

SMC Tailoring SMC-T-006  
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Supersedes:  
New issue



Air Force Space Command

# **SPACE AND MISSILE SYSTEMS CENTER TAILORING**

# **SPECIALTY ENGINEERING SUPPLEMENT TO IEEE-15288.1**

**APPROVED FOR PUBLIC RELEASE; DISTRIBUTION IS UNLIMITED**

## FOREWORD

1. This tailoring document defines the Government's requirements and expectations for contractor performance in defense system acquisitions and technology developments.
2. This new-issue SMC tailoring comprises the text of The Aerospace Corporation report number TOR-2015-01949, entitled *Tailoring of IEEE 15288.1: Specialty Engineering Supplement*.
3. Beneficial comments (recommendations, changes, additions, deletions, etc.) and any pertinent data that may be of use in improving this document should be forwarded to the following addressee using the Standardization Document Improvement Proposal appearing at the end of this document or by letter:

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SPACE AND MISSILE SYSTEMS CENTER  
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4. This tailoring document has been approved for use on all Space and Missile Systems Center/Air Force Program Executive Office - Space development, acquisition, and sustainment contracts.



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# Tailoring of IEEE 15288.1: Specialty Engineering Supplement.

## 1. Intent of this Tailoring Document

This tailoring document is a domain-area supplement to the industry-consensus systems engineering standard, adding specialty engineering requirements that have been historically deemed valuable to mission assurance/success of high-reliability space systems.

This tailoring document supplements IEEE 15288.1-2015 Annex E, which extends the guidance of ISO/IEC/IEEE 15288:2105 Annex E.4, *Process view for specialty engineering*. This document identifies the specialty engineering disciplines<sup>1,2</sup> which are critical to high-reliability space systems for optimizing total system performance and total ownership costs, while ensuring that the system is designed, operated, and maintained to effectively provide the user with the ability to complete their mission.

## 2. Context

### 2.1 ISO-IEC-IEEE-15288: 2015, *Systems and Software Engineering — System life cycle processes*

ISO-IEC-IEEE 15288 is the DOD-adopted standard for systems engineering.<sup>3</sup>

### 2.2. IEEE-15288.1: 2015, *Standard for Application of Systems Engineering on Defense Programs*

IEEE 15288.1 is an addendum to ISO-15288 for application of systems engineering on defense programs that was developed by a joint services working group under the auspices of the Defense Standardization Council. The Joint DOD Systems Engineering working group was led by industry and the SMC Chief Systems Engineer on behalf of DOD. This systems engineering standard was developed in conjunction with IEEE 15288.2, Technical Reviews and Audits on Defense Programs, and coordinated with SAE International's EIA-649-1, Configuration Management for Defense Programs. IEEE 15288.1 was formalized as a standard by the IEEE's Computer Society. The balloting involved a broad range of government and industry members and was nearly unanimous. IEEE 15288.1 has been adopted by DOD for use on contracts.

### 2.3. SMC-S-001 (2013), *Systems Engineering Products and Requirements*

SMC-S-001 is the systems engineering document that was used by SMC since 2008. It was used as the basis for development of IEEE 15288.1 since it was the only systems engineering standard found to be suitable for use on DOD contracts. This standard is the only standard that integrates systems and specialty engineering as it relates to high-reliability space systems in a contractually compliant manner. The specialty engineering requirements in this document derive, verbatim, from SMC-S-001. SMC-S-001 will be superseded in the SMC Compliance Standards list by ISO-IEC-IEEE 15288, IEEE 15288.1, and this supplement.

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<sup>1</sup> SMC Standard # SMC-S-001 (2013), *Systems Engineering*, Section 4.3; a republication of The Aerospace Corporation report # TR-2013-00001, *Systems Engineering Requirements and Products*.

<sup>2</sup> USAF Space and Missile Systems Center. *SMC Systems Engineering. Specialty Engineering Disciplines*. Volume 2, 1<sup>st</sup> edition. 3 October 2011.

