Headquarters U.S. Air Force

Integrity - Service - Excellence

The Way Ahead for Air Force Systems Engineering 2010 NDIA Conference

26 October 2010

Colonel Shawn Shanley
SAF/AQR
Chief, Engineering & Technical Management Division
shawn.shanley@pentagon.af.mil

U.S. AIR FORCE

U.S. AIR FORCE

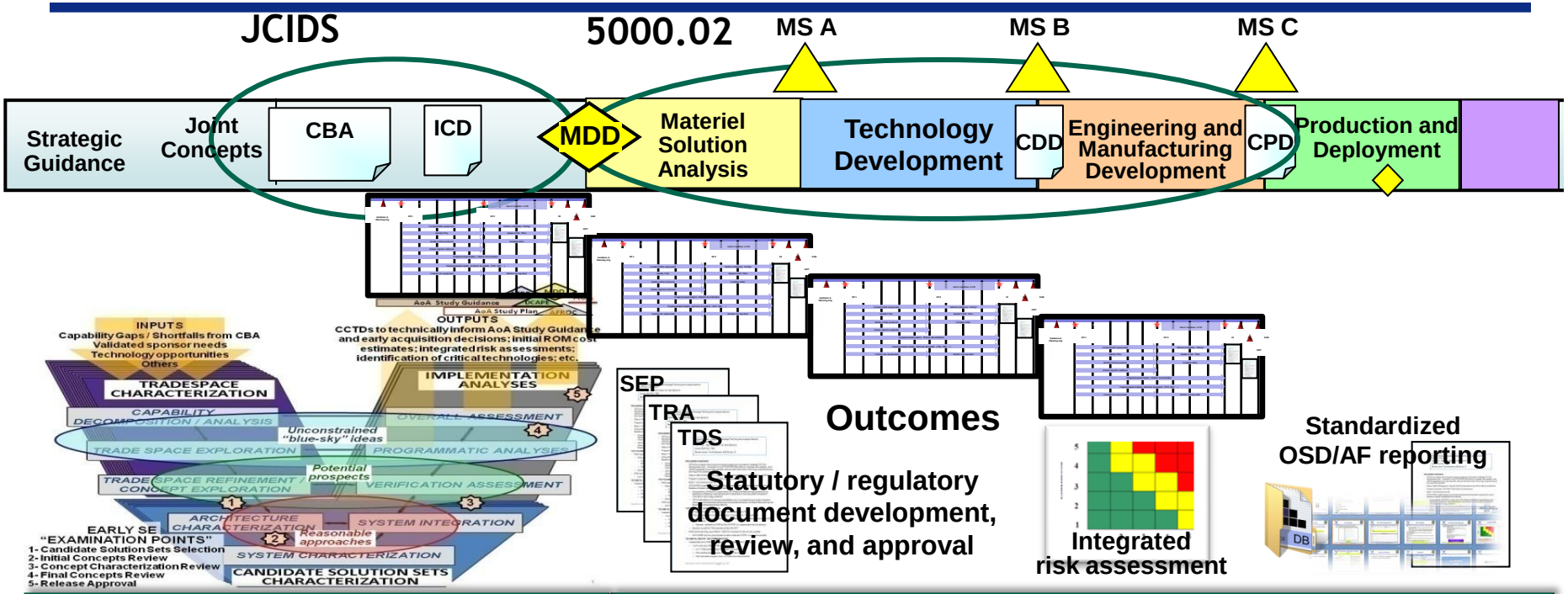
AF Top 5 SE Challenges

1. **Technical Planning & Execution**
   - *Stabilize programs before we commit resources (Pre-MS A)*
   - *Monitor/track/ assess programs to ensure they stay stable (MS A,B & C)*
   - *Integrate sustainment considerations throughout life cycle*
2. **SE Workforce**
   - Shape the way the Air Force manages our mission critical STEM capabilities
3. **Collaboration and Communication**
   - *Improve technical decision making via right info and insight at the right time to support informed & pro-active decision making*
   - *Act on available technical information to ensure effective and efficient program planning, management and execution*
4. **Technical Authority/Accountability**
   - *Codify technical accountability/authority in decision making process--Standardized SE*
   - *Drive efficiency through tailored/flexible standardization of policy, processes, practices, tools & metrics*
5. **Expediency**
   - *Characterize an expedited, tailored SE process for urgent needs, rapid fielding, and technology insertion*

