THE AEROSPACE CORPORATION

SPARTA
Pride in Performance

NDIA
9th Annual
Systems Engineering Conference

Product-based Systems Engineering Requirements

25 October 2006

Brian Shaw, The Aerospace Corporation
Larry Pennell, Sparta, Inc.
Dave Davis, USAF SMC/EAE

Agenda

- Background
  - Space System Acquisition Challenges
  - SMC Specifications and Standards Program
- SMC Approaches to Systems Engineering (SE)
  - SE Processes and Requirements Vision
  - Development of “SE Products and Requirements”
- SE Products and Requirements
  - Sample Products and Requirements
- Summary and Conclusions

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Space Systems Acquisition Challenges

- **Space capabilities are essential for successful military operations**
  - **Requires:**
    - **high reliability**
    - **assured delivery of mission data**
- **Many new space programs exist; success hampered by**
  - **Industry-wide shortage of systems engineers**
  - **Serious lack of acquisition experience at SMC**
- **Congressional confidence in space systems acquisition is low**
- **Space programs are more complex than ever…**
  - **Hardware/software, including COTS infusion**
  - **System integration**
  - **System-of-system/Family-of-systems interoperability**

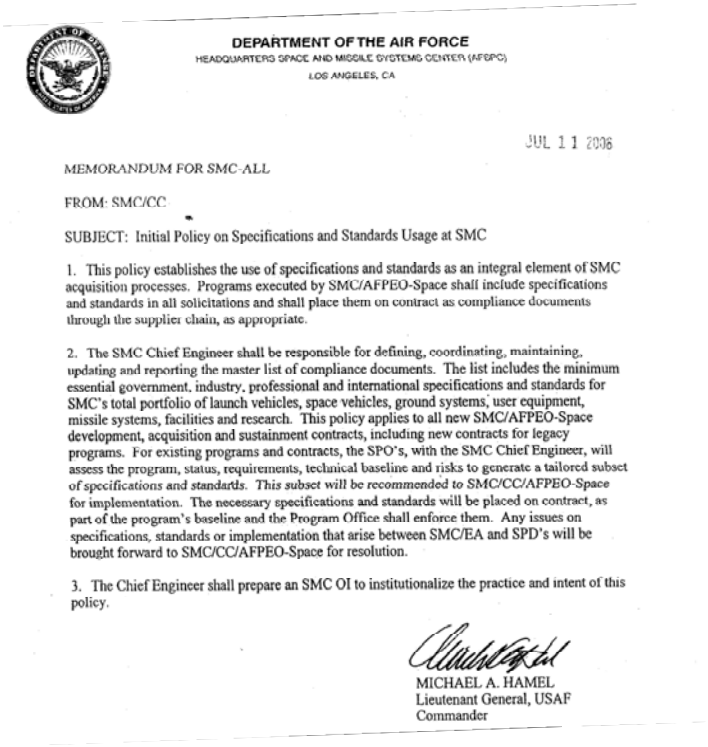
Systems Engineering Framework

Contract:

- ***Defines SE Relationship***
- ***Establishes what Govt considers to be an acceptable level of quality***
- ***Levels playing field in bidding process***
- ***Requires Government control/oversight***

New SMC S&S Policy

- Issued by Lt. Gen. Michael Hamel 11 July 2006
- Establishes specifications and standards as an integral element of SMC acquisition processes
- Applies to all new development, acquisition and sustainment contracts, including new contracts for legacy programs
- Contractual compliance through the supplier chain, as appropriate



DEPARTMENT OF THE AIR FORCE
HEADQUARTERS SPACE AND MISSILE SYSTEMS CENTER (AFSPC)
LOS ANGELES, CA

JUL 11 2006

MEMORANDUM FOR SMC-ALL

FROM: SMC/CC

SUBJECT: Initial Policy on Specifications and Standards Usage at SMC

1. This policy establishes the use of specifications and standards as an integral element of SMC acquisition processes. Programs executed by SMC/AFPEO-Space shall include specifications and standards in all solicitations and shall place them on contract as compliance documents through the supplier chain, as appropriate.

2. The SMC Chief Engineer shall be responsible for defining, coordinating, maintaining, updating and reporting the master list of compliance documents. The list includes the minimum essential government, industry, professional and international specifications and standards for SMC's total portfolio of launch vehicles, space vehicles, ground systems, user equipment, missile systems, facilities and research. This policy applies to all new SMC/AFPEO-Space development, acquisition and sustainment contracts, including new contracts for legacy programs. For existing programs and contracts, the SPO's, with the SMC Chief Engineer, will assess the program, status, requirements, technical baseline and risks to generate a tailored subset of specifications and standards. *This subset will be recommended to SMC/CC/AFPEO-Space* for implementation. The necessary specifications and standards will be placed on contract, as part of the program's baseline and the Program Office shall enforce them. Any issues on specifications, standards or implementation that arise between SMC/EA and SPD's will be brought forward to SMC/CC/AFPEO-Space for resolution.

