Best Practices for Using Systems Engineering Standards (ISO/IEC/IEEE 15288, IEEE 15288.1, and IEEE 15288.2) on Contracts for Department of Defense Acquisition Programs

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1 Introduction

1.1 BACKGROUND

The Department of Defense (DoD) and the defense industry have found that applying systems engineering (SE) processes and practices throughout the system life cycle improves project performance, as measured by the project's ability to satisfy technical requirements within cost and schedule constraints.[1] Simply put, projects that use effective SE processes perform better than those that do not. Given this knowledge, it is in the best interest of both acquirers and suppliers to ensure that defense acquisition projects use effective SE processes as the core of the technical management effort. [2]

In addition, the use of standards in key technical disciplines, such as SE, can enhance project performance and provide a common framework for communicating best practices for implementing effective SE on DoD acquisition projects. Consistent with the Public Law 114-328[3], Public Law 104-113,[4] and with the Office of Management and Budget (OMB) Circular A-119, [5] DoD encourages the adoption of voluntary consensus standards, where practical, rather than developing new or updating existing Government-unique specifications and standards.

A "voluntary consensus standard" is a non-Government standard (NGS), developed and accepted by subject matter experts in Government, industry, and academia.[6] The revised OMB Circular A-119 maintains a strong preference for voluntary consensus standards over Government-unique standards and provides factors for agencies to consider when evaluating whether to use a standard to meet agency needs.

"Adoption" is the process by which DoD expresses formal acceptance of an NGS for use in direct procurement, as a reference in another document, or as guidance in the design, manufacturing, testing, or

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[1] *Weapon System Requirements: Detailed Systems Engineering Prior to Product Development Positions Programs for Success.* GAO-17-77, Government Accountability Office, November 2016.

[2] For purposes of this guide, the "acquirer" refers to a DoD Program Management Office or other Government procurement organization, although in practice the acquirer may be a prime contractor in relation to subcontractors. The "supplier" refers to the selected offeror. The term "project" is used throughout, but all references to a project are applicable to a program. In addition, a defense program may consist of multiple projects for different phases, subsystems, or suppliers.

[3] Public Law 114-328, *National Defense Authorization Act for Fiscal Year 2017*.

[4] Public Law 104-113, *National Technology Transfer and Advancement Act of 1995*.

[5] Office of Management and Budget (OMB) Circular A-119, "Federal Participation in the Development and Use of Voluntary Consensus Standards and in Conformity Assessment Activities," revised January 2016.

[6] DoD Manual 4120.24, *Defense Standardization Program (DSP) Procedures*, September 24, 2014.

support of materiel. [7] An adopted NGS is not a mandatory document; it is simply available for use by DoD activities. Therefore, it is up to each Program Management Office (PMO) to determine if and how the standards should be used to support a particular project.

1.2 PURPOSE

DoD has adopted the voluntary consensus standard ISO/IEC/IEEE[8] 15288, "Systems and Software Engineering–System Life Cycle Processes," for use by acquisition projects. The standard establishes a common process framework for describing the life cycle of man-made systems and defines a set of SE processes and associated terminology typical for the full system life cycle, including conception, development, production, utilization, support, and retirement.

DoD has also adopted the companion standards IEEE 15288.1, "Standard for the Application of Systems Engineering on Defense Programs," and IEEE 15288.2, "Standard for Technical Reviews and Audits on Defense Programs," that define requirements for SE processes, technical reviews, and audits for defense projects. Both companion standards, as well as 15288, were all developed to enable direct citation on DoD acquisition contracts. Throughout the remainder of this document, these three standards will be referred to collectively as the 15288 Standards. DoD projects may use the documents collectively or individually to support effective technical performance on DoD contracts.

The purpose of this document is to assist:

- Acquirers in tailoring the 15288 Standards to meet and communicate project needs
- Acquirers in incorporating appropriate language into a Request for Proposal (RFP) to invoke the standards and express relative importance of the standards in proposal evaluations
- Offerors in developing their proposals to leverage existing organizational processes, or propose alternative value-added tailoring, to support the RFP requirements and comply with the standards as tailored
- Acquirers in evaluating an offeror's ability and commitment to effectively implement SE processes compliant with acquirer's requirements based on the proposed Systems Engineering Management Plan (SEMP), project plan, master schedule, and past performance
- Acquirers in monitoring and enforcing a supplier's compliance with the contract and delivery of the product/service/system

[7] SD-9, "DoD Guidance on Participation in the Development and Use of Non-Government Standards," Defense Standardization Program Office, March 9, 2005.

[8] International Organization for Standardization (ISO)/International Electrotechnical Commission (IEC)/Institute of Electrical and Electronics Engineers (IEEE)

1.3 15288 STANDARDS OVERVIEW

ISO/IEC/IEEE 15288, "Systems and Software Engineering–System Life Cycle Processes," establishes a common framework for describing the life cycle of man-made systems and defines a set of processes and associated terminology from an engineering viewpoint (Table 1). These processes can be applied at any level within a system's hierarchy structure and along any stage of the system's life cycle.

The processes involve all stakeholders, with the ultimate goal of achieving customer satisfaction. ISO/IEC/IEEE 15288 also provides guidance for definition, control, and improvement of the organization or project's system life cycle processes. Organizations and projects may use these processes when acquiring and supplying systems. The standard addresses man-made systems that may be configured with one or more of the following elements: hardware, software, data, humans, processes (e.g., processes for providing service to users), procedures (e.g., operator instructions), facilities, materials, and naturally occurring entities.

Table 1: Systems Engineering Life Cycle Processes

Agreement Processes	**Technical Management Processes**	**Technical Processes**
• Acquisition • Supply	• Project Planning • Project Assessment and Control • Decision Management • Risk Management • Configuration Management • Information Management • Measurement • Quality Assurance	• Business or Mission Analysis • Stakeholder Needs and Requirements Definition • System Requirements Definition • Architecture Definition • Design Definition • System Analysis • Implementation • Integration • Verification • Transition • Validation • Operation • Maintenance • Disposal
Organizational Project-Enabling Processes • Life Cycle Model Management • Infrastructure Management • Portfolio Management • Human Resource Management • Quality Management • Knowledge Management		

Source: ISO/IEC/IEEE 15288, "Systems and Software Engineering–System Life Cycle Processes"

IEEE 15288.1, "Standard for the Application of Systems Engineering on Defense Programs," is a companion standard to ISO/IEC/IEEE 15288, which expands on the SE life cycle processes with additional detail specific to DoD acquisition projects. It adds requirements for SE outputs and the attributes (criteria) for each. The addition of outputs reflects a practical information-based management approach while acknowledging that SE processes are the basis for executing the required work activities. The DoD's SE acquisition approach is based on a contractual acquirer-supplier agreement for the technical activities to be performed, the SE outputs to be produced, and the ability of the acquirer to assess those activities and outputs. IEEE 15288.1 should be part of the acquirer-supplier agreement, tailored by the acquirer to define the requirements for SE processes applicable to the specific project, including tasks to be performed, outcomes to be achieved, and outputs to be developed.

IEEE 15288.2, "Standard for Technical Reviews and Audits on Defense Programs," is a companion standard that provides detailed definition, requirements, and evaluation criteria for the technical reviews and audits associated with DoD acquisition projects (Table 2). The acquirer should tailor IEEE 15288.2 to specify the

reviews, criteria, and expected outcomes appropriate to the specific acquisition project. Through appropriate tailoring and contract negotiation, the acquirer and supplier establish an agreement with specific criteria to be met in each applicable review.[9]

Table 2: Technical Reviews and Audits

General Technical Reviews and Audits	Domain-Specific Technical Reviews
• Alternative Systems Review • System Requirements Review • System Functional Review • Preliminary Design Review • Critical Design Review • Test Readiness Review • Functional Configuration Audit • System Verification Review • Production Readiness Review • Physical Configuration Audit	• Software Requirements and Architecture Review • Software Specification Review • Integration Readiness Review • Flight Readiness Review

Source: IEEE 15288.2, "Standard for Technical Reviews and Audits on Defense Programs."

SE experts in Government, industry, and academia worked with IEEE to produce standards 15288.1 and 15288.2 to enable direct citation of SE processes and technical reviews and audits on DoD acquisition contracts. The DoD intends to use the 15288 Standards as compliance documents in the acquirer-supplier agreement. As with any standard, the 15288 Standards should be tailored appropriately for the specific contractual application and applied in a manner that satisfies the business and mission needs and constraints of the project. When suitably tailored, these standards provide explicit requirements for SE processes, technical reviews, and audits to be resourced and executed during the course of the project.

"Suitably tailored" means tailoring the breadth and depth of the activities or tasks to be performed and the criteria associated with the outputs, along with removing those outside the scope of the acquisition. It does not mean eliminating standard SE processes, derived from industry best practices. Programs should use Appendix A as a guide in tailoring the standard. The tailored 15288 Standards, along with project requirements and other acquisition planning documents such as the acquirer's Systems Engineering Plan (SEP), are part of a clearly stated and properly scoped contract. The inclusion and use of these documents in a contract is meant to ensure that the acquirer's requirements are bid effectively, resourced appropriately, reflected accurately in the supplier's proposed SEMP, project plan, and/or schedule and, ultimately, executed in a manner commensurate with effective technical practices.