U.S. AIR FORCE

Tech Planning & Execution

DP & PSR: Two Critical AF SE Initiatives



Development Planning Process (DP)

- S, T & E Engagement
- Concept/Solution selection influence
- SEP influence
- TDS influence
- T&E risk assessment
- TRL data evaluation

AF Program Support Review Process (AF PSR)

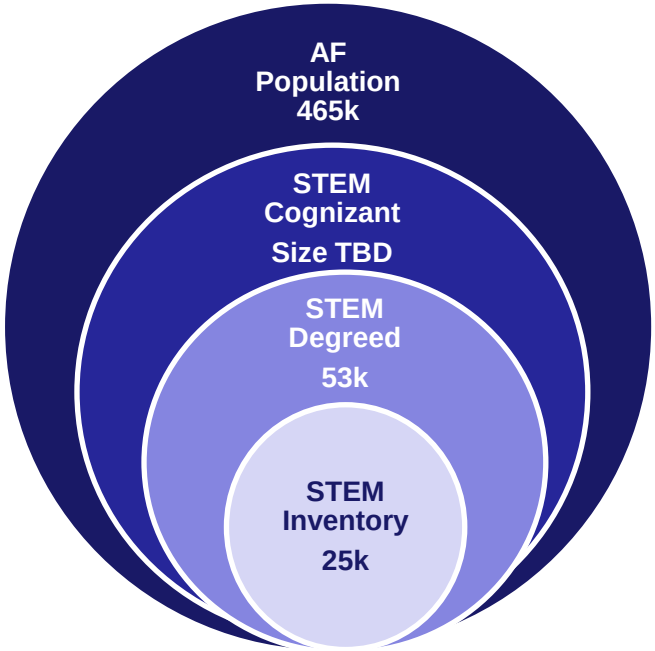
- SE Engagement up front and early with PMs to mentor/assist
- AF Standard for Tech Review Process
- Synchronized data requests to reduce program office & contractor impacts
- Identification of technology maturation/integration risks
- Collaborative with OSD to prevent surprises

SE Workforce: STEM – Revitalizing the AF Workforce

U.S. AIR FORCE

AF STEM Definition

The Air Force professionals having degrees in Science, Technology, Engineering, or Mathematics (STEM).



Goal Areas:

- **Requirements/Inventory**
- **Funding/Resources**
- **Force Management**
- **Continuum of Learning**
- **Outreach**
- **Evaluation/Analytics**

AIR FORCE STEM

U.S. AIR FORCE

Scientists & Engineering Advisory Council (SEAC)

STRATEGIC AREAS:

- S&E Qualifications, Certifications, & Credentialing
- S&E Career Development Programs & Placement
- S&E Continuing Education & Training Requirements
- S&E Workforce Capability Requirements/Advocacy/ Pipeline

U.S. AIR FORCE

Collaboration & Communication Specific Challenges

- **<u>Planning</u>: Ensure sufficient technical input to make informed decisions**
  - Little up-front and early technical mentoring, advice, and assessment
  - Not enough info to make a program start decision — lack of concept solution work prior to Materiel Development Decisions (MDD)
  - Programs pass milestones without adequate look at technical risk
- **<u>Execution</u>: Ensure technical issues/risks are discovered and addressed at the right time and at the right level**
  - Beware of the *"Sea of Green"* — "I'm OK because I've got a plan"
  - Immature technologies and integration issues continue to drive cost and schedule impacts — we need to step up our game
  - ECPs are still rampant — impacts to AF enterprise unknown; must use Configuration Steering Boards more effectively
  - Maintain discipline of SE processes — don't trade away rigor