3. The Chief Engineer shall prepare an SMC OI to institutionalize the practice and intent of this policy.

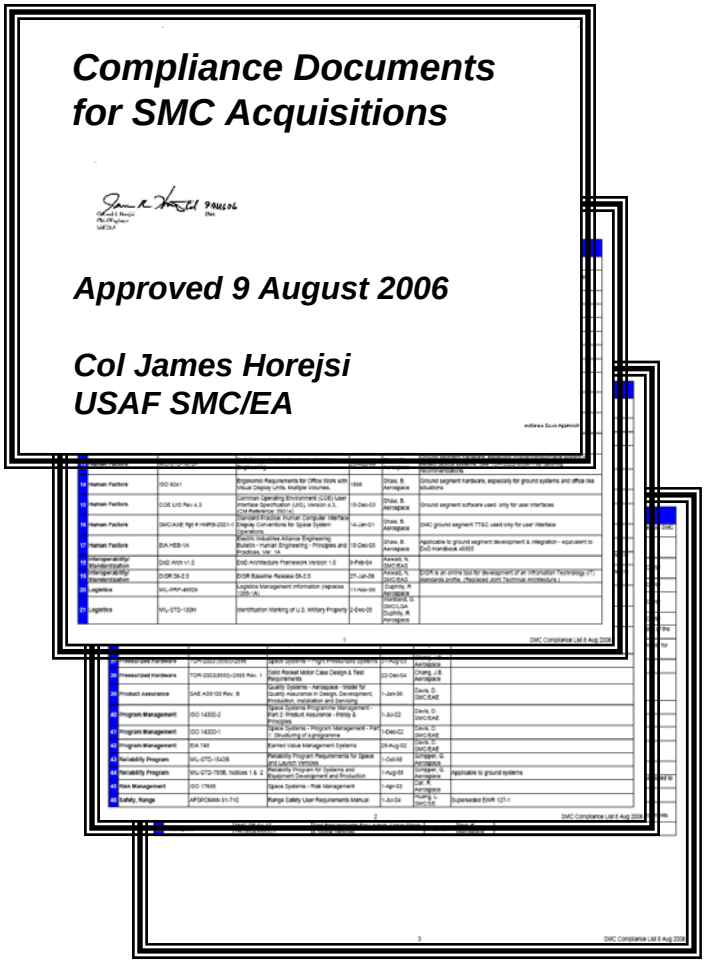
MICHAEL A. HAMEL
Lieutenant General, USAF
Commander

SMC Specs & Standards Initiative

- **SMC Specs & Standards Initiative**
  - SMC initiative to apply specs & standards as key element of acquisition practices and toolset
- **Prior to acquisition reform, SMC used military specifications & standards to specify contractual and prescriptive requirements**
- **Re-institute standards responsible for mission assurance**
  - Select group of military and industry space standards
  - Define government's expectations and specify proven technical practices

S&S Status

- **Revised SMC S&S List published 8/9/2006: 65 essential documents**
  - **Military, international, and industry standards, and Aerospace Corp reports**
  - **Updated to reflect current best practice**
    - **Example standard: *Systems Engineering Requirements and Products* The Aerospace Corporation Report, TOR-2005(8583)-3, Rev A**
      - **Contractually binding requirements defined in terms of required SE products and required attributes of those products**
      - **Consistent with existing industry standards (ANSI/EIA 632 and IEEE 1220)**
  - **Additional updates to current document versions**



Collaboration Ensures Consistency

National Security Space Integration

Co-Chaired by DoD EA Space & DNRO

Space Industrial Base Council

"Bring Senior-Level Attention to Space Industrial Base Issues on a Recurring Basis and Develop 'Actionable' Recommendations to Industrial Base Issues."

Specs & Standards Working Group

- Ensure sound technical practices applied on NSS programs
- Ensure NSS community takes a consistent approach in the application of specs & standards
- SMC; NSSO; NRO; Navy; NASA; MDA; NOAA

SMC / NRO Collaboration

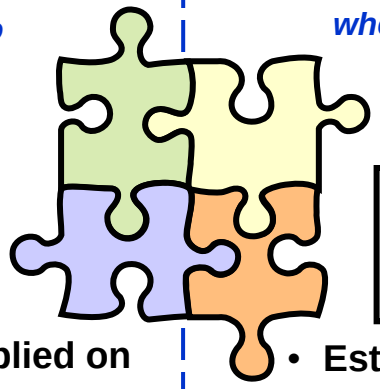
Mission Assurance Improvement Task Force

Co-Chaired by NRO DDSE & SMC/EA

"Identify and implement areas where a common SMC / NRO approach provides benefit."

Specs & Standards Working Group

- Establish a common set of preferred specifications and standards
- Quarterly interchange meetings
- Joint insight into formal standards rationale and approval processes
- SMC; NRO



SMC Specifications and Standards Functional Areas

MANAGEMENT

- Configuration Management
- Design Reviews
- Manufacturing Management / Producibility
- Parts Management
- Product Assurance
- Program Management
- Risk Management
- Systems Engineering
- Safety
- Subcontract Management

TECHNICAL

- Electrical Power, Batteries
- Electrical Power, Solar
- EMI / EMC
- Environmental Eng & Cleanliness
- Human Factors
- Interoperability
- Logistics
- Maintainability
- Mass Properties
- Moving Mechanical Assemblies
- Ordnance
- Pressure Vessels
- Parts, Materials & Processes
- Reliability
- Security
- Software Development
- Structures
- Survivability
- Test, Ground
- Test, Space

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SMC's Vision and Perspective

- **Compliance document for contractor**
  - **Requirements for contractor's SE program**
  - **Characteristics for technical areas important to SMC**
  - **Industry standards for guidance, not direction**
- **Requires associated handbook and tools**
- **Assumes a knowledgeable and intelligent audience**
- **Must be priceable – concise without redundancy**

Author/Team Goals/Vision Consensus

SE Requirements and Product standard should…

- **Cover entire life cycle – 'lust to dust'**
- **Be consistent with DAG*, Mission Assurance initiatives, etc.**
- **Meet SMC's needs for enforceability on contract**
  - **Consist of a specification plus a suite of tools such as handbook, CDRLs, and DIDs**
- **Be supportive of 5000.2, Directive 7, and NSS 03-01**
- **Be systems engineering <u>product</u> oriented**
- **Integrate and/or use any existing products, such as those developed under Mission Assurance initiatives**