<sup>3</sup> Notice – Adoption, Tier 2. [http://quicksearch.dla.mil/qsDocDetails.aspx?ident\\_number=213120](http://quicksearch.dla.mil/qsDocDetails.aspx?ident_number=213120)

### 3. Tailoring of IEEE 15288.1

#### 3.1. General IEEE 15288.1 Tailoring Instructions

The requirements in this document shall be used in conjunction with ISO-IEC-IEEE 15288 and IEEE 15288.1 on contract.

The requirements of this document shall prevail in the event of conflict between this document and ISO-IEC-IEEE 15288 or IEEE 15288.1.

Annex E.4 from ISO-IEC-IEEE-15288:2015 shall be normative (requirements) rather than informative (guidance).

This document, *Tailoring of IEEE 15288.1: Specialty Engineering*, shall replace IEEE 15288.1-2015 Annex E in its entirety and shall be:

1. Normative (requirements rather than informative guidance),
2. Tailored appropriately for specific acquisition/contract considerations, and
3. Implemented as part of the performance of IEEE 15288.1 Task 6.4.1.3, Business or Mission Analysis Process

NOTE: Acquirers should utilize their organizational or domain area compliance standards list (or other related sources) and invoke the appropriate standards for the performance of detailed specialty engineering activities.

#### 3.2. Specific IEEE 15288.1 Tailoring Language

##### 3.2.1 Specialty Engineering Analysis and Control

The contractor **shall**, for each specialty area listed below:

- a. Ensure that the following specialty functions and disciplines are incorporated into the systems engineering process.
- b. Establish a documented valid/approved process (including but not limited to applicable corporate process, military standards, military handbooks, NSS/industry standard processes) that is comprehensive and responsive to the system/end-user requirements for each specialty engineering area being integrated into the systems engineering effort.
- c. Include specialty engineering requirements in the requirements analysis, functional analysis/allocation, synthesis, and systems analysis and control.
- d. Include their impact in system life cycle cost estimates as well as in total system performance/reliability assessments.
- e. Document specific specialty engineering products/outputs in the SEMP.

##### 3.2.2 Parts, Materials, and Processes (PMP)

NOTE: Address as part of Project Planning Outputs – 6.3.1.4

- a. Detailed environmental parameters are defined/derived that impact parts performance.

- b. Parts/materials engineering/design requirements are allocated, baselined, and traced to system-level performance requirements, including risk assessments.
- c. Functional parameters are baselined and captured in detailed technical/procurement specifications.
- d. Technology development plans are executed and technology readiness levels demonstrate products/technology suitable for system application and support program development schedules.
- e. Qualified sources of supply and industrial base assessment are addressed.
- f. Space systems radiation-hardening design solutions are established.

### **3.2.3 Structures**

NOTE: Address as part of Project Planning Outputs – 6.3.1.4

- a. Detailed performance and technical requirements for each structural system, subsystem, and component are defined, allocated, and traced to system requirements.
- b. Structural design specifications comply with requirements and NSS industry practice.
- c. Verification methods for each structural requirement are defined.
- d. Structural requirements correlation with military and other government documents, including standards, specifications, handbooks, guidelines, and Commander's policies, are presented.
- e. Technical risk mitigation approaches are defined.
- f. Trade studies and detailed analyses support structural design solutions.
- g. Analysis tools and techniques are consistent with NSS industry practice.
- h. Design qualification methods adequately define approach to demonstrate structural adequacy.
- i. Quality assurance methodology ensures delivery of high-quality product.

### **3.2.4 Manufacturing**

NOTE: Address as part of Project Planning Outputs – 6.3.1.4

- a. Producibility engineering principles and practices are integrated into the design process.
- b. Manufacturing methods and processes required to build the design are qualified and demonstrated to meet system performance requirements and reliability.
- c. Manufacturing analyses include producibility analyses and manufacturing and production inputs to system effectiveness, tradeoff studies, and life cycle cost analyses.
- d. Alternative designs and capabilities of manufacturing are evaluated.