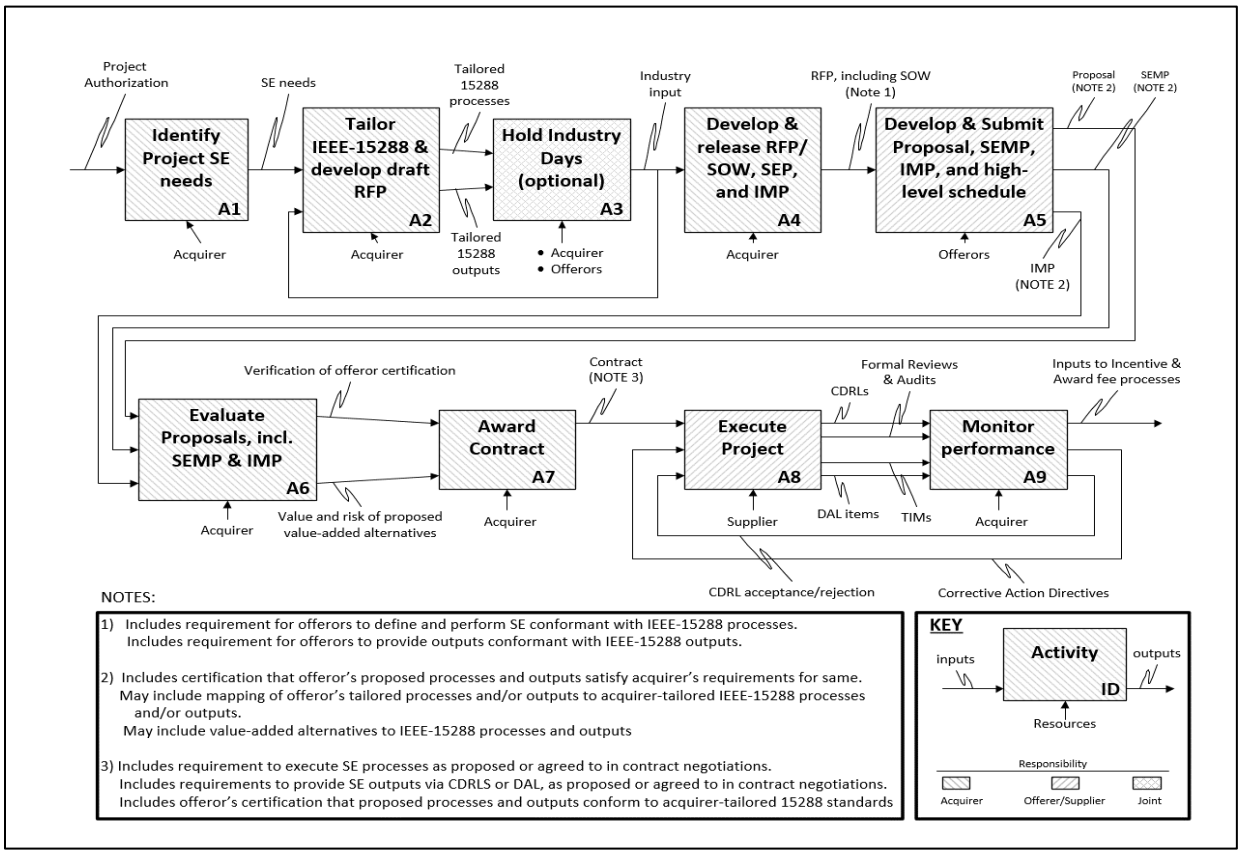
[9] IEEE 15288.1 and IEEE 15288.2 are available at no charge to DoD military and civilian employees via ASSIST, the Defense Logistics Agency (DLA)-sponsored database for DoD specifications and standards. DoD military and civilian employees may view, download, and print these standards for personal use but may not further copy, prepare, or distribute copies of the standard, or significant portions of the standard, subject to the terms of use of the standard. Instructions for how DoD military and civilian employees can access the standards via ASSIST are located on the DASD(SE) website, http://www.acq.osd.mil/se/docs/ASSIST-Access-15288.pdf. Others can purchase all three 15288 Standards via IEEE at http://www.ieee.org.

2 Overview

To establish a project with an effective SE approach in the competitive environment of most DoD acquisitions, the system acquirer should:

1. Stress the importance of SE within the scope of the overall acquisition
2. Define the acquirer's expectations, generally expressed in requirements, for a supplier's SE processes (outcomes, activities, and/or outputs) and technical reviews and audits
3. Levy requirements on the supplier, via the contract, to perform effective SE
4. Ensure the supplier's SE efforts are appropriately funded and resourced
5. Ensure a means for the supplier to demonstrate compliance with those requirements

The 15288 Standards provide one method to define the acquirer's expectations and requirements for the supplier's performance of SE processes and technical reviews and audits. Thoughtful and proper use of these standards can enhance communication and understanding between the acquirer and supplier throughout the solicitation process and contract execution. Figure 1 illustrates how to successfully implement the 15288 Standards in DoD acquisition contracts.



CDRL: Contract Data Requirements List; DAL: Data Accession List; ID: Identifier; IMP: Integrated Master Plan; IMS: Integrated Master Schedule; RFP: Request for Proposal; SE: Systems Engineering; SEMP: Systems Engineering Management Plan; SEP: Systems Engineering Plan; SOW: Statement of Work; TIM: Technical Interchange Meeting

Figure 1: DoD Employment of 15288 Standards in Acquisition Contracts

The process starts with the acquirer outlining the SE needs of the project. Not all projects will use SE processes, technical reviews, and audits within the 15288 Standards to the same extent. For example, a project for follow-on production of a previously designed system may not use the *Architecture Definition*, *Design Definition*, and other design-related processes (Table 1, p. 3) to a large degree. A project to develop a proof-of-concept prototype for testing and evaluation may not use all elements of the *Maintenance* process. Similarly, a project contracting for the Engineering and Manufacturing Development phase most likely will not conduct an *Alternative Systems Review*.

Upon considering the project's objectives, needs, and constraints, the acquirer should tailor the 15288 Standards by adding, modifying, or removing process, output, and/or technical review requirements to define the scope of work to be included in the contract effort (see ISO/IEC/IEEE 15288:2015; Annex A for guidance on the tailoring process). The resulting tailored standards define the acquirer's requirements for SE to be performed by the supplier. Direct-cite standards in a DoD RFP clarify and strengthen the Statement of Work (SOW). These expectations should be discussed with potential offerors during Industry Days and/or draft RFP reviews if conducted, and offeror comments may be considered in the development of the final RFP.

The final RFP and SOW, developed and issued by the acquirer, should cite the tailored 15288 Standards, which define the requirements for performance of SE processes and technical reviews for the project. The RFP should:

- Identify the applicable requirements of the 15288 Standards
- Instruct the offerors to respond to the 15288 Standards requirements and describe how they plan to meet the applicable requirements in their proposal, SEMP, project plan, and/or schedule
- Encourage offerors to use existing organizational processes that satisfy those requirements, and/or propose alternative processes with accompanying rationale

The offeror's response, contained in the proposal, SEMP, project plan, and schedule, should describe the plan to execute and resource the SE effort to meet the requirements of the RFP. Offerors should provide credible assurance of their capability to implement SE processes and conduct technical reviews and audits consistent with the acquirer's requirements. An offeror's approach in a response may include:

- Providing assertions of full or partial conformance to the 15288 Standards
- Providing a mapping between the standards and existing organizational processes and outputs that includes identification of any gaps
- Providing certifications or ratings for other relevant standards or models along with a mapping to the acquirer's requirements reflected in the tailored standards
- Providing evidence of past performance on projects where processes and/or technical reviews consistent with the 15288 Standards were used or conducted
- Proposing alternative tailoring to the 15288 Standards that demonstrate the benefits to the acquirer as well as the risks associated with the alternative

The acquirer should not seek to mandate specific techniques or methods ("how" requirements) for execution of SE processes. Rather the acquirer should enable suppliers to leverage existing organizational processes already in place to satisfy industry best practices with acceptable rigor. Responding to the acquirer's requirements does

not necessitate strict adherence to the 15288 Standards. It should be acceptable for the supplier to reflect the intent of the tailored 15288 Standards in a manner that provides maximum value, both technical and programmatic, to the acquirer and supplier. The offeror should also be encouraged to consider further tailoring of the 15288 Standards if, by doing so, the offeror provides greater value to the acquirer, while still meeting the acquisition goals.

The acquirer reviews the offeror's proposal to determine whether the proposed approach for implementing SE processes and technical reviews and audits demonstrates compliance with the acquirer's requirements and shows an understanding of the project's technical challenges. The acquirer should ensure that all required processes, outputs, and reviews have been addressed and are reflected in the proposed planning artifacts; SEMP/IMP/IMS) and that management and technical resources (funding, personnel, and facilities/equipment) will be in place to ensure both acquisition and mission success. The acquirer may request additional process descriptions and information to support a more detailed assessment of conformance to the standard's requirements.

When a contract is awarded, the acquirer-supplier agreement baselines the applicable requirements of the standards and the supplier's proposed planning documents, including the SEMP, IMP, and IMS. This formalizes the acquirer-supplier agreement for SE – the commitment by the supplier to perform the agreed-upon activities and reviews, achieve the agreed-upon outcomes, and provide the agreed-upon outputs.

Throughout contract execution, the acquirer should assess the supplier's compliance with the contract as well as satisfaction of project objectives. Assessment of SE processes, outputs, and outcomes may be accomplished through: participation alongside the supplier, during ongoing process monitoring at specified checkpoints or during technical reviews, and/or evaluation of deliverables provided by the supplier. Ideally, the acquirer will assess compliance using appropriate measures, preferably with leading indicators rather than lagging indicators. Monitoring the supplier's SE activities and outputs along the way can serve as a leading indicator of project performance, enabling the acquirer to identify project or product shortfalls early and address them in a timely and economical manner. Other examples of leading indicators include:

- Requirements trends (requirements stability, stakeholder needs met)
- Interface trends
- Risk burn-down
- Technical Performance Measure (TPM) trends/summary
- Technical maturity

Sections 3 through 5 provide more detailed information on this process.

3 Systems Engineering Planning Prior to Request for Proposal

Early technical planning is essential to project success. Before issuing an RFP, the acquirer documents the program's overall SE approach in the SEP, which then guides all technical activities of the program. The SEP describes the integration of SE activities with other program management and control efforts, including the Integrated Master Plan (IMP), Work Breakdown Structure (WBS), Integrated Master Schedule (IMS), Risk Management Plan (RMP), Technical Performance Measures (TPM), and other documentation fundamental to successful program execution. The SEP also describes the program's technical requirements, engineering resources and management, and technical activities and products as well as the planning, timing, conduct, and success criteria of event-driven technical reviews and audits throughout the acquisition life cycle. The acquirer should use the SEP to communicate the technical approach to offerors and suppliers.

3.1 PLANNING FOR USE OF SYSTEMS ENGINEERING STANDARDS

The 15288 Standards describe a generic perspective of SE processes and technical reviews. The applicability of that perspective will vary for specific projects, acquisition phases, and/or suppliers. Therefore, the acquirer should initially tailor the standards to meet the specific business or mission needs and constraints of the project, balancing the cost of using the standards with the risk reduction achieved from their use. This initial tailoring establishes the acquirer's SE expectations in the RFP and provides a baseline against which offerors should bid. All tailoring decisions should take into consideration the cost-benefit trade-off of including or excluding specific elements of the standards. In doing so, the potential negative impacts and unintended consequences should be considered.

The value of the 15288 standards is not in the rote performance of the processes and technical reviews they define. Rather, it is in the thought processes and resulting outcomes of the activities that enable better decision making from both technical and programmatic perspectives. As such, the objective should not be to mandate strict task-level conformance to the standards or to require task-level verification of compliance, but to ensure that the *intent* of the standard is met in a way that is most efficient and effective to achieve the outcomes and outputs expected by performance of the processes. Over-prescriptive specification by the acquirer can lead to significant cost impacts and may potentially constrain supplier innovation that could be of mutual benefit.

When deciding how to use standards to support contracting for SE, the acquirer should consider the project characteristics and the scope of the contracted effort. Tailoring the 15288 standard requirements for SE processes and technical reviews and audits should provide a balanced approach to cost, schedule, and performance at acceptable risk. The project characteristics described in this section and in Appendix A provide insight and examples that may be useful to consider as part of the acquirer's tailoring decisions.