* Defense Acquisition Guidebook

Relationship of SE Process Documents

Periodic revision is anticipated

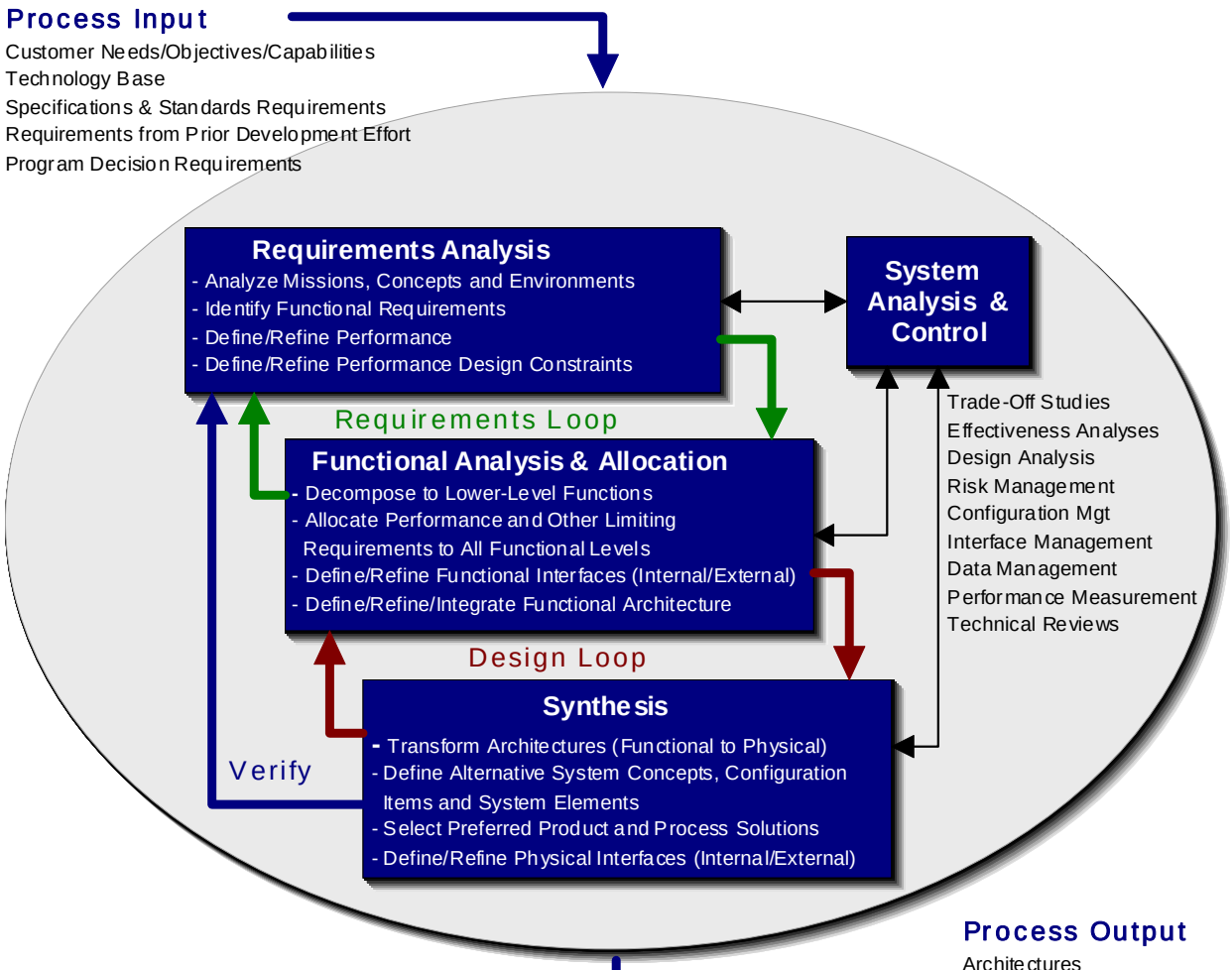
Navy SE Guidebook

INCOSE EIA 632 Revision

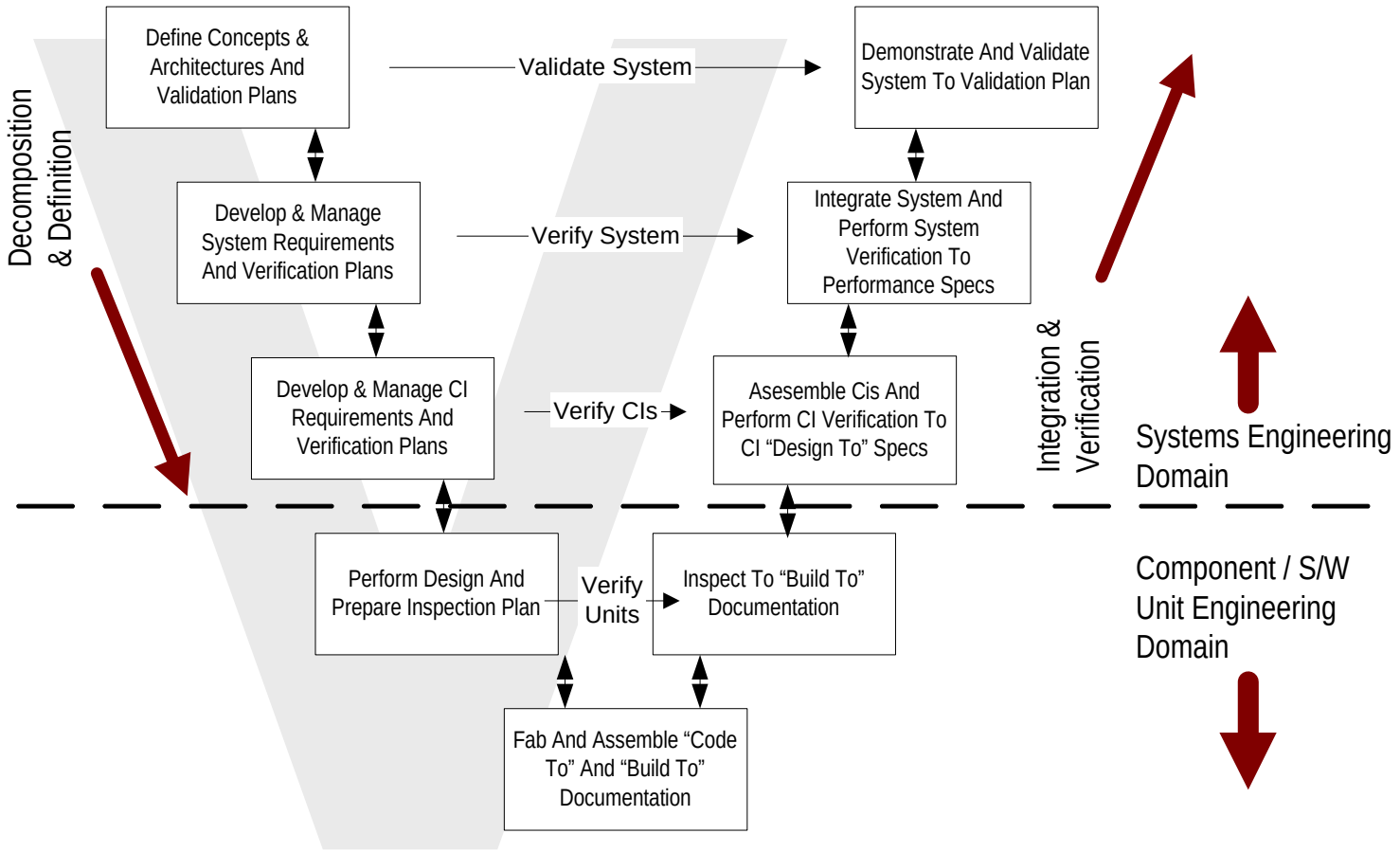
Ever-growing Space Acquisition Experience base