- e. Long-lead-time items, material source limitations, availability of materials and manufacturing resources, and production cost are identified, assessed, and documented.
- f. Manufacturing-critical characteristics of people, product, and process solutions and their risks are identified.
- g. Tooling and test equipment strategies and requirements are defined.
- h. Manufacturing and producibility requirements and constraints are defined.
- i. Items are producible and stable manufacturing processes are in place to reduce risk, manufacturing cost, lead time, and cycle time, and to minimize use of strategic and critical materials.
- j. As part of system design, manufacturing methods, processes, and process controls have been defined, evaluated, and selected, based on total system cost, schedule, performance, and risk.
- k. Product design has stabilized, the manufacturing processes and process controls have been proven, and production facilities, equipment, capability, and capacity are in place (or are about to be established) to support the approved schedule.

### **3.2.5 Quality Assurance**

NOTE: Comprehensively addressed as part of:

- Quality Management Process – 6.2.5 and Quality Assurance process – 6.3.8

### **3.2.6 Test**

NOTE: Comprehensively addressed as part of:

- Project Assessment and Control – 6.3.2.3 (process) and 6.3.2.4 (outputs);
- Decision Management Process Outputs – 6.3.3.4;
- Risk Management Process – 6.3.4;
- Configuration management – 6.3.5.4 c.2 (process) and 6.3.7.4 c.1 (outputs);
- Measurement – 6.3.7.1 (process) and 6.3.7.4 c.1 (outputs);
- System Requirements Definition process – 6.4.3.4;
- Architecture Definition Process – 6.4.4.1;
- Design Definition Process – 6.4.5.1;
- Verification Process Output – 6.4.9.4;
- Transition Process Output – 6.4.10.4;
- Operation Process Output – 6.4.12.4; and
- Data Requirements – 5.3

### **3.2.7 Survivability**

NOTE: Address as part of Project Planning Outputs – 6.3.1.4

- a. System-level survivability requirements are defined, allocated, baselined, and traced to the system-level requirements.
- b. System survivability attributes and mission objectives evolved into a set of system-level survivability requirements.
- c. An approach for verification of system-level survivability/operability requirements is identified.
- d. Test facilities capable of simulating threat environments are identified.
- e. Threat assessments and analysis are conducted, defining categories of the expected threats (i.e., nuclear, biological, terrorism, etc.) and their likelihood of occurrence.
- f. Threats and mitigation strategies are defined.
- g. Nuclear and other threats are translated into system environments and modeled.
- h. System/threat interaction analysis is performed.
- i. Hardness levels and definition of hardness margins and design criteria are identified.

### **3.2.8 Environmental, Safety, and Occupational Health (ESOH)**

NOTE: address as part of Systems Analysis Outputs – 6.4.6.4

- a. System-level ESOH requirements are defined, allocated, baselined, and traced to the system-level requirements:
  - (1) Hazards are identified.
    - (1) Hazardous materials are analyzed, including handling and disposal.
    - (2) Mitigation decisions are evaluated.
    - (3) Residual risk acceptance is evaluated.
    - (4) Current mitigation efforts are assessed.
    - (5) National Environmental Policy Act (NEPA) and Programmatic Environmental, Safety, and Health Evaluation (PESHE) requirements are incorporated.
- b. ESOH risks and corrective actions and alternatives are developed to eliminate or reduce environmental, health, and identified hazards and unsafe conditions; and the threat of regulatory violations is identified.
- c. Criteria are established for monitoring and reporting of pollution elimination/reduction efforts.
- d. A containment program is developed, including procedures for safe use and disposal.
- e. Handling and disposal of hazardous material are included in life cycle cost estimates.