Collaboration & Communication
AF PSR Process

U.S. AIR FORCE

DP #1—Organize, train, equip	DP #2—Provide early status	DP #3—Finalize products	Post Review
-Mentor/advise program office -TRA: ID independent review team -Early risk identification -Gain program understanding	-Provide preliminary report to PM -TRA: approve CTEs -Address risks -Cross flow information	-Out brief findings to PM -TRA: approve TRLs -Capture open risks -Complete MS deliverables	-Support AFRB/DAB -Conduct lessons learned hot-wash

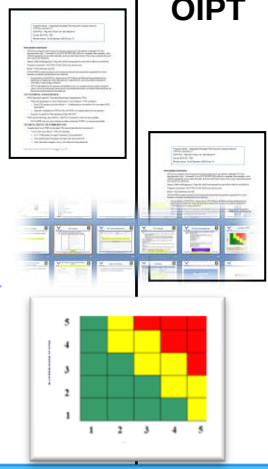
Notional Timeline

MS (-18 to -12) | MS (-17 to-11) | MS (-9 to -6) | MS (-2) | MS (-1) | MS

Guidance & Planning mtg | DP 1 | DP 2 | Interim Feedback to PM | DP 3 | AFRB | DAB | OIPT

Leverage tech reviews

DAPS (OSD-led)	Conduct DAPS assessment	Address preliminary findings
Technology	Identify CTEs	Assess CTEs' TRLs
Manufacturing	Identify critical processes	Complete MRA
Logistics	Review logistics readiness	
ESOH	Review ESOH	
Technical docs	Prepare/review/complete technical documents (TDS, SEP, PESHE, …)	
Integration Risk	Conduct risk assessment	Monitor risk buy-down



Early technical engagement to seamlessly mentor/advise, independently assess & capture risks…so PMs can act

* Statutory/regulatory process

Tech Authority/Accountability Roles & Responsibilities

Guidance Memo

PEO / DAO CSE

- Assigned by PEO / DAO
- Apply, implement, and adhere to all directive publications
- Review SEPs & oversee their implementation
- Assess performance of subordinate lead or chief systems engineers
- Verify technical review entrance/exit criteria are met & verify all technical reviews include independent subject matter
- Ensure full and complete technical information, issues, and risk are communicated

Center-lvl Tech Authority

- Assigned by Center/CC
- Assist PEOs / DAOs in the appointment of CSEs & assess performance of CSEs
- Assesses adequacy of and adherence to policies, practices, guidance, tools, education, and training
- Organize, manage, and coordinate execution of PSRs w/sub-teams, program office and contractors; provide guidance/training to programs & sub-teams

U.S. AIR FORCE

Tech Authority/Accountability Recent Policy Changes

- **Development Planning (changes to AFI 63-101 and AFI 63-1201)**
  - Establishes Concept Characterization & Tech Description (CCTD) as early SE artifact to support Materiel Development Decision/Analysis of Alternatives
  - Starting coordination Aug 10, publishing goal is Oct 10
- **Program Technical Assessments**
  - Establishes AF Program Support Review
  - Establishes responsibilities for Center-Level Technical Authority & PEO Chief Systems Engineers
  - Released over SAF/AQ signature, 10 Aug 10
- **DP Guide**
  - Released over AFMC/A5 & AFSPC/A5 signatures, Jul 10
- **CCTD Guide**
  - In final review; expect release over AQR signature Oct 10
- **Reliability, Availability, & Maintainability (RAM)**
  - Emphasizes continuous improvement & reliability growth plans, GM Jul10

U.S. AIR FORCE

Tech Authority/Accountability Specs and Standards

- **Acquisition Program Execution Problems (technical, cost, and schedule) Have a Common Root Cause:**
  - Blanket government removal of specs/standards (early 90s)
- **This Led To**
  - Absence of well-defined product characteristics
  - Inconsistent application of necessary SE processes
  - Specs and standards compliance becoming trade space in a highly cost-competitive environment
- **Plan for AF Acquisition Improvement Requires …**
  - Tailorable standard practices for SE processes (balanced)
  - Policy to mandate use in solicitations and contracts (TBD)

U.S. AIR FORCE

AF SE Strategic Plan

- **Communicate vision and goals; provide leaderships' guidance**
- **Provide framework for past, ongoing and future initiatives**
  - Roadmap of where we've been, where we are, where we are going
- **Describe relationship to other related plans/roadmaps**
  - E.g., AIP, D&SWS, S&T Roadmap, Bright Horizons
- **Synchronize initiatives to achieve vision and goals**
- **Support prioritization of resources**
- **Properly scope degree of standardization**
- **Use to communicate AF strategic direction -- near, mid, far term**

Vision: World class systems engineering enterprise efficiently and effectively supporting the development, acquisition, sustainment and disposal of compelling air, space and cyberspace capabilities.

