
Integrity - Service - Excellence

Collaborating with Industry to Develop SE and TR&A Standards

Presentation to
NDIA Systems Engineering Conference

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Bottom Line Up Front

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- **Objective – *Develop joint government-industry standards for DOD-wide use***
 - Systems Engineering
 - Technical Reviews and Audits

 - **Experience – *Industry collaboration can be done provided ground rules and working relationships are forged***
 - SMC experience with AIAA on 8 space standards
 - All originated from existing SMC documents; Seven are in use on contracts
 - SMC (Dave Davis) will lead an effort on behalf of the Air Force and other service partners, using knowledge and experience from past SMC experience with AIAA, to collaborate with industry for development of industry standards suitable for use by DOD.

 - **Approach –**
 - Planning the efforts
 - Standards development
 - Standards implementation
-



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Agenda

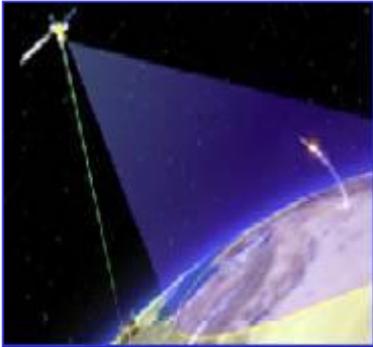
- **SMC Revitalization of Specs and Standards**
- **Partnering with Industry on DOD Standards**
- **DOD Systems Engineering and Technical Review Standards**
- **DOD Manufacturing Standard**
- **Summary and Conclusions**



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SMC Space Missions

WE DEVELOP, ACQUIRE, FIELD AND SUSTAIN SYSTEMS IN FOUR MAJOR MISSION AREAS



Space Superiority

- Space Situation Awareness
 - SBSS
 - Space Fence
- Defensive Counter Space
- Offensive Counter Space



Space Support

- Launch Systems
- Spacelift Range
- Sat Control & Network



Force Application

- Conventional Missiles
- Prompt Global Strike



Space Force Enhancement

- Milstar/AEHF/EPS(Comm)
- DSCS/GBS/WGS(Comm)
- GPS (Navigation)
- DSP/SBIRS (Surveillance)
- DMSP/DWSS (Weather)
- NUDET (Nuclear Detection)

Developing, Delivering, and Supporting Military Space and Missile Capabilities to Preserve Peace and Win Conflicts



Space System Development

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Titan IV-A A-20

- Launch is a “one-strike-and-you’re-out” business
- Spacecraft must work by remote control for 15 years
 - Hostile environment
 - “Small” failures can cripple or end mission