Other acquirer-specific considerations that may impact selection and tailoring of standards include:

- Acquisition model and applicable life cycle phase(s)
- Acquisition type (open and competitive vs. sole source)
- Funding profile, organization of project office, and size of support staff
- Past performance of known or expected bidders
- Mission criticality and risk acceptance levels

3.2 USE OF 15288 AND 15288.1 ON CONTRACT

The acquirer should identify applicable requirements of the 15288 and 15288.1 standards by clause as part of the solicitation. The acquirer should define and tailor the requirements for SE outcomes, activities, and outputs so they meet the project's need for information to provide visibility into the success of product or system development and support decision making to promote programmatic and mission success.

The acquirer should focus on ISO/IEC/IEEE 15288 Clause 6, in particular Clauses 6.X.X.2 and 6.X.X.3, when tailoring to identify desired process outcomes and activity requirements for the supplier. Based on a thorough SE analysis, the acquirer should tailor out process outcomes or activities that do not provide enough value to justify their associated costs.

In IEEE 15288.1, the acquirer should focus on Clause 6.X.X.4 when tailoring to remove outputs and/or associated criteria that are clearly outside the scope of the project. The acquirer can further refine those within scope to reflect the specific project needs by tailoring the breadth/depth of the criteria associated with the outputs.

The acquirer should give specific attention to the tailoring of 15288.1 outcome, activity, and/or output clauses that include the phrase "... in accordance with the acquirer-supplier agreement." Since the SOW, standard, and tailoring will constitute the contractual agreement, the desired outcomes, activities, and outputs should be clearly expressed to ensure the acquirer and supplier have the same understanding of all requirements.

The acquirer should be cautious when eliminating or significantly minimizing any process element in the standard. The acquirer should consider all potential negative impacts and unintended consequences resulting from tailoring, as they may add risk to the project. Tailoring of SE outcomes, activities, and outputs should be balanced with the business/mission needs and project constraints.

3.3 USE OF 15288.2 ON CONTRACT

The acquirer should provide the applicable requirements of IEEE 15288.2 as part of the RFP to define the technical reviews and audits to be conducted in support of the project. The acquirer should give consideration to the different philosophies for technical review execution, for example, bottom-up (subsystem reviews culminating in a system-level review) versus top-down (system review before subsystem reviews). In tailoring, the acquirer should carefully consider the information necessary for informed decision making. The requirement for certain information should be balanced by business/mission needs and project constraints.

- The acquirer should remove any technical reviews that are not planned for the acquisition phase associated with the contract's period of performance.
- For each applicable technical review or audit, the acquirer should review the evaluation criteria in Clause 6 and tailor accordingly. Evaluation criteria that are not applicable should be removed. Each evaluation criterion levied for technical reviews carries an associated element of cost that may not yield sufficient benefit. The selected criteria should reflect the level and type of risk for the project.

The normative requirements for conducting technical reviews and audits are provided in Clauses 5 and 6 of IEEE 15288.2. Clause 5 indicates which reviews are appropriate to the project. As written, all technical reviews and audits in Clause 5 are normative. Therefore in the tailoring, the acquirer should delete and

document any technical reviews or audits that are not appropriate. Any required change regarding the timing for technical reviews or audits should be made clear in Clause 5.X.3. Entry, exit, and success criteria for the reviews are normative and provided in Clauses 5 and 6.

Both the acquirer and supplier should consider and mutually agree upon the tailoring of the reviews in the contract to clarify the expectation for each applicable technical review or audit. The domain-specific technical reviews in Annexes A, B, C, and D are informative and therefore should be specifically invoked if desired as a contractual requirement.

The acquirer should also tailor out any requirements or responsibilities that will be performed solely by the acquirer. Specifically, the required preparation and closure actions in Clauses 6.X.2 and 6.X.4 (including those in the tables) should either be assigned to the supplier or tailored out.

When tailoring either the reviews or the criteria, the parties should remember that this standard does not task the engineering work efforts required to produce the review content. Engineering efforts should be tasked in the SOW and may have standards for practices, design criteria, or testing associated with those efforts. The focus of 15288.2 is limited to the review and approval of intermediate outputs by the acquirer to support effective project management.

3.4 TAILORING CONSIDERATIONS

All 15288 processes have been shown to add value to projects. However, the degree to which each process may be used on a project and the benefits that each provides can vary greatly based on characteristics of the project. For example:

- Larger or more complex projects may benefit from more comprehensive and formal application of these processes, whereas smaller or lower-risk projects may not need to support the same level of application to gain the requisite level of benefits.
- Projects developing systems that are safety-critical, mission-critical, or within regulated domains (e.g., medical, nuclear) may demand more comprehensive and formal application of some processes, as well as additional or more detailed outputs reflecting the risks inherent to the domain.

The application of the 15288 processes on a project may be influenced by various project characteristics. Table 3 provides a sample list of project characteristics and sub-characteristics that may influence the tailoring of the 15288 processes and technical reviews and audits. Appendix A discusses characteristics in more detail.

Table 3: Project Characteristics That May Drive Tailoring

Project Characteristic	Sub-Characteristics
Life-cycle considerations	• Acquisition life cycle phases covered • Acquirer / supplier division of effort • Duration of development effort • Total cost of ownership • Development life cycle model (e.g., rapid) • Known or assumed funding profile
Mission application	• Domain • Mission criticality (“-ilities” required; domain regulations) • Number of usage scenarios • Number of deployment sites / environments • Design for reusability
Organizational complexity	• Number of development organizations • Diversity of organizational viewpoints, for example based on corporate legacy • Commonality and integration of standard processes or toolsets • Reuse of existing components or intellectual property • Staff experience, capability, size, and skills needed
Technical complexity	• Number of requirements • Number of system external interfaces • Number of different types of users • Number of system elements / internal interfaces /architectural levels • Number of KPPs • Total development cost
Risk	• System precedence / technology availability • Technology obsolescence • Integration of the technology • Programmatic / external risk • Sustainment / disposal risk • Manufacturing / supply chain risk • Prior acquisition / system failures or past performance history
Technical understanding	• Requirements understanding • Architecture understanding • Emergence likelihood

4 Request for Proposal and Source Selection

4.1 DEVELOPMENT OF THE REQUEST FOR PROPOSAL

When developing the RFP, the acquirer should carefully consider and be transparent about the type of response expected from the offerors. Many factors can influence the desired level of fidelity in an offeror's response, including the relative importance of SE to the particular project, source selection resources, or prior experience with the offerors. Both preparation and evaluation of proposals is cost-intensive, so clear communication of expectations is important for both the acquirer and supplier organizations. This insight is important for offerors to ensure that they provide sufficiently detailed information to clearly convey their offer, and for the acquirer to ensure that they receive the necessary information to properly evaluate the proposals.

When SE is critical to the project, more detailed proposals may be desired. The most minimal response may be an offeror's self-certification of conformance to the standards, while the maximum response may be a complete mapping of the relationship between the offeror's SE processes and the requirements specified in the RFP, or provision of the offeror's organizational process documentation for source selection review. Intermediate responses may include citation of the offeror's internal process documentation and description of how they meet the intent of the standards and requirements specified in the RFP. While the response types at the extreme may be desirable, they tend to involve different but significant source selection risks.

The acquisition type can dictate the offeror response. A "full and open" competition allows for limited and controlled communication between the source selection team and the offerors for clarification, whereas a sole source situation allows for much deeper and more interactive communication between the parties. In the former case, the proposal should provide sufficient information to allow the source selection team to assess and gain assurance that the proposal responds to the requirements, has adequate resourcing for effective task performance, and meets the intent of the standards. In the latter case, it is possible for detailed discussions in a more dynamic environment, which may be more amenable to detailed explanation of offeror practices and how they meet the requirements or intent of the standards. Contract type can also dictate the offeror response. A fixed price contract may call for a greater level of detail up front, whereas a cost reimbursable contract may allow for more flexibility at the initiation of the contract.

Tailoring of standards by the acquirer as part of RFP development communicates the acquirer's expectations for supplier SE performance to prospective offerors, specifically regarding non-specification requirements. Tailoring may include removal, modification, or addition of requirements. In many cases, the tailoring reflects the scale or rigor of the application of the processes in 15288.1 or the level of detail for the reviews of 15288.2. In these cases, the tailoring will focus more on the outputs required from the execution of the process or the scope and criteria of the reviews or audits. Use of a direct-cite standard supports the SOW in documenting the work against which the offerors bid, and for which offerors may opt to propose additional or alternative tailoring. Tailoring of the 15288 Standards should be included in the RFP as an attachment to the SOW.

Due to copyright and licensing limitations, tailoring of industry-published standards precludes "marking up" and distributing the standard itself, unless specific permission is obtained from the SDO. Tailoring may need to be documented as change language indicating the requirements modification, deletion, or addition. For example: "Clause X.X.X, Change to read, ..."; "Clause X.X.X, Delete in its entirety"; or "Clause X.X.X, Add

the following additional requirements: ...” Appendix C provides an example tailoring document template that can be included in an RFP to convey the acquirer’s tailored set of requirements.

The acquirer should consider the intended delivery mechanism for SE process outputs. If the acquirer desires to receive formal delivery of an output for approval, then a Contract Data Requirements List (CDRL) item may be required. If the acquirer desires to have access to data and/or outputs, but not formal delivery, then those outputs can be specified in a Data Accession List (DAL). When appropriate, use of existing Data Item Descriptions (DID) should be considered for content specification only.

In addition, the acquirer should consider how the offeror will identify, acquire, and manage the technical data, computer software, intellectual property, and their associated license rights to support acquisition and sustainment of the system throughout its entire life cycle. These data rights considerations may affect the contracting strategy for SE process outputs and tailoring of the standards.

4.2 SUGGESTED REQUEST FOR PROPOSAL LANGUAGE

Applying the 15288 Standards on acquisition contracts involves two related but distinct concepts:

- *Conformance:* the extent to which an offeror’s proposed SE activities, tasks, and outputs align with the requirements of the IEEE 15288 standards, as tailored. Conformance of SE processes and technical reviews and audits to the IEEE 15288 standards is evaluated for contract award (i.e., via proposals and documentation submitted in response to a RFP and SOW).
- *Compliance:* the extent to which a supplier adheres to the contract by performing the required SE processes and technical reviews and audits, and generates the required outputs. Compliance is monitored and evaluated during project execution.

Once the acquirer determines the desired scope of conformance to the 15288 Standards, offerors are required to propose that conformance. The acquirer incorporates the conformance requirements into Section C (SOW), Section L, and Section M of the RFP.