U.S. AIR FORCE

AF SE Conference 3-5 Aug 2010

- **Key takeaways**
  - Robust SE contributes to successful programs
  - Implementing standard SE practices, processes, and policies fosters effective and efficient integrated life cycle management
  - Must take a balanced approach to reducing risk
  - Improved development and management of the technical workforce are critical to the future success of SE throughout the acquisition and sustainment life cycle
  - Ensure SEP as a “blueprint” for the technical aspects of programs instead of just a “check (√) the box” item
  - Accurate product and design data improve reliability and availability, OSS&E and sustainment
- **Feedback was overwhelmingly positive**
- **AQR, CSE, and AFMC/EN have agreed to co-sponsor next year’s conference; 2-4 Aug 2011 at WPAFB, Dayton, OH**
- **Industry panel at next conference as well as increased PM attendance**

Air Force Systems Engineering Conference

Tuesday, 3 August 2010

Day 1 Theme: Need for Disciplined SE (Policy)		
0730-0815	Check-in	
0815-0830	***Room 118/121/123;Overflow Rooms 111,112,116*** Welcome/Conference Administration	
Leadership Expectations of Systems Engineering (SE) ***Room 118/121/123; Overflow Rooms 111, 112, 116***		
0830-0900	Lt Gen Mark Shackelford, SAF/AQ	
0900-0930	Dr. Steven Butler, AFMC/CA	
0930-1000	Mr. Blaise Durante, SAF/AQX	
Keynote Address ***Room 118/121/123; Overflow Rooms 111, 112, 116***		
1000-1030	Mr. David Van Buren, Air Force Service Acquisition Executive	
1030-1050	*Break*	
SE in Acquisition (WSARA) Panel MODERATOR: Dr Steven Walker, SAF/AQR ***Room 118/121/123; Overflow Rooms 111, 112, 116***		
1050-1110	Mr. Stephen Welby, DDR&E, Systems Engineering	
1110-1130	Mr. Robert Boulware, SAF/AQXA	
1130-1150	Col Shawn Shanley, SAF/AQRE	
1150-1210	Panel Q&A	
1210-1330	*Lunch*	
Technical Sessions		
1330-1500	**1A:** SE Policy (incl. JCIDS, DoDI 5000.02 & Early SE)	Room 118/121/123
	1B: Revitalization of Specs and Standards	Room 111/112
	1C: Systems Engineering Research	Room 116
1500-1530	*Break*	
1530-1700	**1D:** Modeling & Simulation	Room 118
	1E: Architectural Frameworks	Room 121/123
	1F: Human Systems	

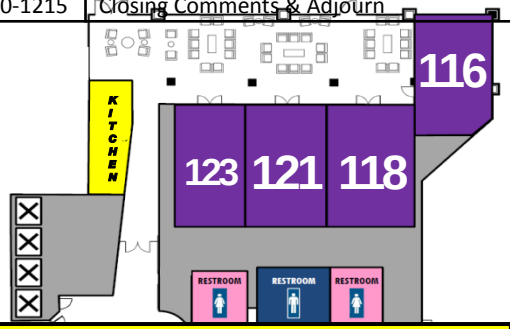
No-Host Social, 1700-1900
Hamlet Restaurant