Delta III

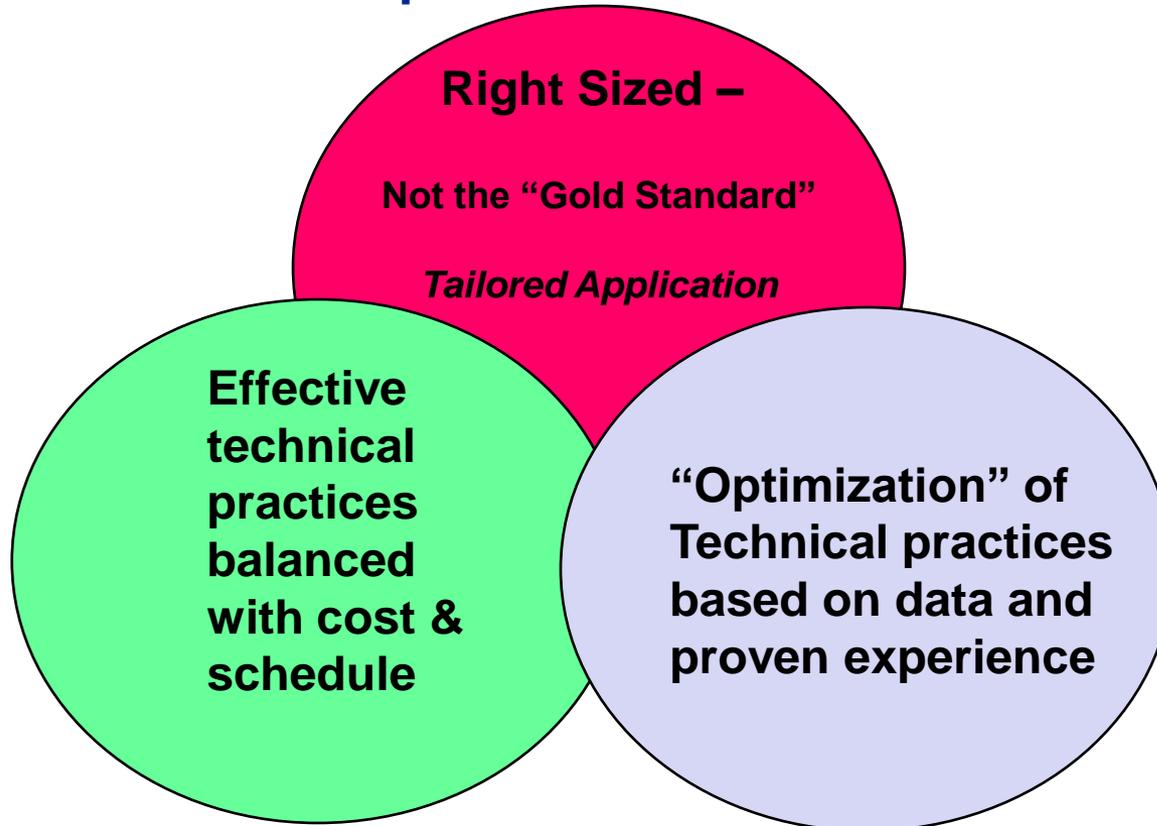
*No “flight Testing” and No Service Calls in Space
Mandates Unique, High-Confidence Mission Assurance Culture*



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Balanced Technical Practices

Specs & Standards



Reliable Products & Supply Base

Decision Analysis/Risk Mgmt

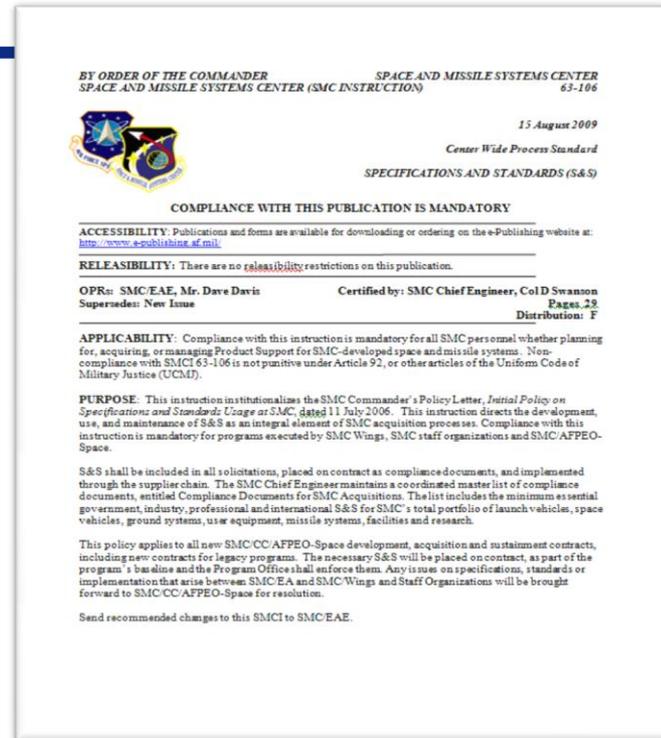
Include commercial data/practices where available and applicable



SMC Specs & Standards (S&S) Policy

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- Apply specs & standards as element of acquisition practices and toolset
- “Select” list of space systems standards
- Issued as formal policy
- Supports smartly-tailored critical standards in RFPs
- Specs & Standards program ensures that sound technical practices are applied across NSS programs