The following tables provide recommended clauses for the acquirer to incorporate into the RFP. The following conventions are used in these clauses:

- Text contained in {} braces is optional and may be deleted
- Text contained in [] brackets is intended to be modified by the acquirer

Table 4 contains recommended clauses for the SE portion of the SOW. These clauses should be considered individually for addition to Section C.

Table 4: Section C Recommended Clauses

(SOWxx1) The Contractor shall define and implement systems engineering processes in conformance with IEEE 15288.1-2014{as tailored by [Ref *tailoring document*]}. Conformance shall be measured via the outcomes and outputs specified by 15288.1-2014{as tailored by [Ref *tailoring document*]}.

(SOWxx2) The Contractor shall define and conduct technical reviews and audits in conformance with IEEE 15288.2-2014 {as tailored by [Ref *tailoring document*]}. Conformance shall be measured via the outputs and criteria specified by 15288.2-2014{as tailored by [Ref *tailoring document*]}.

(SOWxx3) The Contractor shall deliver a Systems Engineering Management Plan (SEMP) that documents the system development approach applying systems engineering standards, including processes, outputs, technical reviews, and audits, that is consistent with the Government-provided Systems Engineering Plan (SEP) {*RFP Document reference*}.

(SOWxx4) The Contractor shall deliver an Integrated Master Plan (IMP) and Integrated Master Schedule (IMS) that includes the applicable technical reviews and audits as documented in the SEMP.

Section L of the RFP includes instructions to offerors. The acquirer should encourage offerors to propose alternative tailoring to the 15288 Standards, with appropriate justification. If a tailoring description is requested from the offeror, the response is recommended to be an appendix to the Technical Volume and not be page limited. The rationale for the alternative tailoring shall include risk and cost-benefit analysis (e.g., risk of tailoring compared with the risk of not tailoring). Table 5 contains recommended provisions for Section L, which the acquirer should consider individually for inclusion.

Table 5: Section L Recommended Provisions

(L1:M1) The offeror shall, as part of its technical proposal, provide a Systems Engineering Management Plan (SEMP), Integrated Master Plan (IMP), and Integrated Master Schedule (IMS) to describe the implementation of IEEE 15288.1-2014 and IEEE 15288.2-2014{as tailored by [Ref *tailoring document*] and/or any alternative proposed tailoring} in its system engineering processes and schedule to meet the requirements of the Statement of Work (SOW), System Performance Specification, and other contractual requirements.

Section M of the RFP includes the evaluation factors for how the acquirer will evaluate the proposals. Table 6 contains recommended provisions for Section M, which the acquirer should consider individually for inclusion.

Table 6: Section M Recommended Provisions

The offeror's proposal will be evaluated based upon:

1. **(M1:L1)** The extent to which the offeror's systems engineering approach and schedule demonstrate an appropriate balance of cost, schedule, and performance risk {including any alternative value-added tailoring options that meet the intent of IEEE 15288.1 and IEEE 15288.2}.

The rationale for the tailoring should include risk and cost-benefit analysis for the tailoring (e.g., risk of tailoring compared with the risk of not tailoring). Eliminating or significantly restricting SE areas ostensibly to improve cost, schedule or performance may not actually add value when the associated risks are considered.

4.3 OFFEROR RESPONSE TO REQUEST FOR PROPOSAL

In general, the offeror's SE approach will be documented in the proposal's technical volume – execution details in the SEMP, scheduling details in the project plan and/or schedule (i.e. IMP/IMS), and resourcing details in the cost volume. The acquirer's SEP, and the supplier's SEMP where applicable, should define the planned acquirer/supplier implementation of SE processes and common understanding of expected outputs. The tailored SE standards should be specified in an attachment to the supplier's SOW. When baselined by contract, this forms a set of requirements for the scope of work to be performed along with the baseline against which compliance will be evaluated.

There are opportunities to improve the implementation of standards on contract after the pre-RFP tailoring. During contract award and negotiation, the acquirer assesses the feasibility of the approach, and provides an opportunity for further tailoring of the standards to improve SE effectiveness, achieve a common understanding of conformance verification, and factor in affordability improvements. The acquirer should encourage suppliers to propose additional tailoring opportunities to the 15288 Standards, with appropriate justification. If a tailoring description is requested from the supplier, it is recommended the response be an appendix to the Technical Volume that does not count against the page limit.

During the proposal effort, offerors respond to the RFP requirements and may demonstrate alignment of their established organizational processes with those of the acquirer-tailored standard. Offerors may accomplish this by adapting, where necessary, existing organizational processes to conform to the standards, or by proposing alternative tailoring of the 15288 Standards in a manner that preserves the acquirer's intent but aligns with the established organizational processes.

However, offerors should be aware that tailoring that does not strictly conform to the SOW, CDRL, or other RFP requirements may result in the proposal being rejected as non-responsive. Offerors should use Industry Days, responses to draft RFPs, and other discussions with the acquirer to determine the level of tailoring permitted, including the acceptability of alternate proposals that do not strictly conform to RFP requirements.

Given the acquirer's requirements for 15288 conformance, as stated in the RFP, the offeror's objective is to provide the most efficient and effective means of achieving that conformance. Often this is best achieved through the offeror's existing organizational processes. In this case, the offeror's challenge is to ensure that these existing processes satisfy the acquirer's conformance requirements and to ensure that the proposal is responsive to the RFP.

If the RFP specifies that alternative tailoring proposals are acceptable, the offeror may submit proposals for alternative tailoring to the 15288 Standards. Such proposals should address the value added by the alternative tailoring, as well as the associated risks and opportunities. The end result is a collection of processes the offeror is committing to perform, a collection of outputs that the offeror is committing to provide either as CDRL or DAL items, and a commitment to conformance with the processes and outputs of the 15288 Standards.

Analysis of the driving factors discussed in section 3.4, Tailoring Considerations, and Appendix A will also inform the offeror's approach to tailoring.

The offeror's proposed technical solution will further influence the tailoring. For example, consider a proposed solution that is a modification of a previously developed system. Since the system design already exists, the *Architecture Definition* and *Design Definition* processes employed will differ from those used on a completely novel design. These *Architecture Definition* processes will focus not on the creation of a new architecture, but on the adaptation of an existing architecture to the new application. Likewise the *Design Definition* process will focus on adapting existing designs to the new application. Prior experience will also influence the risks facing the offeror, concentrating them in areas of less experience.

A useful place to start in assuring conformance is to map the organizational processes and the outputs they produce to the 15288 processes and the 15288.1 outputs. Given such a mapping, the offeror may then identify those process and output gaps that need to be filled to provide the required level of conformance.

As a result of the mapping process, offerors should be able to specify a collection of standard or modified organizational processes that they will execute on the project, and a collection of standard or modified outputs that those processes produce. The offerors' proposals should:

- Identify the organizational processes that will be performed to achieve conformance to the acquirer's process requirements derived from IEEE/ISO/IEC 15288, and certify that those processes meet the stated requirements
- Identify the work products produced from these organizational processes that will satisfy the acquirer's output requirements derived from IEEE 15288.1, and certify that those work products meet the stated requirements
- Identify the review and audit activities to be performed that will satisfy the acquirer's technical review and audit needs derived from IEEE 15288.2, and certify that those review and audit activities meet the stated requirements

4.4 PROPOSAL EVALUATION AND SOURCE SELECTION

During source selection, the acquirer will assess offerors' proposals to determine whether or not they are responsive to the RFP and, with regard to SE and technical reviews, conform to the 15288 Standards. The source selection will also assess bid realism and select the offer that provides the best overall technical and programmatic benefit.

The offeror's proposal should:

- Clearly address the activities, outputs, reviews, and audits that are incorporated into the project
- Ensure that these conform to the 15288 Standards
- Demonstrate the ability and commitment to:
  - successfully execute the required SE activities,
  - produce the required outcomes and outputs, and
  - conduct the required technical reviews and audits

During source selection the acquirer should ensure that the offers:

- Adequately respond to the mission/project technical requirements stated in the RFP
- Adequately respond to the SE requirements stated in the RFP
- Adequately conform to the 15288 Standards, as tailored
- Properly implement the required technical reviews and audits to support technical, mission, and programmatic decision-making
- Include mechanisms, such as Technical Interchange Meetings (TIM), and management/review boards, for early and persistent insight into the evolving engineering activities, development of the acquisition products, and associated risks
- Properly plan and resource, such that execution of the proposed effort is assured
- Attain support from past performance success in similar/related acquisition efforts
- Maintain credibility and balance for the overall needs of the effort
- Provide the best value proposition to the acquirer considering technical merit, cost, schedule, and risk

This evaluation can be complex and involves many variables, including weighting of evaluation factors. It is generally not a purely technical evaluation but should not be purely a cost evaluation either. The acquirer should balance the acquisition priorities and weighting, including the requirements for adequate SE processes and technical reviews, for successful source selection.

Prior to contract award, the acquirer and supplier may enter into negotiations to achieve specific contracting objectives (e.g., reduction in price, accelerated schedule). The negotiated contract provides the definition of the activities and outputs of the supplier, and forms the baseline against which the acquirer will assess the supplier's compliance. However, it is possible that during these negotiations the parties will further tailor the processes, work products, or technical assessments initially proposed by the offeror and evaluated by the acquirer. Such modifications will likely impact the degree of conformance to the 15288 Standards that the supplier will provide. During the negotiations, it is imperative that the acquirer and supplier identify the impact of changes on the conformance to the 15288 Standards and reach agreement on the resulting level of conformance to be provided.

The awarded contract creates a commitment for the supplier to:

- Perform the processes in accordance with contract requirements, including all associated compliance standards
- Create and make available the outputs in accordance with contract requirements
- Perform the technical reviews and/or audits in accordance with contract requirements
- Deliver a product that meets the specification requirements placed on contract

5 Contract Execution

The ultimate objective of the acquirer is to obtain a product or system that meets the acquirer's needs and satisfies the terms of the contract. In order to achieve this objective, the acquirer and supplier should monitor the execution of the project to ensure conformance to the best practices described in the 15288 Standards, and compliance with the specification and non-specification requirements contained in the contract.

5.1 PROCESS COMPLIANCE

Through various engagements (e.g., TIMs, design reviews, etc.) with the supplier during contract execution, the acquirer will have the opportunity to observe the processes being performed on the project, or observe evidence of the processes having been performed. Through these observations, the acquirer can identify elements of non-compliance in the form of:

- Failure of the supplier to perform the processes according to the contract
- Failure of the processes to conform to the acquirer-defined elements of the 15288 Standards

If such failures are observed, the acquirer can issue corrective action directives. For some contracts and suppliers, the Defense Contract Management Agency (DCMA) can be helpful in assessing the supplier's process performance.