SE Requirements and Products	**Aerospace TOR Revision A**		
Draft SE Standard	**Mil-Std 499C (Draft) Aerospace TOR**		
Military Standards	**Mil-Std 499A**	**Mil-Std 499B (Draft)**	
SE Models and Processes	**EIA 632/IEEE 1220**	**Defense Acquisition Guidebook**	**SMC SE Handbook**
DOD Acquisition Policy	**DoDD 5000.1**	**DoDD 5000.2**	**NSS 03-01**

Example SE Process



SE Process – Typical Vee depiction



SE Process, Requirement and Baseline Flow

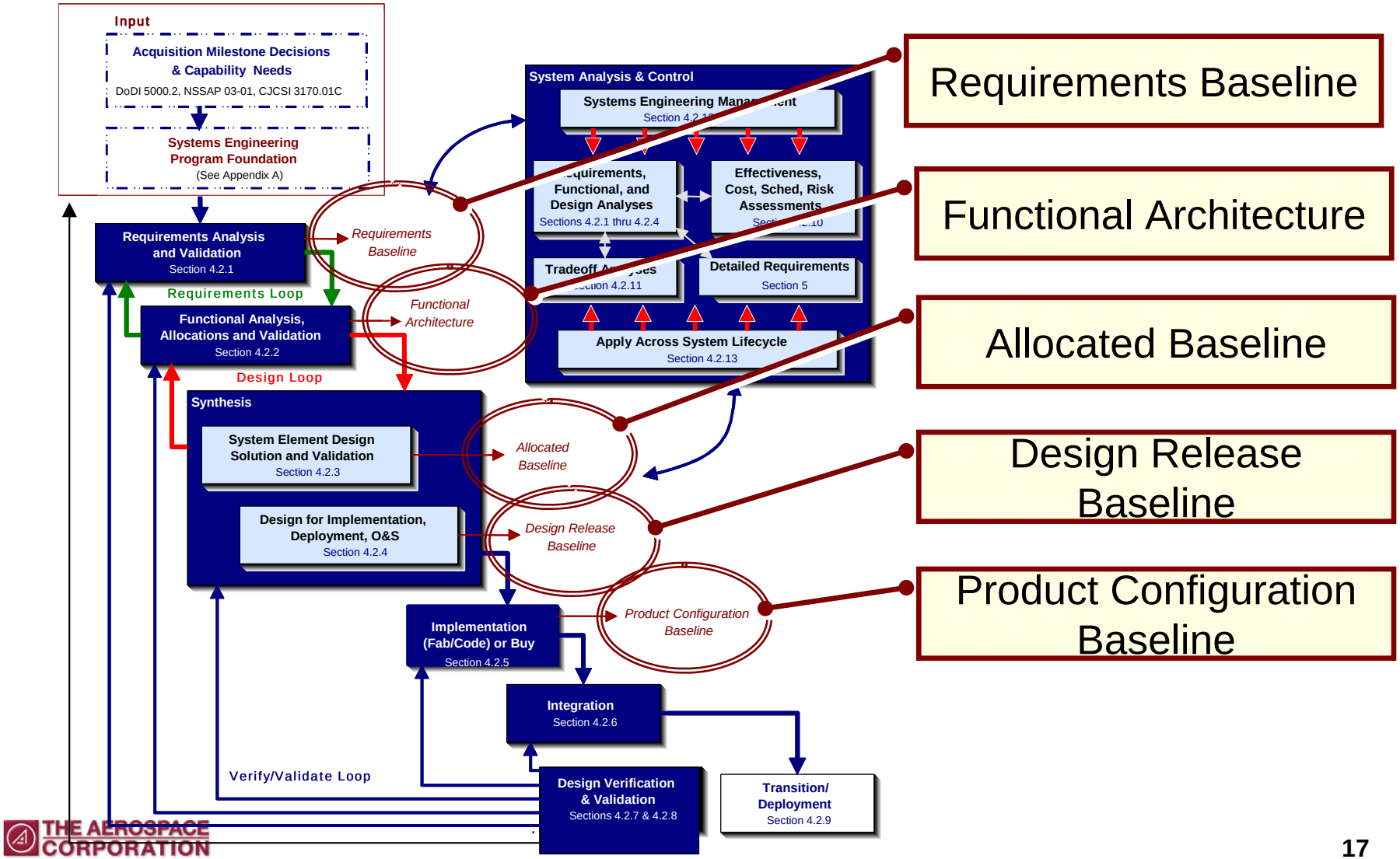


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Table of Contents *(2 of 2)*

SE Requirement and Product Sample

4.2.3 System Element Design Solution and Validation

The Contractor SHALL determine the design solution, support validation of the design solution, and develop the associated required systems engineering products with the product attributes specified in this documen

4.2.3.1 Required ystem Engineering Products

a. The validated, approved, an d allocated (d) baseline in specifications and interface documents or their elec lement such as segment, subsystem, component (and part

4.2.3.2 Required P

a. The allocated baseline:

(1) Identifies all system p

(2) Documents the asse criteria; and analyzes decisi

(3) Includes the design- constraints for each p

(4) Includes all derived de t.