- SMC Instruction 63-106, issued 2011
- Applies to all new development, acquisition and sustainment contracts,
- including new large ECPs or contracts for legacy programs
- Contractual compliance through the supplier chain, as appropriate
- SMC/EN (Chief Engineer) is OPR

Tailoring is critical aspect of S&S use on current acquisitions



Functional Areas of SMC Standards

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STANDARD PRACTICES (SOW-related)

- Program Management
- Subcontract Management
- Systems Engineering
- Design Reviews
- Configuration Management
- Product Assurance
- Logistics
- Manufacturing /Production Management
- Parts Management
- Risk Management
- System Safety
- Occupational Safety and Health
- Reliability/Availability

DESIGN CRITERIA (Spec-related)

- Electrical Power, Batteries
- Electrical Power, Solar Cells/Panels
- Electromagnetic Interference & Control
- Environmental Engineering; Cleanliness
- Human Systems Integration
- Interoperability
- Maintainability
- Mass Properties
- Moving Mechanical Assemblies
- Ordnance
- Pressurized Systems & Components
- Parts, Materials & Processes
- Information Assurance/Program Protection
- Software Development
- Structures
- Survivability
- Test, Space & Ground

SMC has a history of success invoking BOTH on contract



SMC Specs & Standards (S&S) Implementation Roles and Responsibilities

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■ Commander

- Approves/directs policy formulation and implementation
- Provides resolution of S&S or acquisition policy disagreements

■ Program Executive Officers (PEOs)

- Implements S&S policy on programs and contracts
- Provides resolution of S&S implementation disagreements

■ Directorate of Engineering

- Establishes/maintains S&S list
- Manages S&S policy and instructions
- Assesses need and fulfillment of new/revised S&S
- Prepares/supports processes for S&S implementation on RFPs/contracts

■ Acquisition Center of Excellence

- Provides acquisition information to standards needs analysis
- Ensures S&S requirements and standards integrated in acquisition strategy and RFP