5.2 OUTPUT COMPLIANCE

Throughout the execution of the contract, the acquirer can monitor compliance with the provision of outputs. These outputs may be obtained as CDRL items or via the DAL. The acquirer should also assess outputs as an indicator of the technical maturity, feasibility, technical risk, and expected performance of the end product. As outputs become available, the acquirer should obtain and evaluate the output to verify:

- The output complies with the contract
- The output conforms to the acquirer-defined elements of the 15288 Standards
- The output provides reasonable confidence that the product will meet specification requirements

The acquirer can gain early insight into output compliance by participating in TIMs and by reviewing analyses or test results as they are evolving or being conducted. If the outputs provided as CDRL items fail to satisfy these requirements, they may be rejected with instructions to correct deficiencies and resubmit. If outputs provided via the DAL fail to satisfy these requirements, the Contracting Officer may issue a corrective action directive specifying actions to comply with the contract.

5.3 TECHNICAL REVIEW COMPLIANCE

Throughout the execution of the project, the acquirer should be involved in the conduct of technical reviews and audits specified in the contract. Monitoring for compliance should address both the technical review process and the entry/exit/success criteria established as part of the contract. The acquirer should use technical reviews and audits to evaluate product maturity, assess technical feasibility and risk, and monitor technical performance measures and test results. At each technical review or audit, the acquirer should verify:

- The technical review or audit complies with the contract
- The technical review or audit conforms to the acquirer-defined elements of the 15288.2 standard
  - Appropriate preparation is made
  - Entry criteria are defined and met
  - Appropriate personnel are involved
  - The defined review process is followed
  - Exit/success criteria are defined and met
  - Results are documented
  - Action items are driven to closure.

If the technical review or audit fails to satisfy these requirements, they may be rejected with instructions to correct deficiencies and reassess.

Appendix A – How Project Characteristics May Drive Tailoring of the 15288 Standards

Certain project characteristics and associated sub-characteristics may influence tailoring of the 15288 Standards. The tailoring should identify which outcomes, activities, tasks, and outputs, in part or in full, are applicable to the acquisition and those which are not. Before the acquirer and offeror can consider adjusting the intensity and rigor applied to the outcomes, activities, tasks, and outputs, they should understand the type of system and the mission application or domain. The driving characteristics discussed in this appendix include

- Life cycle considerations
- Mission application
- Organizational complexity
- Technical complexity
- Risk
- Technical Understanding

A.1 Life Cycle Considerations

System and acquisition life cycle considerations can have an enormous impact on the focus and rigor of SE processes used on a specific project. The life cycle considerations listed below are examples of those that can drive the tailoring of the 15288 Standards. However, unlike the leading factors for risk or technical understanding that tend to drive tailoring in a consistent direction (e.g., higher risk requires more rigor in many processes), life cycle considerations may not be easily aligned in the ways they influence tailoring. Therefore, it is critical for acquirers and suppliers to carefully examine each of the life cycle considerations below, as well as any additional considerations that may be applicable, to determine how specific processes and technical reviews should be tailored.

- **Acquisition life cycle phases covered** – Few contracts cover the full acquisition life cycle from concept development to operation, maintenance, and disposal. The phase(s) of acquisition or development covered by the RFP can have a large impact on which technical processes are emphasized for that project or contract. For example:
    - Contracts addressing early acquisition phases will most likely mean more emphasis and rigor in the *Stakeholder Needs and Requirements Definition, System Requirements Definition,* and *Architecture Definition* processes, among others.
    - Contracts addressing later phases may require increased emphasis and rigor on the *Transition, Validation, Operation,* and *Maintenance* processes.
    - Contracts for a system that has already been partially developed may allow tailoring of the *Architecture Definition* process by deleting the need for developing models and views of candidate architectures since the architecture choice has already been made.

In contrast, the acquisition phase(s) may have less impact on the tailoring of technical management processes, which generally apply throughout the acquisition life cycle.

While a particular project/contract may not address the full life cycle of the system, both the acquirer and the supplier should ensure adequate consideration of all life cycle processes. Failure to consider *Transition*, *Operation*, and *Maintenance* processes during the design and production of the system can have an adverse impact on both the performance of the system and the life cycle cost. The acquirer should clearly indicate the level of attention to be paid to aspects of the system life cycle outside of the acquisition phase(s) within the scope of the contract by defining the process activities, outcomes, and outputs expected from the supplier.

- **Acquirer/Supplier division of labor** – The division of labor and/or responsibility between the acquirer and the supplier can impact the tailoring of processes in the RFP and contract. There may be outcomes, activities, and/or outputs that the acquirer elects to perform. In those cases, the applicable process elements would be tailored out of the contract. For example, the acquirer may conduct an Analysis of Alternatives to select the system concept to address a particular need. In this case, the activities and outcomes of the *Business/Mission Analysis* process are the responsibility of the acquirer and should be tailored out. The acquirer should clearly indicate the process activities, outcomes, and outputs to be provided by the acquirer, and those expected from the supplier.
- **Duration of development effort –** The duration of the development effort can impact tailoring of SE processes in several ways. Schedule constraints due to urgent operational needs may not allow for all activities, tasks, and outputs of certain processes to be performed, requiring both the acquirer and supplier to carefully select, prioritize, and apply rigor/intensity to the processes based on risk. Since the elimination/reduction of process elements increases the risk of the project, such tailoring should be accompanied by an increase in the rigor and focus of the *Risk Management*, *Measurement*, and *Project Assessment and Control* processes in order for the timely insights needed to manage under the schedule constraints. On the other hand, lengthy development efforts may require the supplier to establish more robust *Project Planning*, *Project Assessment and Control*, *Configuration Management*, and *Information Management* processes to keep the project on track and ensure knowledge and data is not lost. Lengthy development efforts may also require more robust *Business or Mission Analysis* and *Stakeholder Needs and Requirements Definition* processes to account for new or changing requirements to meet emerging threats.
- **Development life cycle model (e.g., rapid development) –** The opportunities and constraints associated with the development life cycle model chosen for a given project can impact tailoring of SE processes. As discussed above, rapid acquisitions to meet urgent operational needs introduce schedule constraints that may limit the use of some SE processes. Other life cycle models include incremental delivery of capabilities, which may affect a project's Architecture Definition, Design Definition, and Implementation processes (e.g., an evolutionary life cycle benefits from having a robust architecture and design that accommodates the addition of functionality in the future). The choice of the life cycle model may impact the timing of the process activities and tasks, as well as the timing and content of the outputs (e.g., for an incremental delivery, the outputs would be provided incrementally as the system evolves rather than as a single, complete product).
- **Type of system being developed –** Development of platforms, weapons, command and control, or IT systems platforms each poses unique requirements and constraints on the development activities. The 15288 technical processes and resulting outputs are likely to differ for these categories of systems. For example, development of an IT system using iterative development techniques may require a very robust *Configuration Management* process. Development of a platform such as a ship may require extensive attention to the *Architecture Definition* process, since the ship is essentially a system-of-systems. Development of a satellite may require extra attention to the *Quality Management* process to

address the environmental qualification of components and overall system reliability. Only a clear understanding of the system type will support appropriate tailoring of the 15288 Standards.

A.2 Mission Application

The mission, and the scope and type of project can influence the acquisition strategy and overall technical approach of the project, and may have a significant impact on tailoring of the 15288 Standards. The mission will dictate the degree to which specific SE processes may be required. Table A-1 identifies the Mission Application Sub-Factors. Table A-2 provides examples of the subfactors with a mapping to their associated ISO/IEC/IEEE 15288 processes. **Error! Reference source not found.** provides a space-specific example of tailoring considerations.

Table A-1: Mission Application Subfactors

Mission Application	• Domain • Mission criticality (‘-ilities’ required; domain regulations) • Number of usage scenarios • Number of deployment sites / environments • Design for reusability

Domain – “System Domain” is a term with many meanings. To some, it means a classification of the system type (e.g., weapon, transportation, command and control, information technology). For others it refers to the system operating environment (e.g., air, land, sea, space, undersea, cyberspace). For some, it addresses a classification of the end-users (e.g., Army, Air Force, Navy, Marines). Regardless of the specific definition of the term, the system domain can have a significant impact on the tailoring of the 15288 processes.

Table A-2: Mission Application Subfactors Examples

Mission Application Subfactors	Examples	15288 processes
Mission Criticality	• Reliability, Maintainability, and Availability (RMA) • Safety, Privacy, Cybersecurity, Dependability (Degraded Performance) • Interoperability, Extendibility • Resiliency	6.4.2 Stakeholder Needs and Requirements Definition 6.4.3 System Requirements Definition 6.4.4 Architecture Definition 6.4.9 Verification
Number of Usage Scenarios	• Concept of Operations • Operation Concepts • Mission Scenarios • Interoperability	6.4.2 Stakeholder Needs and Requirements Definition 6.4.6 System Analysis 6.4.11 Validation
Number of Deployment Sites/ Environments	• Configuration Management o Single Operational Baseline o Multi-Configuration Baselines • Data Management • Logistics	6.4.4 Architecture Definition 6.4.5 Design Definition 6.4.8 Integration 6.4.10 Transition 6.4.11 Validation
Design for Reusability	• Logical Architecture o Non-Developmental Items(COTS, GOTS, Reuse) • System Element Fidelity • System Integration • Interface Management • Requirements Traceability	6.4.3 System Requirements Definition 6.4.4 Architecture Definition 6.4.8 Integration

Table A-3: Example - Summary of Space Vehicle Risk Class Attributes

System Development Activity	Lowest Risk Tolerance (e.g. operational systems)	Medium Risk Tolerance (e.g. demonstration systems)	Highest Risk Tolerance (e.g. experimental systems)	References to SE Standards which may be Tailored to Achieve specific Requirements
Technical Oversight	Formal inspections, peer reviews, independent assessments and analysis of design, requirements and verification documentation conducted	Some independent assessments and analysis conducted on design, requirements and verification documentation Inspections conducted on high risk areas	Informal inspections as required by the developer Peer review encouraged	**15288.2**
Cost Reporting	Earned value management (EVM) system required	EVM may be used	Not required	**15288.1** 6.2.3 Portfolio Management (6.2.3.3 items 5 & 7) 6.3.1.4 Project Planning Process Outputs
Risk Management	Formal risk management (RM) plan as deliverable and common risk management tool Validated/approved process and process documentation, formal risk management boards, integration of risk management process/databases throughout the subcontractor/supplier chain with full acquirer participation	Contractor RM best practices applied at inception of the project to the end Risks reported on a monthly basis (as required) until risks are mitigated	Risk is accepted by the developer or reported on a periodic basis	**15288.1** 6.3.4 Risk Management
Configuration Management	Formal configuration management (CM) plans, processes and boards integrated throughout the sub/supplier chain with Government approval for baseline/change control and configuration audits	CM plan not a deliverable Rely on contractor system with periodic visibility into process controls such as internal CSA reports. Include delivery of baselines.	Periodic visibility into acquirer CM process controls	**15288.1** 6.3.5 Configuration Management Process **EIA 649-1** Configuration Management **Defense Acquisition Guidebook (DAG)** 4.3.7 Configuration Management Process