### **3.2.9 Contamination**

NOTE: Address as part of Project Planning Outputs – 6.3.1.4

- a. Requirements for contamination control are identified for sensitive components or subsystems, including:
  - (1) Need for normal, medium, or challenging/stressing contamination control to meet requirements.
  - (2) Any needs for new or upgraded facilities.
  - (3) Shipping and prelaunch operations.
- b. Cleanliness challenges are identified and solutions proposed, including:
  - (1) Uncleanable materials.
  - (2) Solvent incompatibility.
  - (3) Mission-unique requirements to launch vehicle.
  - (4) High outgassing materials.
- c. Heritage analysis comprehensively and completely demonstrates that prelaunch cleanliness requirements can be met and that overall end-of-life (EOL) requirements can be met.

### **3.2.10 Mass Properties**

NOTE: Address as part of Project Planning Outputs – 6.3.1.4

- a. Mass properties requirements are reviewed and generated; changes are proposed where applicable.
- b. Baseline design is reflected in the mass properties analyses and reports.
- c. Subsystem and subcontractor's definition of critical mass properties parameters are reviewed and tracked to ensure that specification requirements are met.
- d. Configuration layout for optimizing mass properties (weight, balance, and inertia) is analyzed.
- e. Balance weight locations are defined. Provisions for balance weight installation are ensured.
- f. Test plan and test procedure are generated; method of verifying requirements is defined; required mechanical ground support equipment (MGSE) is identified.

### **3.2.11 Logistics**

NOTE: Address as part of Project Planning Outputs – 6.3.1.4



- a. Logistics requirements are defined, allocated, baselined, and traced to system requirements. Logistics management information (LMI), life cycle cost (LCC) analysis with a discussion of risks, and any risk reduction or control are included for the following logistics areas:
  - (1) Design interface – system reliability, maintainability, availability, survivability, including hardness and unique characteristics.
  - (2) Support concepts/maintenance plan – initial and steady-state support; implementation and transition schedule at organizational and depot level; warranties and SORAP.
  - (3) Manpower and personnel – operations, maintenance (hardware and software), and training support personnel.
  - (4) Supply support – support concept for initial and steady state, sparing requirement to support concept of operation.
  - (5) Support equipment and simulators – common and specialized organizational and depot support equipment, and system-level simulators and trainers.
  - (6) Training and training support – initial and follow-on training, equipment, documentation and facilities; student requirements.
  - (7) Technical data – engineering drawings and technical orders; data rights, technical manual contract/delivery requirements.
  - (8) Computer resource support – software and database maintenance, facilities, equipment, COTS, and documentation.
  - (9) Facilities – Space projections, new or reuse requirements, site survey, deployment transportable facilities.
  - (10) Packaging, handling, storage and transportation (PHS&T) – LMI packaging analysis, government and commercial packaging requirements, and packing requirement meet all concept of operations, including deployment storage, oversized and special packaging instruction, and air, ground, or sea shipping requirements.

### **3.2.12 Human Systems Integration (HSI)**

NOTE: Address as part of Project Planning Outputs – 6.3.1.4

NOTE: This section presents requirements for the systems engineering planning activities associated with human systems integration. The requirements for the subordinate domains are contained within specific domain-level standards.

#### **3.2.12.1 Scope and Nature of Work**

- a. Human systems integration (HSI) shall be applied as part of the overall systems engineering effort to efficiently and effectively integrate humans into the design of the system. The goals of the human systems integration effort shall be to:

- (1) Plan and execute efficient development of systems that effectively integrates human operators, maintainers, support personnel, and/or users.
- (2) Plan for impacts of military system operation, use, or disposal on potentially affected general populations.
- (3) Ensure system performance by ensuring human integration and specified levels of performance.
- (4) Apply to all aspects of military systems, equipment, and facilities acquisition, including analysis, design, development, acquisition, test and evaluation, sustainment, and product improvement.
- (5) Implement by making effective demands upon, and tradeoffs between, personnel resources, skills, and training to allow for knowledgeable management of total system ownership costs.