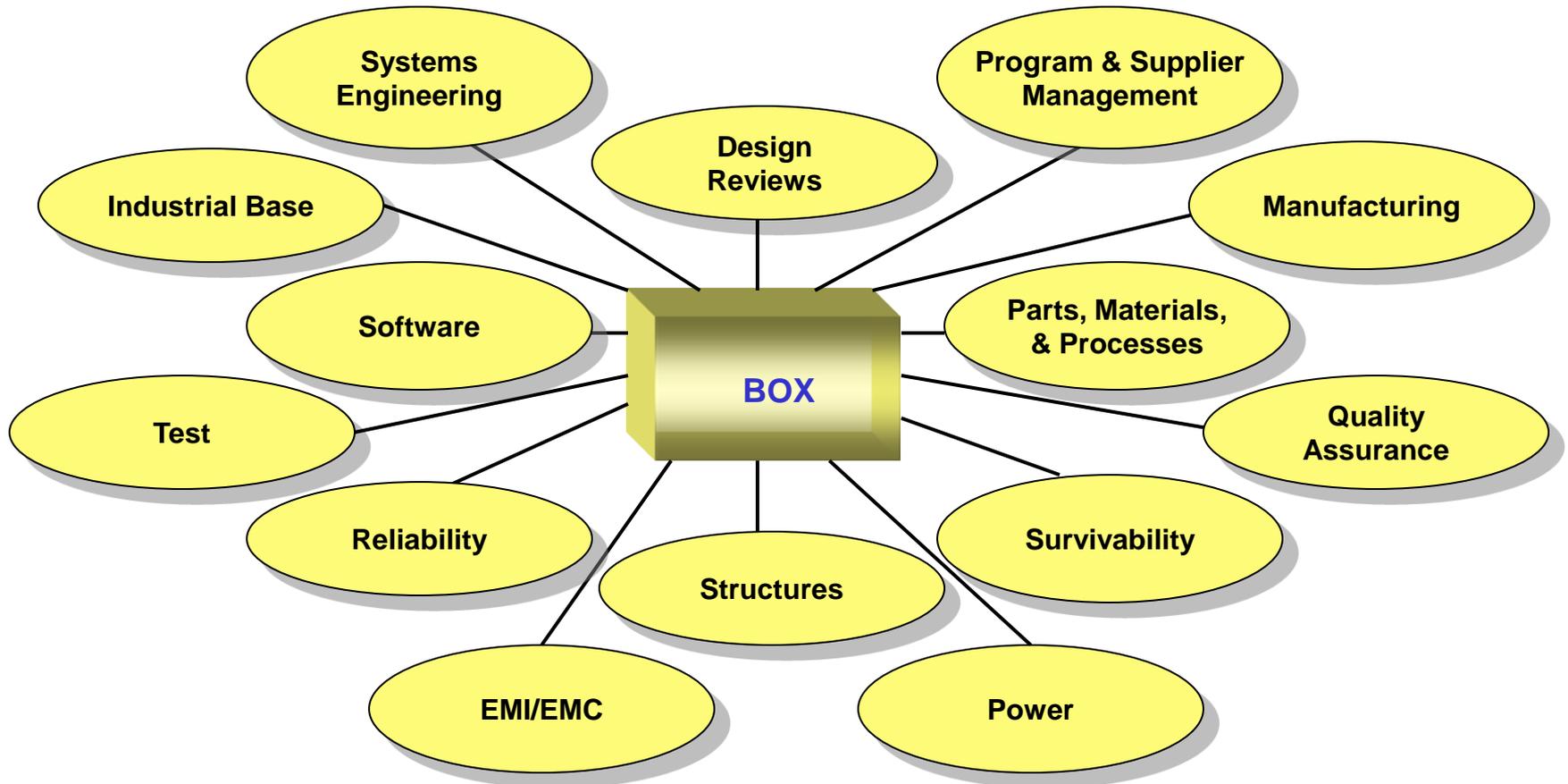
■ Program Acquisition Directorates (SPOs)

- Conducts analysis for use and tailoring of S&S to specific acquisition needs
 - Use standard as is
 - Do not use standard - not applicable
 - Tailor standard for specific contract
 - Use alternative in lieu of standard, e.g.
 - contractor command media
 - existing data item or plan
- Implements S&S on contracts
- Assesses S&S impacts on major ECP or rebaselined programs
- Provides access to information for evaluating S&S effectiveness

SMC governance and implementation of S&S is fully institutionalized



Specs and Standards at “Box-level”





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Contract Implementation

3. Initial Applicable Documents (Compliance & Reference)

for

***A Typical Satellite Vehicle Acquisition Program
For Prescribed Development***

ANNEX A TO ATTACHMENT 1

RFP NO. 000000-00-0-0000

Prepared by SMC

00 Month 0000

Revised 00 Month 0000

The Offeror may propose the listed specification or standard contained herein or another government, industry technical society (IEEE, AIAA, etc.), international or corporate version, provided it is comparable in rigor and effectiveness. If alternative standards are proposed, the Offeror must provide information that shows that the recommended alternative provides the same level of efficacy as does the listed specification/standard. In all cases the acceptable responses will be placed on contract as a compliance document.