(5) Includes all interfaces an well as the logical issues such as

(6) Includes the verification metho

Contractor Requirement

Perform activity; produce product

SE Requirement and Product Sample

4.2.3 System Element Design Solution and Validation

The Contractor SHALL determine the design solution, support validation of the design solution, and develop the associated required systems engineering products with the product attributes specified in this document.

4.2.3.1 Required System Engineering Products

a. The validated, approved, and maintained allocated (design-to) baseline in specifications and interface documents or their electronic equivalent grouped by each system element such as segment, subsystem, component (hardware and software), computer software unit, and part

4.2.3.2 Required Product Attributes

a. The allocated baseline:

(1) Identifies all system products and

(2) Documents the assessment and analyzes decision u

(3) Includes the design-to constraints for each

(4) Includes all derived

(5) Includes all interface the logical issues such

(6) Includes the verification

Product Description

SE Requirement and Product Sample

Product content/quality metrics

4.2.3 S…ign Solution and Validation

Th…nport validation of the design solution, and …ts with the product attributes

…ring Products

a. …sign-to) baseline in specifications and interfac…ped by each system element such as segment, subsyst…are and …ware), computer software unit, and part

4.2.3.2 Required Product Attributes

a. The allocated baseline:

(1) Identifies all system products and establishes the interactions of the system.

(2) Documents the assessment of alternative solutions; identifies and quantifies decision criteria; and analyzes decision uncertainties.

(3) Includes the design-to technical functional and performance requirements and design constraints for each product.

(4) Includes all derived design-to requirements and design constraints for each product.

(5) Includes all interfaces and addresses how the interface will be implemented, as well as the logical issues such as data formats, data semantics, etc.

(6) Includes the verification method(s) selected for each requirement.

Specialty Engineering Requirement and Product Sample

5.1.13 Reliability

a. Space system specific reliability requirements are defined, allocated, baselined, and traceable to system requirements.

(1) Parameters and limits defined and provided within the System Specification

(2) Reliability requirements reviewed against functional requirements, customary design practices

b. Applicable specific design tasks and analyses conducted, including:

(1) Failure Reporting Analysis, Corrective Action System (FRACAS)

(2) Source selection and vendor control procedures

(3) Failure Modes Effects and Criticality Analysis (FMECA)

(4) Derating and margins of safety

(5) Fault coverage

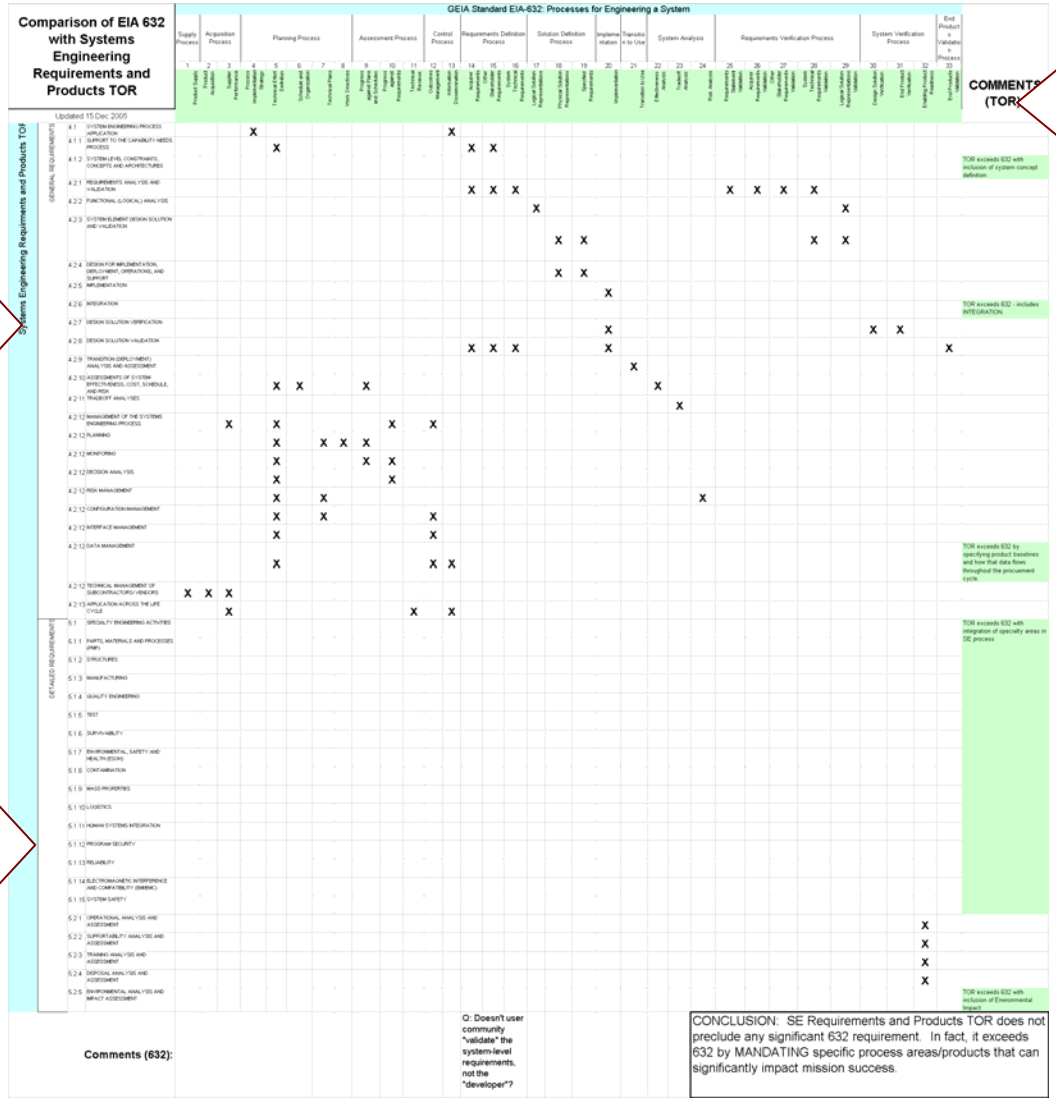
(6) Single point failure

(7) Redundancy/single string

c. Reliability Program Plan and Risk Management Plan developed for final top-level space system

d. Items in development that have impact on support resources identified, including time, people, money, parts, tools, storage, and transportation assets.