### **3.2.12.2 HSI Planning**

- a. HSI shall be part of the overall systems engineering effort within the total project and shall coordinate with all appropriate systems engineering specialties or disciplines.<sup>4</sup>
- b. HSI planning shall establish the collaboration between HSI domain disciplines with emphasis on each domain area's participation in system (hardware and software) design and testing.
- c. HSI shall be documented and managed accordingly.
- d. Risk management — HSI-related risks and issues that involve technical, cost, or schedule risks shall be identified and managed as early as possible as part of a program's overall risk management approach.
- e. Reviews — HSI-related activities shall be reported in all appropriate programmatic or technical reviews.

The contractor shall establish a comprehensive Human Systems Integration (HSI) effort as part of the overall systems engineering effort.

- f. HSI shall address the following discipline areas<sup>5</sup>:
  - (1) Manpower – number and mix (military, contractor, and civilian) of personnel required, authorized, and available to train, operate, maintain, and support the system.
  - (2) Personnel – human aptitudes, skills, experience levels, and abilities required to operate, maintain, and support the system when fielded and throughout its life cycle.

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<sup>4</sup> Support material for HSI planning can be found in The Aerospace Corporation report TOR-2012(8960)-1 REV A – HSI Planning Requirements.

<sup>5</sup> Individual DOD services/components may organize these same domain areas into different domain area combinations.

- (3) Training – instruction and resources required to provide the necessary knowledge, skills, and abilities to properly integrate, operate, maintain, and support the system.
  - (4) Human factors engineering – integration of human capabilities (cognitive, physical, sensory, and team dynamics) into system design, development, modification, and evaluation to optimize human-machine interactive performance for operation and maintenance of the system.
  - (5) Environment – issues related to water, air, and land and the interrelationships between these and all living things.
  - (6) Safety – issues including design of operational systems to minimize the possibilities for accidents or mishaps that threaten the survival of the system.
  - (7) Occupational health – minimizing risk of injury, acute and/or chronic illness, disability, and/or reduced job performance to personnel who operate, maintain, or support the system.
  - (8) Survivability – minimizing risk of fratricide, detection, and probability of being attacked; and inclusion of factors that enable the crew to withstand man-made or natural hostile environments without aborting mission or suffering acute/chronic illness or death.
  - (9) Habitability – living or working conditions necessary to sustain the morale, safety, health, and comfort of the user/maintainer population, contributing directly to personnel effectiveness and mission accomplishment.
- g. The HSI activities shall be integrated into the overall systems engineering program and management. The HSI requirements specified herein shall be coordinated with, but shall not duplicate, efforts performed to fulfill other contractual program tasks. The HSI-related portion of any analysis, design, or test and evaluation program shall be conducted under the direct cognizance of a qualified HSI-domain practitioner(s) assigned such responsibility by the contractor. “Qualified” should consider basis of education, experience, and/or certification in systems engineering, human systems integration, or any of the individual HSI domains.
- h. The contractor shall determine the scope and nature of HSI domain area applicability such that:
- (1) Program/contract requirements are allocated to the appropriate HSI domain (discipline) areas.
  - (2) Responsible entities (e.g., HSI Working Group and/or Integrated or Cross Product Teams – IPTs) are identified for each applicable HSI domain within the systems engineering IPT structure.
  - (3) Key or lead HSI personnel in all applicable domains are identified and described in terms of qualifications.
  - (4) Interfaces between related HSI domains are defined and developed to ensure comprehensive and effective execution of human-related requirements.
  - (5) Interfaces are established between the prime contractor and all subcontract or vendor HSI activities.