***SMC/EN team engages with SPO and ACE
during RFP development to identify applicable standards.***



Re-establishing Best Practices

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• SV/LV Environmental Test Requirements	Aerospace TOR	SMC Standard	
• Hardware Development Tests & Environments		MIL-STD-810G	
• Software Development & Verification	Mil-Std 498	SMC Standard	
• Ground Equipment Test Requirements	Mil-Std-1833	SMC Standard	
• Mass Properties Controls for Space Systems	Aerospace TOR	AIAA S-120-2006	
• EMI/EMC Requirements	Aerospace TOR	SMC Standard	(AIAA)
• Wiring Harness Design & Testing	Aerospace TOR	SMC Standard	
• Battery Requirements	Aerospace TOR	SMC Standard	
• Solar Cell Development & Test	Aerospace TOR	AIAA S111-2005	
• Solar Panels Development & Test	Aerospace TOR	AIAA S112-2005	
• Moving Mech. Assemblies	Aerospace TOR	AIAA S114-2005	
• Structural Design & Test Rqts	Aerospace TOR	AIAA S110-2005	
• Metallic Pressure Vessels-Pressurized Structures		AIAA S-080-1998	
• Composite Overwrapped Pressure Vessels		AIAA S-081-2000	
• Solid Motor Case Design & Test Requirements		SMC Standard	
• Explosive Ordnance	Aerospace TOR	AIAA S-113-2005	
• Flight Pressurized Systems		SMC Standard	
• Technical Requirements for PMP	Aerospace TORs	SMC Standard	
• Electrical Power Systems for Unmanned Spacecraft		AIAA S-122-2007	
• Systems Engineering	Aerospace TOR	SMC Standard	IEEE (in work)
• Technical Reviews and Audits	Aerospace TOR	SMC Standard	IEEE (in work)
• Manufacturing Mgmt/Engineering		Mil-Std 1528A	SAE (in work)



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Agenda

- SMC Revitalization of Specs and Standards
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Background – DOD SE/TRA Standards

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■ **DSC and DSE Direction**

- Concurred with recommendations of Gap Analysis Working Groups
 - SE/TRA, Configuration Management and Manufacturing management
- Redirected to:
 - investigate non-government standards (NGS) approach
 - align with Defense Acquisition Guide (DAG) Chapter 4 re-write

■ **DSC Team Assignments for DOD Standard Development**

- Systems Engineering and Technical Reviews: USAF
- Configuration Management: USA for handbooks; reassigned standard to USN
- Logistics Support Analysis: DASD(MR) - for non-DSP handbook
- Manufacturing Management: USAF AFMC

■ **USAF SE and TRA Implementation (Briefed at March 2012 DSC)**

- Systems Engineering: Lead = HQ AFMC, delegated to SMC
- Technical Review and Audits: Lead = SMC
- *Comply with DSE direction to pursue NGS feasibility options*



Government-Industry Partnership

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■ Mutual-benefit stipulations:

- Must meet both party's needs and objectives
- Potential teaming partners must have existing experience with subject matter of document and existing infrastructure for publishing standards
- Content of documents must be consistent with government needs

Example from prior SMC effort



The World's Voice for Aerospace Leadership

Project Goals

- Develop standards to be used for AF procurement
 - Recruit broad industry consensus body
 - Use baseline documents as starting point
 - Follow AIAA standards program procedures
- Resulting documents sufficiently detailed to support AF needs
- Establish strong industry/government consensus on content

3



The World's Voice for Aerospace Leadership

AIAA Support

- AIAA provides:
 - Accredited procedures for performing work
 - Guidance and advice
 - Industry recognition of published documents
 - Infrastructure to perform committee work virtually
- Neutral environment for work to be completed

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Source: AIAA Standardization Activity Kick-off Meeting, 24 March 2009