Table A-3: Example - Summary of Space Vehicle Risk Class Attributes (continued)

Subcontractor/ Supplier Management	Formal subcontractor/supplier management practices required Includes validated/approved process and process documentation, integration of prime and sub/supplier activities	Monitored for critical items (such as command and data handling or momentum wheels)	Usually no or little monitoring of subcontracts	**15288.1** 6.1.2 Supply Process
Manufacturing & Production Management	Formal manufacturing and production management projects with plans required	Limited Government oversight Focus on anomalies, waivers, parts alerts	Informal manufacturing and production management approach	**15288.1** 6.3.5.4 Configuration Management Process Outputs 6.3.7 Implementation Process
Reviews & Audits	Formal comprehensive design reviews required to component level at all major milestones (SFR, PDR, and CDR)	Four or five major reviews are performed (SRR, PDR, CDR, TRR, pre-ship review)	Developer's discretion	**15288.2, with section 6 criteria tailored**
SE Process	System engineering (SE) processes/applicable deliverables required throughout the system life cycle	SE principles applied to project but formality and deliverables are minimized. Government evaluates contractor processes	Highly tailored to a small set of critical SE processes	**15288.1**
Design Assurance	Design reviews/deliverables include assessment of design process execution, change process, design changes, technology readiness level, and adequacy of technology demonstrations	Dependent on supplier process with Government insight	Dependent on supplier process	**15288.2**
System Safety	Formal systems safety program with plan required as deliverable	System safety program required	Developer needs to prove space vehicle is safe to integrating/launch vehicle contractor(s)	**15288.1** 6.4.2 Stakeholder need and Requirements Definition Process 6.4.3.4 System Requirements Definition Process Outputs
Reliability	Reliability plan and analysis required	Reliability analysis required	Reliability analysis requirements based on applicable safety requirements	**15288.1** 6.4.2 Stakeholder need and Requirements Definition Process 6.4.3.4 System Requirements Definition Process Outputs

A.3 Organizational Complexity

Organizational complexity can be associated with both the number of development organizations involved and how they relate to one another in performing their tasks and fulfilling their missions. Viewpoints of the involved organizations may be diverse and have likely been formed based on their respective corporate legacy. Standards can effectively focus these viewpoints on a common goal. As the number and hierarchy of involved participants grow, the degree of formality and process rigor will need to grow as well. Tailoring of the standards should be particularly scrutinized in the *Project Planning* process, where the Project Management Plan along with the acquirer's SEP and supplier's SEMP closely align.

Another key 15288 process area related to Organizational Complexity is *Project Assessment and Control*. As the project is executed, the performance of a complex organization should be monitored to maintain ongoing awareness of task performance and evolving risks. Well-orchestrated interaction between the acquirer and supplier can be crucial to both acquisition and mission success for procurements with greater levels of complexity. This allows for leading indicators of progress and potential problems before formal reviews or output delivery. Technical and project reviews should be planned to enhance information sharing at key decision points where changes can be made to the acquisition with minimal risk or impact. Although formal reviews are conducted at the progress points identified in the IMS, the discussion and information sharing between supplier and acquirer should be honest and frequent to ensure that any deviations from planned performance are investigated and analyzed before they become significant concerns. Affected stakeholders throughout the complex organization should be kept aware of project status, along with any need for corrective actions and re-planning. Additional process tailoring may be required at that time and should be updated in the SEMP/IMP/IMS and other detailed plans to facilitate recovery.

The *Decision Management* process is vital to support management and tracking of the many diverse choices inherent in a complex acquisition, especially when performed by a complex organization. As the diversity and hierarchy of stakeholders increase, the process outputs and their fidelity may need to be more detailed. Tailoring of the *Decision Management* process should ensure that the alternatives are properly analyzed and recommendations made, in as timely a manner possible, that are consistent with the needs, expectations, and phase of the project. Capturing and promptly communicating these decisions across the project, regardless of project phase, are vital as the solution matures to prevent unnecessary rework, cost, and schedule delays. Expectations as to what types of decisions are to be made and their evaluation process/criteria, along with results of prior key decisions, should be factored into the technical plans, including the SEP, SEMP, and lower level technical plans used by the project.

In order to retain and communicate the project effort throughout a complex organization, a robust *Information Management* process is needed. Expectations of the *Information Management* services should be factored into the SEP and SOW, with the acquirer specifying the needs and expectations of the supplier's processes and capabilities. Similarly, the supplier processes should be articulated in the SEMP to explain how information is managed within the supplier's organization and what information will be supplied to sub tier suppliers and the acquirer. It is important to identify the types of information which should be retained as well as duration of retention and what information should be retired/archived.

A.4 Technical Complexity

Technical complexity may be driven by a number of factors, including:

- Number of requirements
- Requirement complexity
- Number of system external interfaces
- Number of user classes
- Number of system elements / internal interfaces /architectural levels
- Number of KPPs
- Reliance on immature technology

As technical complexity increases due to any or all of these factors, the supplier should enhance a number of processes to address this complexity. Increased complexity may be manifested in more system elements, more and more complicated interactions or interfaces between system elements, and more system functions.

Chances are high that ALL 15288 processes will contribute to project success to some degree, regardless of the level of technical complexity. However, the challenges of higher complexity may require even more rigor and more emphasis in processes including, but not limited to:

- ***System Requirements Definition*** – Increased complexity is typically embodied in more requirements, and more complex requirements. A robust *System Requirements Definition* process is essential to manage this requirements environment. For more complex systems, formal and documented requirements development methods that ensure clarity, completeness, and traceability of requirements are required. Automated requirements management tools can be helpful.
- ***System Analysis*** – Increased complexity often implies more intricate, more comprehensive, and/or more types of analysis to define the functionality to be implemented. In more complex systems, such analysis is best served by formal analytical methods, (e.g., performance analysis, feasibility analysis, specialty engineering analysis), increased Integrated Product Team (IPT) use and interaction, and increased stakeholder interaction.
- ***Architecture Definition*** – Increased complexity can drive more complex physical architectures containing more elements, more complicated elements, and more interfaces and dependencies between elements. Complexity can also drive more complex functional architectures, with larger numbers of and more sophisticated functions, and more interdependencies. This is further complicated when interacting systems are being developed concurrently by multiple organizations. Development of more complex systems requires greater attention to system architecture modeling and documentation. Tools and techniques such as Systems Modeling Language (SysML) and the DoD Architecture Framework (DoDAF) can be helpful. Increased attention should also be paid to architecture analysis to ensure satisfaction of functional, non-functional, and performance requirements.
- ***Design Definition*** – Increased complexity often results in larger and more complicated designs needed to satisfy system requirements and conform to system architectures, both of which are impacted by technical complexity. Design of more complex systems often manifests itself in larger and more diverse design teams, performing more complicated design tasks. In such cases, design staff may require more

sophisticated skill sets, and design activities may require more technical analyses and documentation demanded by a more robust *Design Definition* process.

- ***Verification*** – Increased requirements, more complex architectures, and more complicated designs derive from increased technical complexity. All of these factors drive an increase in the scope of the *Verification* activities. A robust *Verification* process is needed to ensure adequate and comprehensive technical reviews throughout the development process. The process ensures necessary and sufficient developmental testing at all levels (e.g., component, integration, system, certification), which may increase with increased complexity.
- ***Project Planning*** – Increased complexity results in more complicated requirements, architectures, and designs; and often creates demands for larger development teams. All of these factors place increased demands on the *Project Planning* process. Larger design teams require greater task definition and coordination. More complicated design tasks require more attention to design planning, design management, and design monitoring. In such cases, a more robust *Project Planning* process is needed to define, distribute, track, and manage the tasks of the project.
- ***Configuration management*** – Increased complexity is often manifested in more requirements, more complicated architectures, and larger designs. All of these produce more artifacts that should be maintained under configuration management. Furthermore, the larger design teams associated with more complex systems produce more artifacts, and update these artifacts more frequently. All of these factors demand a robust *Configuration Management* process. Tools that automate the *Configuration Management* process and integrate with customer *Configuration Management* processes can be helpful.
- ***Risk Management*** – Increased complexity is often manifested in more requirements, more complicated architectures, and larger designs. All of these produce more risks that require management. All of these factors demand a robust *Risk Management* process. Tools that automate the *Risk Management* process and integrate with customer *Risk Management* processes can be helpful.

A.5 Risk

Technical risk is a key factor influencing the tailoring of the processes of the 15288 Standards. Risk may arise from numerous sources, including:

- System precedence / technology availability
- Technology obsolescence
- Integration of the technology
- Programmatic / external risk
- Sustainment / disposal risk
- Manufacturing / supply chain risk
- Prior acquisition / system failures or past performance history

For projects posing higher risks, the supplier should enhance a number of processes to address this risk.

All 15288 processes likely apply to projects of any risk level, but the challenges of higher risk projects may require more rigor and more emphasis in processes including, but not limited to:

- ***Risk Management*** – Clearly, projects with higher levels of technical risk require more attention to the *Risk Management* process. To manage risks, the project should employ robust methods of continuously identifying, characterizing, and prioritizing risks. The supplier should develop and document plans for addressing the identified risks, and track the execution of these plans. It is important to ensure that risk mitigation plans be integrated with the project IMP and IMS, and be appropriately budgeted and staffed. Tools that automate the *Risk Management* process and integrate with customer *Risk Management* processes can be helpful.
- ***Business or Mission Analysis*** – Projects with higher technical risks will be challenged to satisfy their business or mission objectives. Consequently, the *Business and Mission Analysis* process should be performed rigorously to clearly identify, document, and prioritize the business or mission objectives. This analysis aids the project planners in evaluating the impact of identified risks on those objectives, and helps formulate mitigations that optimize project results.
- ***Life Cycle Model Management*** – the choice of a development life cycle is influenced by the level of project risk. Risk often necessitates variation from the initial plan and the initial system design. Some development life cycles, such as agile and spiral, are more adept at addressing such changes.
- ***Project Planning*** – Project risks should be addressed during the *Project Planning* process. Adequate budget and schedule reserves should be established to address the mitigation activities taken to manage the risks, and/or the consequences that will arise from realization of the risks. Additionally, the project plans should provide sufficient resources and staff for the execution of the *Risk Management* process.
- ***Measurement*** – Establishing a *Measurement* process that includes robust use of leading indicators is an important step in managing risk. Leading indicators can aid in early identification of deviations from plan resulting from identified or unidentified risks. Early identification supports early corrective actions, which are often less costly than later corrective actions.
- ***Project Assessment and Control*** – Projects facing higher risks are more likely to deviate from initial project plans. Careful attention to the *Project Assessment and Monitoring* process can detect these deviations as leading indicators of future project issues, and can provide valuable inputs to the *Risk Management* process.
- ***Architecture Definition*** – Fragile architectures can be unable to accommodate variations needed to address risks as they arise. Thus, a robust and flexible architecture is often a good mitigation strategy against technical risks. System architectures often have strong influences on a project's quality attributes (e.g., reliability, scalability, adaptability). These quality attributes can be essential in addressing issues as the system evolves during its development to address risks as they arise. Knowing the risks facing a project enables the development of an architecture best suited to address those risks.
- ***Configuration Management*** – Projects facing higher risks are more likely to deviate from initial project plans. Thus, more attention is needed to the *Configuration Management* process to ensure that these deviations are authorized and effectively documented and communicated.
- ***Remaining Processes*** – depending upon the characteristics of the risks facing the project. Risks arising from requirements issues demand more attention to the *Stakeholder Needs and Requirements Definition* process and the *System Requirements Definition* process. Risks arising from test issues may demand more attention to the *Verification* and *Validation* processes.