- (6) Domain interdependencies and tradeoffs are identified to ensure humans are considered as part of system design on par with the hardware and software.
- i. HSI planning shall be described in a configuration-managed document that is used to execute the HSI effort.
- j. HSI planning shall:
  - (1) Include the human-related tasks to be performed, milestones, level of effort, methods, and design concepts to be used, and the test and applicable evaluation methodologies.
  - (2) Describe data flow between HSI domains and/or IPTs (see Appendix B Giver-Receiver relationships).
  - (3) Be documented as a human systems integration plan and/or within the Systems Engineering Management Plan (SEMP).
  - (4) Be validated/updated prior to major programmatic and technical reviews.
  - (5) Be updated at program rebaseline and/or engineering change proposal (ECP).
- k. The following activities shall be considered:
  - (1) Integration of relevant human-related data and analyses into all design and development activities with human-related requirements, design features, or implications, especially considering the relationships between these efforts and opportunities to effect efficiencies in system development, operation, and maintenance.
  - (2) HSI implications for integrated development of logistics and operational support materials, including procedures, manuals, and technical documentation.
  - (3) User involvement and community review of human-related activities and products, including prototype assessments, peer reviews, and formal reviews.
  - (4) Verification and/or validation of human requirements and human-related design options/solutions.
- l. The contractor shall identify and manage human-related risks, issues, and opportunities in a way that:
  - (1) Ensures HSI-related risks are managed within the program's risk management process.
  - (2) Identifies potential cost, schedule, technical, and performance risks that result from human system integration.
  - (3) Quantifies such risks and their impacts on cost, schedule, and performance.
  - (4) Evaluates and defines the sensitivity of HSI-related risks.
  - (5) Identifies alternative solutions to HSI-related problems and defines the associated risks of each alternative.

- (6) Documents the identified risks, their potential impact, and the mitigation action(s) taken.
- (7) Manages the actions required to avoid, minimize, control, or accept each HSI-related risk.
- m. Human systems integration domain activities shall be addressed in all applicable programmatic and technical reviews, including but not limited to:
  - (1) Programmatic reviews, which include but are not limited to program management review, integrated baseline review, and integrated system review.
  - (2) System reviews, which include, but are not limited to:
    - i. Concept and requirements definition.
    - ii. Analysis of alternatives.
    - iii. System requirements review.
    - iv. Preliminary design review.
    - v. Critical design review.
    - vi. Test readiness reviews.
    - vii. System safety reviews.
    - viii. Engineering change proposal reviews.
    - ix. Post-implementation reviews.
  - (3) Subsystem and other lower-level reviews including, where applicable, software specification, test readiness, and functional reviews (e.g., support, training, systems engineering, test, and manufacturing).

### **3.2.13 System Security and Information Assurance**

NOTE: Address as part of Project Planning Outputs – 6.3.1.4

- a. A system security program is implemented that includes Information Systems Security Engineering (ISSE).
- b. Protection needs are documented, including identification of mission assets and assessment of threats to those assets.
- c. System security requirements are defined and complete. Includes system-specific threats and compliance with applicable DOD, national, and international system security policies. Includes system security design constraints.
- d. System security architecture and management plan is documented.
- e. Security design, including constraints and tradeoffs, is detailed; cryptography plans are coordinated with the National Security Agency.

- f. Certification and accreditation process activities are coordinated.
- g. Protection mechanisms have been verified to satisfy security requirements and residual security risks have been approved by the appropriate authorities.

### **3.2.14 Reliability**

NOTE: Address as part of Project Planning Outputs – 6.3.1.4

- a. Space system-specific reliability requirements are defined, allocated, baselined, and traceable to system requirements.
  - (1) Parameters and limits are defined at this level and provided within the system specification.
  - (2) Reliability requirements are reviewed against functional requirements and customary design practices.
- b. Applicable specific design tasks and analyses are 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. The reliability program plan and risk management plan are developed for final top-level space system.
- d. Items in development that have impact on support resources are identified, including time, people, money, parts, tools, storage, and transportation assets.

### **3.2.15 Electromagnetic Interference and Compatibility (EMI/EMC)**

NOTE: Address as part of Project Planning Outputs – 6.3.1.4

- a. EMI/EMC requirements are defined, allocated, baselined, and traced to system requirements, including:
  - (1) Use of RF shielded enclosures for vehicle, subsystems, or components, and other significant design features affecting EMC.
  - (2) Structure RF shielding effectiveness in excess of 40 dB.