Successful partnership REQUIRES commitment from both parties



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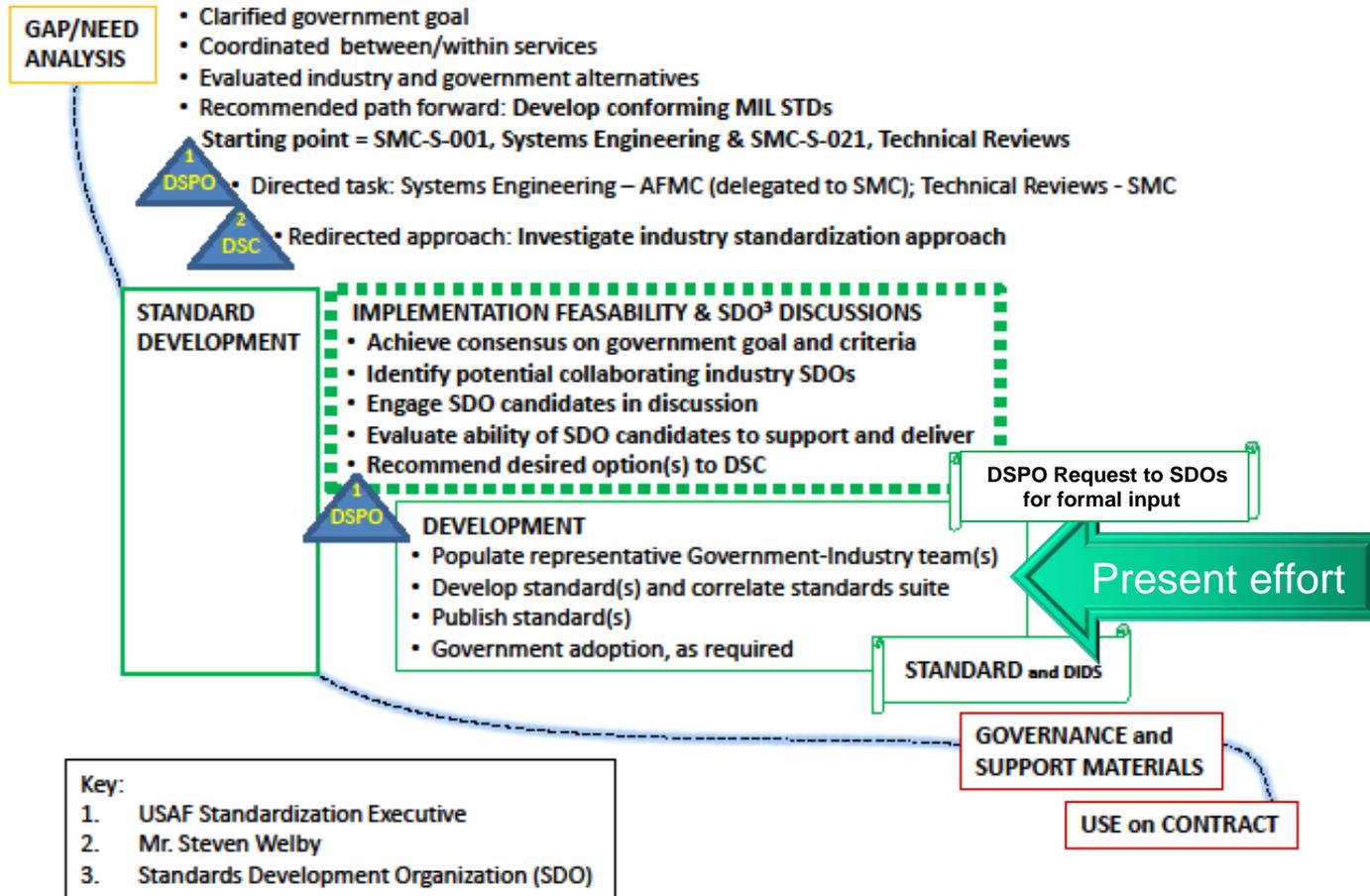
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DOD SE/TRA Standards Process

Standard Development Phases





IEEE Joint Systems Engineering WG

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- **DoD-IEEE Standards Working Group established**
 - Kickoff meetings 15 & 22 Aug
 - Leadership Team
 - WG Chair, Garry Roedler, Lockheed Martin
 - WG Vice-chair, Dave Davis, USAF SMC
 - WG Secretary, Brian Shaw, The Aerospace Corp.
 - Technical Editors
 - SE Standard, Bill Bearden, Los Alamos National Labs
 - TR&A Standard, Mark Henley, L-3 Com
 - DoD & Industry broadly represented (next chart)
 - Same WG members for SE and TR&A teams
 - **Two IEEE projects**
 - 15288.1 Defense Systems Engineering: DoD addendum to 15288
 - Leverage 15288 process language; specify work products and attributes
 - 15288.2 TR&A Standard: stand-alone document
 - No equivalent industry standard)
 - Hook reviews/audits to 15288 process
-