SE Requirements and Products and EIA 632 Mapping



EIA 632 SE Requirements

TOR Products & Requirements

Specialty Area Products & Requirements

- **Systems Engineering Requirements and Products *Exceeds* EIA 632 Requirements**
- Basic SE Requirements

PLUS

- Specialty Engineering Product Integration

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Summary

- **Systems Engineering is critical to overall mission success**
  - **Baselines are the product of SE process**
  - **Control of baselines is key to SE success**
- **SE products facilitates SE verification**
  - **Verification requires products with known attributes**
- **Contracting (buying) SE must be done differently**
  - **<u>Products</u> must be contractually required (purchased)**

Conclusion

- **Systems Engineering (SE) Requirements and Products**
  - **Supports government and industry SE initiatives**
  - **Provides clear SE tasking and evaluation criteria**
  - **Being integrated with Mil-Std-1521 C (Technical Reviews)**
  - **Is coordinated with national security space community**
  - **Has become the SE Compliance document for SMC**

Back-up Charts

Contributors to the SE Requirements & Products Report

- ***The author acknowledges the contributions of:***

Mr. Frank Knight

- The Aerospace Corporation, Systems Director Corporate Chief Architect/Engineer Division

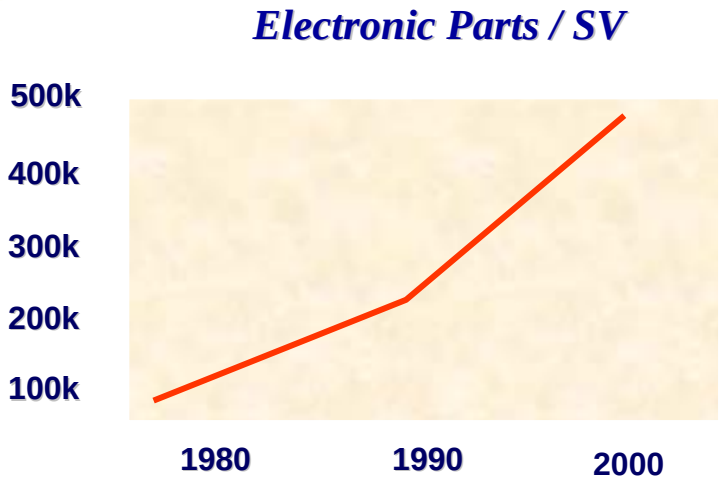
Mr. Barry Portner

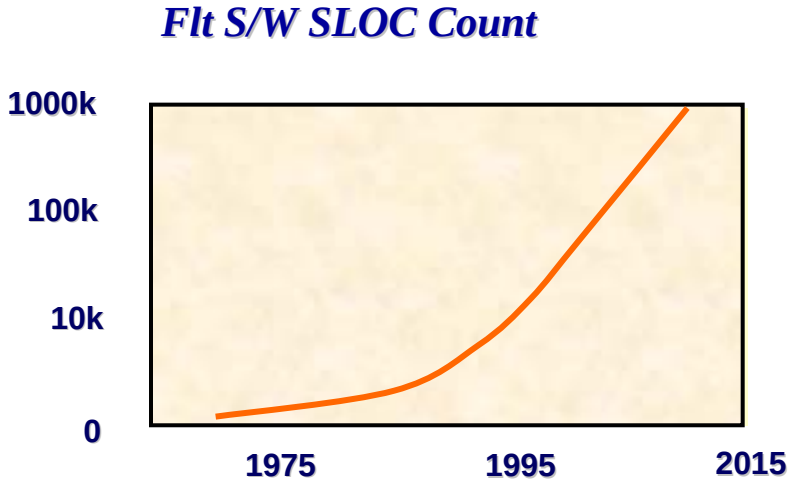
- Innovative Space Engineering Services, Inc.

… and a large number of subject matter experts from The Aerospace Corporation

- Systems Engineering Division; Engineering and Technology Division
- National Systems Division

Increased Space System Complexity





- **Increased complexity also results in:**
  - **More latent defects (increased late build-cycle and orbital failures)**
  - **Greater test challenges related to changes in technology, manufacturing and materials**
    - Increasing electronic part or device complexity (e.g., ASIC, FPGA)
    - Increased use and complexity of software
    - Increased system design and subsystem complexity
    - Lack of robust testing
      - Ability and willingness to “test like you fly”
      - Inclusion of off-nominal test regimes

SMC Compliance Documents

Compliance documents for SMC Acquisitions

Approved by:

9 AUG 06

Colonel J. Hoeji
Chief Engineer
SMC/EA

Date

Compliance Docs Approval

SMC Compliance List

Compliance Documents for SMC Acquisitions dated 08/08/06

	Functional/ Technical Area	Document Number	Title	Pub Date	Tech POC	Comments
1	Configuration Management	TOR-2006(8583)-1	Configuration Management	15-Aug-05	Donahue, C Aerospace	
2	Contamination	ASTM E 1548-03	ASTM E1548, Standard Practice for Preparation of Aerospace Contamination Control Plans	10-May-03	Luey, K. Aerospace	Must be tailored to change 'should' to 'shall' and to specify that 'buyer' includes the U.S. government.
3	Design Reviews	MIL STD 1521B Notice 3	Technical Reviews & Audits for Systems, Equipment and Computer Software	10-Apr-95	Davis, D. SMC/EAE	
4	Electrical Power	TOR-2005(8583)-2	Electrical Power Systems, Direct Current, Space Vehicle Design Requirements	11-May-05	Lenertz, B. Aerospace	
5	Electrical Power	DOD-W-83575A Rev A Notice 1	Wiring Harness, Space Vehicle, Design And Testing	1-Sep-92	Simpson, M. Aerospace	Tailoring available - from Mark Simpson
6	Electrical Power, Batteries	TOR-2004(8583)-5 Revision 1	Space Battery Standard	1-Apr-05	Hwang, W. Aerospace	
7	Electrical Power, Solar Cells	AIAA Std-111 2005	Qualification and Quality Requirements for Space-Qualified Solar Cells	15-Aug-05	Reed, B. Aerospace	
8	Electrical Power, Solar Panels	AIAA Std S-112 2005	Qualification and Quality Requirements for Space-Qualified Solar Panels	15-Aug-05	Reed, B. Aerospace	
9	Electromagnetic Interference/ Compatibility	TOR-2005(8583)-1	Electromagnetic Compatibility Requirements For Space Equipment and Systems	8-Aug-05	Dunbar, M. Aerospace	
10	Electromagnetic Interference/ Compatibility	MIL-STD-461E	Electromagnetic Emissions and Susceptibility, Requirements for the Control of Electromagnetic Interference	1-Aug-99	Dunbar, M. Aerospace	
11	Electromagnetic Interference/ Compatibility	MIL-STD-1542B	EMC Grounding Requirements for Space System Facilities	1-Nov-91	Dunbar, M. Aerospace	
12	Environmental Safety and Occupational Health	NAS 411	Hazardous Materials Management Program	19-Jan-95	Caponpon, V. SMC/AXFV	
13	Human Factors	MIL-STD-1472F	DoD Design Criteria Standard - Human Engineering	23-Aug-99	Shaw, B. Aerospace	Ground segment hardware, especially mobile/transportable system or fielded tactical systems. See TOR-2002-8506-1 for tailoring recommendations
14	Human Factors	ISO 9241	Ergonomic Requirements for Office Work with Visual Display Units, Multiple Volumes.	1998	Shaw, B. Aerospace	Ground segment hardware, especially for ground systems and office like situations
15	Human Factors	COE UIS Rev 4.3	Common Operating Environment (COE) User Interface Specification (UIS), Version 4.3, (CM Reference: 59314)	15-Dec-03	Shaw, B. Aerospace	Ground segment software used only for user interfaces
16	Human Factors	SMC/AXE Rpt # HMRB-2001-1	Standard Practice: Human Computer Interface Display Conventions for Space System Operations.	14-Jan-01	Shaw, B. Aerospace	SMC ground segment TT&C used only for user interface
17	Human Factors	EIA HEB-1A	Electric Industries Alliance Engineering Bulletin - Human Engineering - Principles and Practices, Ver. 1A	15-Dec-05	Shaw, B. Aerospace	Applicable to ground segment development & integration - equivalent to DoD Handbook 46855
18	Interoperability/ Standardization	DoD Arch v1.0	DoD Architecture Framework Version 1.0	9-Feb-04	Awwad, N. SMC/EAS	
19	Interoperability/ Standardization	DISR 06-2.0	DISR Baseline Release 06-2.0	27-Jun-06	Awwad, N. SMC/EAS	DISR is an online tool for development of an Information Technology (IT) standards profile. (Replaced Joint Technical Architecture.)
20	Logistics	MIL-PRF-49506	Logistics Management Information (replaces 1388-1A)	11-Nov-96	Duphilly, R Aerospace	
21	Logistics	MIL-STD-130M	Identification Marking of U.S. Military Property	2-Dec-05	Wantland, G. SMC/LGA Duphilly, R Aerospace	

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	Functional/ Technical Area	Document Number	Title	Pub Date	Tech POC	Comments
22	Logistics	MIL-STD-1367A	Packaging, Handling, Storage, and Transportability Program Requirements for Systems and Equipments	1-Oct-89	Duphily, R Aerospace	
23	Logistics	TM-86-01	Air Force Technical Manual Contract Requirements (TMCR)	1-Jun-97	Duphily, R Aerospace	Tailoring available from SMC/LGA
24	Logistics	MIL-PRF-29612B	Training Data Products	31-Aug-01	Duphily, R Aerospace	Tailoring available from SMC/LGA
25	Maintainability	MIL-STD-470B	Maintainability Program for Systems and Equipment	1-Jun-95	Duphily, R Aerospace	
26	Manufacturing Management / Producibility	MIL-STD-1528A	Production Management	1-Sep-86	Davis, D., SMC/EAE	
27	Mass Properties	TOR-2005 (8583)-3970	Mass Properties Control Standard for Space Vehicles	20-Jul-05	Yang, L. Aerospace	
29	Moving Mechanical Assemblies	AIAA S-114-2005	Moving Mechanical Assemblies for Space and Launch Vehicles	30-Jun-05	Gore, B. Aerospace	
30	Ordnance	AIAA S-113-2005	Criteria for Explosive Systems and Devices Used on Space and Launch Vehicles	10-Nov-05	Goldstein, S. Aerospace,	
31	Parts Management	ANSI / AIAA R-100A	Recommended Practice for Parts Management	16-Aug-01	Davis, D SMC/AXE	Applicable to ground systems
32	Parts Management	TOR -2004(3909)-3315 Rev. A	Parts, Materials, & Processes Control Program for Space Vehicles - Revision A	12-Aug-04	Robertson, S. Aerospace	Replacement TOR [TOR-2006(8583)-5235] anticipated to be published in August 2006
33	Parts Management	TOR-2004(3909)-3316 Rev. A	Technical Requirements for Electronic Parts, Materials, and Processes Used in Space Vehicles - Revision A	12-Aug-04	Robertson, S. Aerospace	Replacement TOR [TOR-2006(8583)-5236] anticipated to be published in August 2006
34	Parts Management	TOR-98(1412)-1 Rev A	Parts, Materials, and Processes Control Program for Expendable Launch Vehicles - Revision A	1-Jan-04	Chang, G. E. Aerospace	
35	Pressurized Hardware	AIAA S-080-1998	Space Systems, Metallic Pressure Vessels, Pressurized Structures, and Pressure Components	1-Sep-98	Chang, J.B. Aerospace	
36	Pressurized Hardware	AIAA S-081A-2000	AIAA Standard for Space Systems — Composite Overwrapped Pressure Vessels (COPVs)	1-Dec-00	Chang, J.B. Aerospace	
37	Pressurized Hardware	TOR-2003 (8583)-2896	Space Systems – Flight Pressurized Systems	31-Aug-03	Chang, J.B. Aerospace	
38	Pressurized Hardware	TOR-2003(8583)-2895 Rev. 1	Solid Rocket Motor Case Design & Test Requirements	22-Dec-04	Chang, J.B. Aerospace	
39	Product Assurance	SAE AS9100 Rev. B	Quality Systems - Aerospace - Model for Quality Assurance in Design, Development, Production, Installation and Servicing	1-Jan-06	Davis, D. SMC/EAE	
40	Program Management	ISO 14300-2	Space Systems Programme Management - Part 2: Product Assurance - Policy & Principles	1-Jul-02	Davis, D. SMC/EAE	
41	Program Management	ISO 14300-1	Space Systems - Program Management - Part 1: Structuring of a programme	1-Dec-02	Davis, D. SMC/EAE	
42	Program Management	EIA 748	Earned Value Management Systems	28-Aug-02	Davis, D. SMC/EAE	
43	Reliability Program	MIL-STD-1543B	Reliability Program Requirements for Space and Launch Vehicles	1-Oct-88	Schipper, G. Aerospace	
44	Reliability Program	MIL-STD-785B, Notices 1 & 2	Reliability Program for Systems and Equipment Development and Production	1-Aug-88	Schipper, G. Aerospace	Applicable to ground systems
45	Risk Management	ISO 17666	Space Systems - Risk Management	1-Apr-03	Dar, R. Aerospace	
46	Safety, Range	AFSPCMAN 91-710	Range Safety User Requirements Manual	1-Jul-04	Huang, L. SMC/SE	Superseded EWR 127-1

