Lifecycle
- Data Acquisition, Data Rights, & IP
- Infrastructure to move large 3D model files
- Common Taxonomies & Definitions with OEMs
- Communicating the Value Proposition & Metrics
- Enterprise-wide Governance





Opportunities for Industry Insight



- Virtual Technical Reviews
 - Identify methods, processes, procedures
 - What does a future Design Review look like?
- Develop Engineering Workforce
 - Identify skillsets required
 - Identify technology domains
 - Identify training best practices