IEEE Joint Systems Engineering WG

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■ Participating Organizations

DASD(SE)	SAF/AQRE	AFMC/EN	AFLCMC/EN
Army ARDEC	NAVAIR	NAVSEA	NSWC
DCMA	DAU	LOCKHEED MARTIN	NORTHROP GRUMMAN
BOEING	RAYTHEON	GENERAL DYNAMICS	BAE SYSTEMS
L-3 COM	LEIDOS	SAIC	UNITED TECHNOLOGIES
HARRIS	BALL AEROSPACE	Fla Gulf Coast UNIVERSITY	INCOSE
NDIA SED	AIA	SAE INTL	ISO/IEC/JTC1/SC7 WG7

DoD

INDUSTRY

ACADEMIA

SDO / INDUSTRY PROFESSIONAL



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DOD-IEEE WG for Systems Engineering *

Industry

- BAE Systems
- Boeing
- General Dynamics
- Lockheed Martin
- Northrop Grumman
- Raytheon
- SAIC
- United Technologies

Associations

- AIA
- IEEE-CS/SA
- INCOSE
- ISO/IEC
- NDIA
- SAE Intl

Defense

- Air Force
- Army
- Navy
- OSD – DASD (SE)
- DAU
- DSPO

Leadership Team

Chair, Garry Roedler, Lockheed Martin

Vice-chair, Dave Davis, USAF SMC

Secretary, Brian Shaw, The Aerospace Corp.

Technical Editor, Bill Bearden, Los Alamos Nat. Lab.

* Although any individual is welcome to participate in the working group, individuals from the organizations above were requested to ensure a good cross section of the industry stakeholders. Names and affiliations of individuals rather than organizations will be used for identification of working group membership as individuals sign up for the group.



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Background: Manufacturing Management

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- **Weapon system problems have been caused by a lack of focus on Manufacturing and Quality**
 - Cost overruns
 - Schedule delays
 - Grounded systems
 - Quality escapes
 - Unhappy customers

- **Mfg/QA requirements have been eliminated over the past 15 years**
 - Cancellation of Air Force Mfg policies, instructions, and guidance
 - Cancellation of Mfg MIL-Specs and Standards that provided contractual taskings



Background: Manufacturing Management

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- **Industry has told us that the Air Force does not specify proper Mfg/QA requirements in contracts**
 - A standard will provide a vehicle to contractually communicate manufacturing, and quality requirements and puts all contractors on the same playing field with cost
 - Contractors can plan and budget to standard requirements

- **Air Force and Army developed MIL-HDBK-896 to re-institute standard manufacturing practices**
 - Aligned with 5000.02 and Manufacturing Readiness Level matrix threads
 - However, a MIL-HDBK is generally not contractually enforceable