- (3) Return of power on spacecraft structure.
  - (4) Unshielded or untwisted or unpaired wires.
  - (5) Radiated emissions requirements less than 20 dBuV/m.
  - (6) Gimbals that form part of a shielded enclosure—high risk.
  - (7) Radiated susceptibility requirements in excess of 100 V/m—high risk.
  - (8) Systems having passive intermodulation products of order 7 or less in platform receiver pass bands.
  - (9) Any EMC wire shields or grounds that are required to flex or rotate or rub/roll more than 20 times.
  - (10) Magnetic dipole requirements more stringent than  $3.5E-3 \text{ A-m}^2/\text{kg}$ .
  - (11) All first-flight/first-use EMC parts.
  - (12) All cryo-cooled sensor EMC designs.
  - (13) All EMC requirements with negative margin.
  - (14) Any RF receiver required to work in a dense EMI environment.
  - (15) Any RF receiver with a burnout level of less than 30 dBm (1 mW).
- b. A summary of all significant areas are addressed in the EMC Control Plan, including but not limited to program requirements tailoring and the use of heritage equipment and other NDI.
  - c. EMC requirements verification planning to the unit level is conducted.
  - d. EMI/EMC risk areas are identified and risk mitigation closure plans developed.

### **3.2.16 System Safety**

NOTE: Address as part of Project Planning Outputs – 6.3.1.4

- a. System safety requirements are defined, allocated, baselined, and traced to system requirements, including:
  - (1) System safety design requirements are specified and safety design criteria determined.
  - (2) Hazards associated with the system are identified and risks involved identified; hazard analysis is complete.
  - (3) Risks are minimized in the design, materials, testing, and production of end item.
  - (4) Retrofit actions are minimized by inclusion of safety features during definition and development of system.

- (5) Retrofit actions are minimized by inclusion of safety features during definition and development of system.
- b. Hazardous substances, components, and operations are isolated from other activities, areas, personnel, and incompatible materials.
- c. Catastrophic risks are eliminated.
- d. Critical hazards are minimized.

#### **4. Applicable Documents**

The following documents form a part of this document to the extent specified herein. Unless otherwise specified the issues of these documents are those cited in the solicitation or contract.

- ISO-IEC-IEEE-15288: 2015, Systems and Software Engineering — System life cycle processes.
- IEEE-15288.1: 2015, Standard for Application of Systems Engineering on Defense Programs.
- Shaw, B E, *Systems Engineering Requirements and Products*, Aerospace Report Number TR-2013-00001. The Aerospace Corporation, El Segundo, CA (February 28, 2013).  
and  
SMC-S-001 (2013), Systems Engineering Products and Requirements.



<b>SMC Standard Improvement Proposal</b>		
<p align="center"><b>INSTRUCTIONS</b></p> <p>1. Complete blocks 1 through 7. All blocks must be completed.</p> <p>2. Send to the Preparing Activity specified in block 8.</p> <p>NOTE: Do not use this form to request copies of documents, or to request waivers, or clarification of requirements on current contracts. Comments submitted on this form do not constitute or imply authorization to waive any portion of the referenced document(s) or to amend contractual requirements. Comments submitted on this form do not constitute a commitment by the Preparing Activity to implement the suggestion; the Preparing Authority will coordinate a review of the comment and provide disposition to the comment submitter specified in Block 6.</p>		
<b>SMC STANDARD CHANGE RECOMMENDATION:</b>	<b>1. Document Number</b> SMC-T-006	<b>2. Document Date</b> 2015
<b>3. Document Title</b>	Specialty Engineering Supplement to IEEE 15288.1	
<p><b>4. Nature of Change</b> (Identify paragraph number; include proposed revision language and supporting data. Attach extra sheets as needed.)</p>		
<b>5. Reason for Recommendation</b>		
<b>6. Submitter Information</b>		
<b>a. Name</b>	<b>b. Organization</b>	
<b>c. Address</b>	<b>d. Telephone</b>	
<b>e. E-mail address</b>	<b>7. Date Submitted</b>	
<b>8. Preparing Activity</b>	Space and Missile Systems Center AIR FORCE SPACE COMMAND 483 N. Aviation Blvd. El Segundo, CA 91245 Attention: SMC/EN	