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47	Safety, System	MIL-STD-882C	System Safety Program Requirements	19-Jan-93	Huang, L. SMC/SE	Version D is most current; SMC/SE requires Version C to be used on SMC contracts.
48	Satellite Disposal	TOR-2006 (8583)-4474	Requirements for End-of-Life Disposal of Satellites Operating at Geosynchronous Altitude	3-Nov-05	Allor, W. Aerospace	
49	Security	DoD 8510.1-M	DoD Information Technology (IT) Security Certification and Accreditation (C&A) Process (DITSCAP) Application Manual	31-Jul-00	Dupuis, J. Aerospace	Tailoring to generate requirements language available from SMC/PIP
50	Security	DoDI 8500.2	Information Assurance Implementation	06-Feb-03	Dupuis, J. Aerospace	Tailoring to generate requirements language available from SMC/PIP
51	Security	DODD 5200.39	Security, Intelligence, and Counterintelligence Support to Acquisition Program Protection	10-Sep-97	Dupuis, J. Aerospace	Tailoring to generate requirements language available from SMC/PIP
52	Security	MIL-HDBK 1785A	System Security Engineering Program Management Requirements	1-Aug-95	Dupuis, J. Aerospace	Tailoring to generate requirements language available from SMC/PIP
53	Security	DCID 6/3 Manual	Protecting Sensitive Compartmented Information Within Information Systems	11-Dec-03	Dupuis, J. Aerospace	Tailoring required to generate contractor requirements for portions of the system processing SCI. Available from SMC/PIP
54	Security	TSRD	Telecommunications Security Requirements Document	Written for each application	Dupuis, J. Aerospace	NSA-provided, system specific document that specifies requirements for cryptography and key management
55	Software Development	ISO/IEC STD 15939	Software engineering -- Software Measurement Process	11-Jul-02	Zambrana, M. SMC/EAS	
56	Software Development	RTCA-DO-278	Guidelines For Communication, Navigation, Surveillance And Air Traffic Management (CNS/ATM) Systems Software Integrity Assurance - DO-278	5-Mar-02	Zambrana, M. SMC/EAS	Applicable to AIRBORNE systems only.
57	Software Development	RTCA-DO-178B	Software Considerations In Airborne Systems and Equipment Certification	1-Dec-92	Zambrana, M. SMC/EAS	Applicable to AIRBORNE systems only.
58	Software Development	TOR-2004(3909)-3537 Rev B	Software Development Standard for Space Systems	11-Mar-05	Zambrana, M. SMC/EAS	
59	Structures	AIAA S-110-2005	Space Systems — Structures, Structural Components, and Structural Assemblies	12-Jul-05	Chang, J.B. Aerospace	Tailoring available from POC
60	Structures, Loads	TOR-2003(8583)-2886	Independent Structural Loads Analyses of Integrated Spacecraft, Launch Vehicle Systems	22-Aug-03	Kabe, A. Aerospace	
61	Survivability	TOR-92(2904)-5	Survivability Program Management Requirements For Space Systems	1-Jan-93	Cuevas, G. Aerospace	
62	Systems Engineering	TOR-2005 (8583) -3 Rev. A	Systems Engineering Requirements and Products	29-Sep-05	Shaw, B. Aerospace	Significantly revised to specify SE requirements and products; validated to be EIA 632 and IEEE 1220 compliant.
63	Test, Ground	MIL-STD-1833	Test Requirements for Gnd Equipt & Assoc Computer S/W Sptng Space Vehicles	4-May-98	Maynard, R. Aerospace	
64	Test, Ground	MIL-STD-810F	Department of Defense Test Method Standard for Environmental Engineering Considerations and Laboratory Tests	14-Jul-89	Davis, D. SMC/EAE	Applies to vehicle mountings, or ground support in various environments
65	Test, Space	SMC-TR-04-17 TR-2004(8583)-1	Test Requirements For Launch, Upper-Stage, & Space Vehicles	31-Jan-04	Perl, E. Aerospace	

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