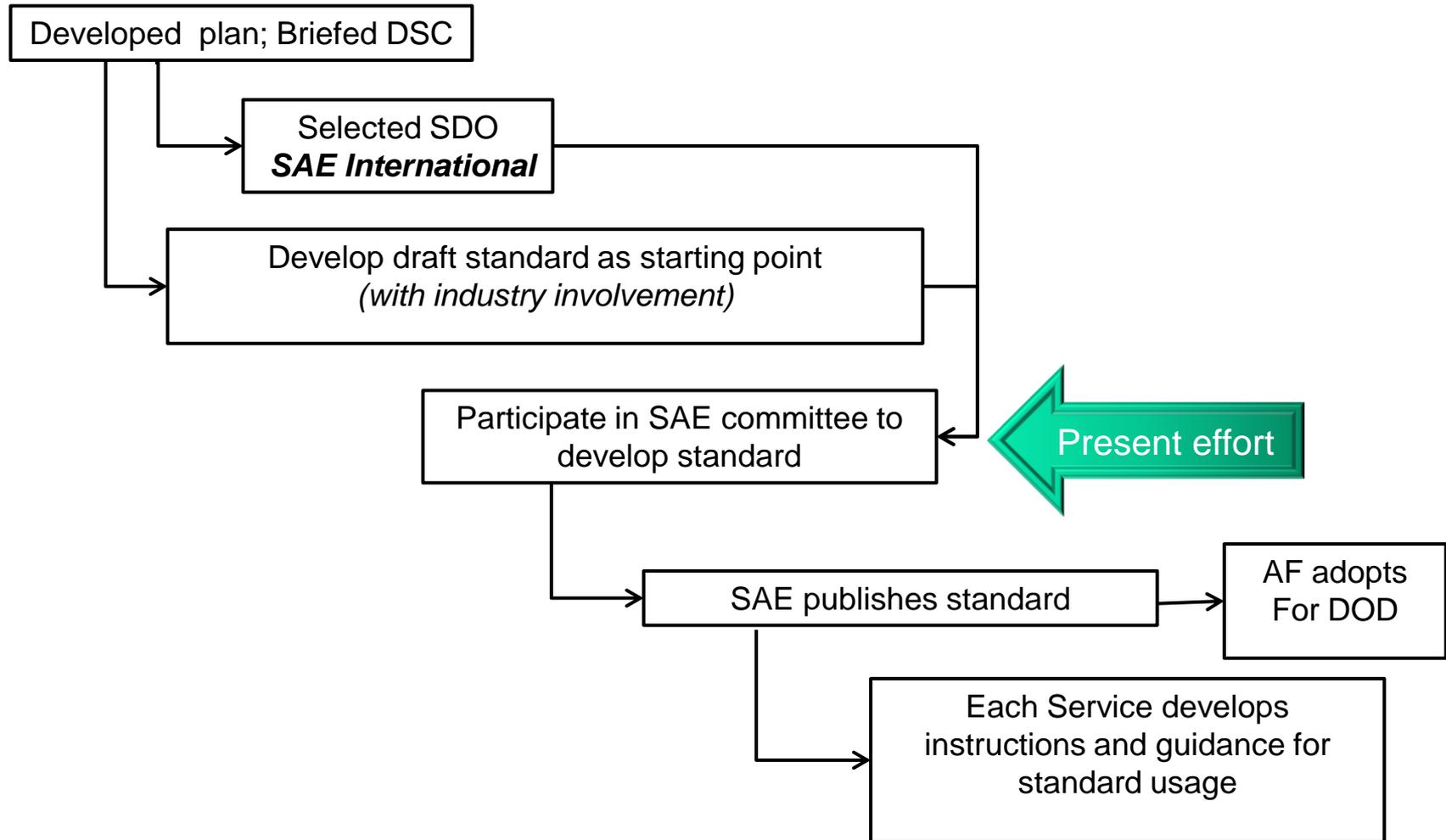
Manufacturing Management Standard

OSD Scope
Mfg Program Planning
Mfg Risk Identification & Resolution
Mfg System Verification
Industrial Material Management
Facility Planning
Design Analysis for Mfg (Producibility)
Mfg Operations Management
Process Controls
Supplier Management
Mfg Feasibility Assessments
Mfg Capability
Mfg Readiness
Production Readiness



DOD Manufacturing Management Standard Process

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Summary and Conclusions

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- **Use of standards as “normal” part of gov’t toolbox recommended**
 - States expectations/requirements of government customer
 - Lets industry know what’s important to customer
 - Helps level playing field
 - There is a cost to doing our business, but we should already be doing
- **Data collection/analysis is critical for effective use of S&S**
 - Need to understand what is going on with the programs using standards
 - Need to use lessons-learned to write/update standards
- **Teaming with industry essential!**
 - For both technical and political reasons
 - Selection of industry partners critical
 - Willingness to publish standard consistent with government needs
 - Basis for military standard if no cooperative agreement with an industry organization established