Wednesday, 4 August 2010

Day 2 Theme: Importance of Standardized SE Across the Life Cycle (Where SE is applied and by whom)		
0730-0815	Check-in	
0815-0830	***Room 118/121/123;Overflow Rooms 111,112,116*** Conference Administration	
SE Importance Across the Acquisition Life Cycle MODERATOR: Mr G Richard Freeman, AFIT/SY ***Room 118/121/123; Overflow Rooms 111, 112, 116***		
0830-0850	Dr. Kenneth Barker, AFRL/XP	
0850-0910	Mr. Gerald Freisthler, ASC/CA	
0910-0930	Maj Gen David Eichhorn, AFFTC/CC	
0930-0950	Mr. Grover Dunn, AF/A4I	
0950-1010	Panel Q&A	
1010-1030	*Break*	
S&E Workforce Development Panel MODERATOR: Mr G Richard Freeman, AFIT/SY ***Room 118/121/123; Overflow Rooms 111, 112, 116***		
1030-1050	Dr. Donald Gelosh, DDR&E	
1050-1110	Lt Col Michelle Trigg, SAF/AQH	
1110-1130	Mr. Albert Boulter, AFPC/DPIBE	
1130-1150	Panel Q&A	
1150-1330	*Lunch*	
Technical Sessions		
1330-1500	**2A:** Integrated Master Plan & Integrated Master Schedule	Room 118/121/123
	2B: Reliability	Room 111/112
	2C: ESOH	Room 116
1500-1530	*Break*	
1530-1700	**2D:** Test and Evaluation	Room 121/123
	2E: Life Cycle Supportability	Room 118
	2F: Cool Tools (ARM, SEAM, RI3, RTT, etc)	Room 111/112

Thursday, 5 August 2010

Day 3 Theme: SE Applied (How SE is applied and measured)	
0730-0815	Check-in
0815-0830	***Room 118/121/123;Overflow Rooms 111,112,116*** Conference Administration
SE Application and Assessment Panel MODERATOR: Col Shawn Shanley, SAF/AQRE ***Room 118/121/123; Overflow Rooms 111, 112, 116***	
0830-0850	Mr. Robert Martin, AF PM&AE
0850-0910	Dr. Marvin Sambur, Univ. of Maryland
0910-0930	Mr. Russell Howard, AFMC/EN
0930-0950	Col David Swanson, SMC/EA
0950-1020	Panel Q&A
1020-1040	*Break*
Technical Assessments Panel MODERATOR: Col Shawn Shanley, SAF/AQRE ***Room 118/121/123; Overflow Rooms 111, 112, 116***	
1040-1100	Mr. James Thompson, DDR&E
1100-1120	Mr. Joseph Shearer, SDB II Program
1120-1140	Lt Col Scott Brown, SAF/AQRE
1140-1200	Panel Q&A
1200-1215	Closing Comments & Adjourn



All briefings will be posted to the AF SE Conference CoP by 12 August

https://rso.my.af.mil/afknprod/ASPs/Reg/GroupAdmin.asp?Filter=23843&EventID=14647&GroupID=19841

U.S. AIR FORCE

Summary: Way Ahead for AF SE

- Robust, disciplined SE -- sound engineering/technical management
  - People, Policy, and Processes
- Objective broker on affordability/performance/technical risks
- Thorough understanding of SE trades and programmatic technical issues
- Competent insight into contractor technical planning and execution

To meet these expectations, we must:

(1) Institutionalize Technical Rigor and Discipline Across the Life Cycle of Acquisition Programs

(2) Revitalize the AF SE Workforce

BACK UP CHARTS

U.S. AIR FORCE

MDD Information Needs – Forthcoming DDR&E Policy

To support those decisions, the DoD Components shall provide evidence at the MDD Review that will facilitate the determination that:

a. **The candidate materiel solution approaches have the potential to successfully address the capability gap(s), associated dependencies, and operational attributes.**

b. **There exists a range of technically feasible solutions generated from across the entire solution space, as demonstrated through early prototypes, models, or data.**

c. **Consideration has been given to near-term opportunities to provide a more rapid interim response to the capability need.**

d. **The plan to staff and fund analytic, engineering, and programmatic activities supports the proposed milestone entry requirements.**

- **AF is assessing issues associated with industry engagement during DP / Early SE**
- **Conflicts of interest, protection of proprietary information, solutions masquerading as concepts, contracting terms and conditions, numerous others ...**

Capability Planning, Development Planning, Early SE, and Acquisition

U.S. AIR FORCE