A.6 Technical Understanding

The technical understanding of the problem and solution spaces is a primary factor driving the tailoring of SE processes across the life cycle. Technical understanding includes, but is not limited to, the:

- Mission understanding
- Requirements understanding
- System architecture understanding
- Technology understanding
- Likelihood of emergent properties (i.e., unplanned and unanticipated performance) of the system

The lower the level of understanding of these subfactors may make it necessary to increase the rigor of implementation of the following processes:

- ***Business or Mission Analysis*** – Lower levels of mission understanding may be mitigated by increased efforts in the *Business or Mission Analysis* process. Such analysis can refine and clarify mission understanding, ensure proper identification of the problem space, and provide opportunities to validate that understanding across the stakeholder community.
- ***Stakeholder Needs and Requirements Definition*** – Lower levels of mission understanding and/or requirements understanding demand increased efforts in the *Stakeholder Needs and Requirements Definition* process. These efforts should focus on identifying all relevant stakeholders, accurately collecting and representing their needs, integrating those needs into a complete consistent set of stakeholder requirements, and validating that set of requirements across the stakeholder community. This effort enhances the understanding of the mission by viewing it from the perspective of the stakeholders.
- ***System Requirements Definition*** – Development of a high-quality set of system requirements is based on a clear understanding of the mission, the stakeholder needs, and the available technology. Lower levels of understanding in these areas demands increased effort in the *System Requirements Definition* process. These efforts should focus on the translation of mission requirements and stakeholder needs into a high-quality set of system requirements that are implementable within the constraints of available technology and within the constraints of the project (i.e., cost and schedule).
- ***Architecture Definition*** – Development of an appropriate system architecture demands a clear understanding of the mission, the system requirements, and the available technology. Lower levels of understanding in these areas demand increased effort in the *Architecture Definition* process. These efforts should focus on:
  - Development of candidate architectures intended to satisfy both the functional and non-functional requirements of the system, and
  - Evaluation of the candidate architectures to choose the one that best satisfies both the programmatic constraints and the requirements.
- ***System Analysis*** – The *System Analysis* process supports nearly all technical processes, and is typically performed throughout the development life cycle to support architecture development, design implementation, system integration, etc. The *System Analysis* process is based on a clear understanding of the mission, system requirements, system architecture, and available technology. Lower levels of

understanding in these add risk and effort to the *System Analysis* process. A lack of understanding of these inputs is best rectified by regressing to the earlier processes to improve that understanding. However, remaining deficiencies in that understanding may be partially mitigated within the *System Analysis* process by investigating sensitivities and resiliency issues within the system. Development of less sensitive and more resilient solutions can reduce the impact of evolving understanding of mission, requirements, and system architecture.

- ***Design Definition*** – The development of a system design is based on a clear understanding of the mission, the system requirements, and the system architecture. Lower levels of understanding in these areas demand additional efforts in the *Design Definition* process. The *Design Definition* process builds on the system requirements allocated to the system elements, and the system element descriptions and system interface descriptions of the system architecture. A lack of understanding of these inputs is best rectified by regressing to the earlier processes to improve that understanding. However, remaining deficiencies in that understanding will add both risk and effort to the *Design Definition* process. Partial mitigation of these deficiencies may be achieved by ensuring the traceability of efforts and results of the *Design Definition* process to elements of mission, requirements, and architecture inputs and assumptions. As the understanding of these inputs evolves, this traceability supports the ability to propagate this evolution into design changes.
- ***Decision Management*** – The primary objective of the *Decision Management* process is to choose between alternative courses of action encountered throughout the process. The *Decision Management* and *Systems Analysis* processes are closely allied in these activities. Project personnel should identify and record assumptions supporting specific decisions. Then, when technical understanding of the project evolves, the impact of that evolution may be traced to prior decisions that may need to be revisited.
- ***Project Assessment and Control*** – limited technical understanding compromises the project manager's ability to perform the *Project Assessment and Control* process. Without adequate technical understanding, accurate assessments of project status and project risks may not be possible. This may necessitate increased effort within the *Project Assessment and Control* process resulting from an inability to discriminate between critical and non-critical elements of the assessment.
- ***Risk Management*** – A lack of technical understanding can significantly increase project risk. This demands increased effort and attention to the *Risk Management* process to identify and manage these risks. Projects with limited technical understanding should employ a more robust *Risk Management* process that broadens the categories of risks to be considered, increases the frequency of risk reporting and monitoring activities, and engages a broader population of project staff in risk identification and analysis activities.

To avoid a lack of technical understanding, acquirers and suppliers should define and implement processes associated with the concept and system definition in a more iterative and/or incremental manner. The iteration of these processes requires rigorous *System Analysis* and *Decision Management*. Developing a better technical understanding requires closer communication and coordination between the acquirer and supplier, leading to a more comprehensive approach to *Project Assessment and Control*, and may require additional changes in the agreements via the *Acquisition* and *Supply* processes. Finally, the acquirer and supplier will need to focus on risk management. As the technical understanding (i.e., concept and system definition) evolves, the initial cost and schedule estimates will likely change, as well as potential technical impacts. Thus, there will be a need for strong integration between the *Project Assessment and Control* process and the *Risk Management* process.

Appendix B – Work Aid for Definition of Outputs to Be Supplied

The table below is a work aid for the acquirer to select which outputs are required to be produced by the supplier during execution of the project. Keeping in mind that all outputs selected and included in the contract add to the total cost, the acquirer should consider which outputs are truly value-added. Not all outputs from IEEE 15288.1 are likely to be required for every project. Considering the project, technical, and contract characteristics described in Appendix A, the acquirer should indicate which outputs are required and include the priority and rationale for including or excluding those outputs. Depending on the priority, the supplier may choose to propose additional tailoring of the outputs to provide maximum value to the acquirer. Attributes for many of these outputs are included in 15288.1.

Table B-1: Work Aid for Definition of Outputs

ISO/IEC/IEEE 15288 Process	IEEE 15288.1 Outputs	Relative Emphasis for the Project Acquisition (Priority and Rationale)	Tailored Outputs
Agreement Processes			
Acquisition	• Request for Proposal • Supplier Selection Report • Agreement • Agreement Change Management Procedure • Agreement Change Report • Supply Assessment Report • Delivery Acceptance Report		
Supply	• Supply Response (e.g., proposal, tender) • Agreement Change Management Procedure • Agreement Change Requests • Supply Delivery Records		
Organizational Project-Enabling Processes			
Life Cycle Model Management	• Life Cycle Policies, Processes • Life Cycle Procedures • Life Cycle Models • Process Assessment Results • Process Improvement Report		
Infrastructure Management	• Infrastructure Requirements • Infrastructure Elements • Infrastructure Change Requests		
Portfolio Management	• Portfolio Analysis Report • Project Initiation Report • Project Evaluation Report • Project Closure Report		

Table B-1: Work Aid for Definition of Outputs (continued)

ISO/IEC/IEEE 15288 Process	IEEE 15288.1 Outputs	Relative Emphasis for the Project Acquisition (Priority and Rationale)	Tailored Outputs
Human Resource Management	• Required Skills Report • Skills Inventory • Skill Development Assets • Skill Development Records • Qualified Personnel • Staff Assignment Records		
Quality Management	• Quality Management Policies, Objectives & Procedures • Quality Assurance Assessment Report • Corrective & Preventive Action Report		
Knowledge Management	• Knowledge, Skill, & Knowledge Asset Records • Knowledge, Skill, & Knowledge Asset Report • Knowledge, Skill, & Knowledge Management Elements		
Technical Management Processes			
Project Planning	• Project Technical Management Plan • Project Life Cycle Model • Work Breakdown Structure • Project Schedules • Project Budgets • Project Infrastructure & Services Requirements • Project Authorization Record		
Project Assessment and Control	• Project Assessment Records • Measurement Analysis Results & Recommendations • Project Assessment Reports • Project Control Requests • Authorization to Proceed to Next Milestone		
Decision Management	• Decision Register • Decision Report		
Risk Management	• Risk Profile • Risk Action Requests • Risk Profile Reports		
Configuration Management	• Configuration Management Records • Configuration Baselines • CM Change / Variance Requests • Configuration Status Reports • Configuration Evaluation Reports • System Release Reports		

Table B-1: Work Aid for Definition of Outputs (continued)

ISO/IEC/IEEE 15288 Process	IEEE 15288.1 Outputs	Relative Emphasis for the Project Acquisition (Priority and Rationale)	Tailored Outputs
Information Management	• Information Item Register • Information Management Reports		
Measurement	• Measurement Records • Measurement Information Needs Report		
Quality Assurance	• QA Evaluation Reports • QA Records • Incident Records • Problem Records		
Technical Processes			
Business or Mission Analysis	• Preliminary Life cycle Concepts • Problem or Opportunity Statement • Solution Alternatives & Recommendation		
Stakeholder Needs and Requirements Definition	• Operational Concept • Other Life cycle Concepts • Stakeholder Needs • Stakeholder Requirements • Stakeholder Requirements Report • Critical Performance Measures • Traceability Mapping		
System Requirements Definition	• System Description • System Requirements • System Requirements Report • Critical Performance Measures • Traceability Mapping		
Architecture Definition	• Architecture Viewpoints • Architecture Views & Models • Architecture Report with rationale • Interface Definitions (initial) • Architecture Assessment Report • Traceability Mapping		
Design Definition	• Design Characteristics Report • Design Artifacts • Design Artifacts Report with rationales • Interface Definitions • Traceability Mapping		
System Analysis	• System Analysis Report		
Implementation	• Implementation Records • Implementation Report • Traceability Mapping		

Table B-1: Work Aid for Definition of Outputs (continued)

ISO/IEC/IEEE 15288 Process	IEEE 15288.1 Outputs	Relative Emphasis for the Project Acquisition (Priority and Rationale)	Tailored Outputs
Integration	• Integration Records • Integration Report • Traceability Mapping		
Verification	• Verification Records • Verification Report • Traceability Mapping		
Transition	• Transition Records • Transition Report • Traceability Mapping		
Validation	• Validation Records • Validation Report • Traceability Mapping		
Operation	• Operation Records • Operational Problem Reports • Customer Support Records • Operation Report		
Maintenance	• Maintenance Records • Maintenance Requests • Maintenance Problem Reports • Logistics Actions & Report • Maintenance Report		
Disposal	• Disposal Records • Archive Report		

Appendix C – Example Tailoring Document Template

Table C-1 is an example of how the tailored requirements of the 15288 and 15288.1 standards may be included in the RFP without violating copyright and distribution laws. The applicable (meaning mandatory for the given contract) subclauses are identified, as well as any additional requirements related to those processes.

Table C-1: Notional Tailoring Document Template

	Applicable Subclauses	Additional Requirements	Notes
6.1 Agreement Processes			
6.1.1 Acquisition Process			
6.1.1.2 Outcomes	None		
6.1.1.3 Activities and Tasks	None		
6.1.1.4 Outputs	None		
6.1.2 Supply Process			
6.1.2.2 Outcomes	None		
6.1.2.3 Activities and Tasks	None		
6.1.2.4 Outputs	None		

6.2 Organizational Project-Enabling Processes			
6.2.1 Life Cycle Model Management Process			
6.2.1.2 Outcomes	None		
6.2.1.3 Activities and Tasks	None		
6.2.1.4 Outputs	None		
6.2.2 Infrastructure Management Process			
6.2.2.2 Outcomes	None		
6.2.2.3 Activities and Tasks	None		
6.2.2.4 Outputs	None		
6.2.3 Portfolio Management Process			
6.2.3.2 Outcomes	None		
6.2.3.3 Activities and Tasks	None		
6.2.3.4 Outputs	None		
6.2.4 Human Resource Management Process			
6.2.4.2 Outcomes	None		
6.2.4.3 Activities and Tasks	None		
6.2.4.4 Outputs	None		
6.2.5 Quality Management Process			
6.2.5.2 Outcomes	None		
6.2.5.3 Activities and Tasks	None		
6.2.5.4 Outputs	None		
6.2.6 Knowledge Management Process			
6.2.6.2 Outcomes	None		
6.2.6.3 Activities and Tasks	None		
6.2.6.4 Outputs	None		

Table C-1: Notional Tailoring Document Template (continued)

	Applicable Subclauses	Additional Requirements	Notes
Technical Management Processes			
6.3.1 Project Planning Process			
6.3.1.2 Outcomes			
6.3.1.3 Activities and Tasks			
6.3.1.4 Outputs			
6.3.2 Project Assessment and Control Process			
6.3.2.2 Outcomes			
6.3.2.3 Activities and Tasks			
6.3.2.4 Outputs			
6.3.3 Decision Management Process			
6.3.3.2 Outcomes			
6.3.3.3 Activities and Tasks			
6.3.3.4 Outputs			
6.3.4 Risk Management Process			
6.3.4.2 Outcomes			
6.3.4.3 Activities and Tasks			
6.3.4.4 Outputs			
6.3.5 Configuration Management Process			
6.3.5.2 Outcomes			
6.3.5.3 Activities and Tasks			
6.3.5.4 Outputs			
6.3.6 Information Management Process			
6.3.6.2 Outcomes			
6.3.6.3 Activities and Tasks			
6.3.6.4 Outputs			
6.3.7 Measurement Process			
6.3.7.2 Outcomes			
6.3.7.3 Activities and Tasks			
6.3.7.4 Outputs			
6.3.8 Quality Assurance Process			
6.3.8.2 Outcomes			
6.3.8.3 Activities and Tasks			
6.3.8.4 Outputs			
Technical Processes			
6.4.1 Business or Mission Analysis Process			
6.4.1.2 Outcomes			
6.4.1.3 Activities and Tasks			
6.4.1.4 Outputs			
6.4.2 Stakeholder Needs and Requirements Definition Process			
6.4.2.2 Outcomes			
6.4.2.3 Activities and Tasks			
6.4.2.4 Outputs			
6.4.3 System Requirements Definition Process			
6.4.3.2 Outcomes			
6.4.3.3 Activities and Tasks			
6.4.3.4 Outputs			

Table C-1: Notional Tailoring Document Template (continued)

	Applicable Subclauses	Additional Requirements	Notes
Technical Processes *(continued)*			
6.4.4 Architecture Definition Process			
6.4.4.2 Outcomes			
6.4.4.3 Activities and Tasks			
6.4.4.4 Outputs			
6.4.5 Design Definition Process			
6.4.5.2 Outcomes			
6.4.5.3 Activities and Tasks			
6.4.5.4 Outputs			
6.4.6 System Analysis Process			
6.4.6.2 Outcomes			
6.4.6.3 Activities and Tasks			
6.4.6.4 Outputs			
6.4.7 Implementation Process			
6.4.7.2 Outcomes			
6.4.7.3 Activities and Tasks			
6.4.7.4 Outputs			
6.4.8 Integration Process			
6.4.8.2 Outcomes			
6.4.8.3 Activities and Tasks			
6.4.8.4 Outputs			
6.4.9 Verification Process			
6.4.9.2 Outcomes			
6.4.9.3 Activities and Tasks			
6.4.9.4 Outputs			
6.4.10 Transition Process			
6.4.10.2 Outcomes			
6.4.10.3 Activities and Tasks			
6.4.10.4 Outputs			
6.4.11 Validation Process			
6.4.11.2 Outcomes			
6.4.11.3 Activities and Tasks			
6.4.11.4 Outputs			
6.4.12 Operation Process			
6.4.12.2 Outcomes	None		
6.4.12.3 Activities and Tasks	None		
6.4.12.4 Outputs	None		
6.4.13 Maintenance Process			
6.4.13.2 Outcomes			
6.4.13.3 Activities and Tasks			
6.4.13.4 Outputs			
6.4.14 Disposal Process			
6.4.14.2 Outcomes			
6.4.14.3 Activities and Tasks			
6.4.14.4 Outputs			

Appendix D – Definitions and Acronyms

DEFINITIONS

Acquirer	An organization or individual soliciting products or services from a supplier. The acquirer typically defines the scope and terms of the procurement via an RFP released to potential suppliers. Potential suppliers (offerors) respond to the RFP via proposals. The acquirer evaluates proposals submitted by offerors, selects a supplier, and negotiates a formal contract for the desired products, systems, and/or services. For purposes of this guide, the acquirer is typically a DoD Program Management Office or other Government procurement organization, but may also be a prime contractor in relationships with subcontractors or lower-tier suppliers.
Certification	The procedure by which written assurance is given that a product or service conforms to a standard or specification.
Compliance	A formal demonstration of adherence to the terms, conditions, and requirements of an agreement.
Conformance	A formal demonstration of meeting the requirements defined by a standard.
Contract Data Requirements List	A list of authorized data requirements for a specific procurement that forms a part of the contract. The CDRL is the standard format for identifying potential data requirements in a solicitation, and deliverable data requirements in a contract.
Data Accession List	An index of supplier internal data which has been generated by the supplier in compliance with the work effort described in the Statement of Work (SOW) that is made available to the acquirer upon request.
Data Item Description	A document that defines the data required of a supplier. The document specifically defines the data content, format, and intended use.
Defense Contract Management Agency	A DoD Combat Support Agency that ensures the integrity of the contracting process, and provides a broad range of contract-procurement management services for the warfighter.
Informative	Documents or other information that are useful and supplemental, but are not mandatory. Also known as “Reference”
Integrated Master Plan	An event-driven plan consisting of a hierarchy of project events, with each event being supported by specific accomplishments, and each accomplishment associated with specific criteria to be satisfied for it completion
Integrated Master Schedule	An integrated, networked schedule containing all the detailed discrete work packages and planning packages necessary to support the SEP and SEMP, as well as the events, accomplishments, and criteria of the IMP. An IMS may also contain resources necessary to accomplish each work package.

Key Performance Parameter	Performance attribute of a system considered critical or essential to the development of an effective military capability.
Key System Attribute	Key performance attributes of a system considered important to achieving a balanced solution/approach to a system, but not critical enough to be designated a KPP.
Normative	Documents or requirements that are indispensable and mandatory (i.e., they are understood and used). However, normative requirements can be tailored out according to the acquirer-supplier agreement.
Offeror	Potential suppliers responding to an acquirer's request for proposal (RFP) or request for information (RFI). At the time of contract award, the selected offeror is referred to as the supplier.
Outcomes	A set of objectives for a life cycle process. Outcomes define a state that is expected to be achieved by the successful completion of the process.
Outputs	Information, artifacts, or services resulting from the performance of a life cycle process.
Request for Proposal	A formal solicitation by an acquirer interested in procurement of a commodity, service or valuable asset, to potential suppliers to submit business proposals.
Request for Information	A formal request issued by an acquirer with the purpose of collecting written information about the capabilities of various suppliers.
Statement of Work	The portion of a contract which establishes and defines all non-specification requirements for a supplier's efforts either directly or with the use of specific cited documents.
Supplier	The selected offeror engaged via an acquirer-supplier agreement, generally a contract with the acquirer, to provide the desired products, systems, and/or services.
Systems Engineering Management Plan	A plan developed by the supplier defining the supplier's SE approach to be applied to a project.
Systems Engineering Plan	A plan developed by the acquirer defining the acquirer's SE approach to be applied to a project. The SEP may be included as part of the RFP / RFI to communicate the acquirer's expectations for the SE efforts of the supplier.

ACRONYMS

CDR	Critical Design Review
CDRL	Contract Data Requirements List
COTS	Commercial Off-the-Shelf
DAL	Data Accession List
DCMA	Defense Contract Management Agency
DID	Data Item Description
DoD	Department of Defense
GOTS	Government Off-the-Shelf
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronics Engineers
IMP	Integrated Master Plan
IMS	Integrated Master Schedule
IPT	Integrated Product Team
ISO	International Organization for Standardization
KPP	Key Performance Parameter
KSA	Key System Attribute
NGS	Non-Government Standard
OMB	Office of Management and Budget
PDR	Preliminary Design Review
PMO	Program Management Office
QA	Quality Assurance
RFI	Request for Information
RFP	Request for Proposal
RMA	Reliability, Maintainability, Availability
RMP	Risk Management Plan
SDO	Standards Development Organization
SE	Systems Engineering
SEMP	Systems Engineering Management Plan
SEP	Systems Engineering Plan
SFR	System Functional Review
SOW	Statement of Work
SRR	System Requirements Review
TIM	Technical Interchange Meeting
TPM	Technical Performance Measure
TRR	Test Readiness Review
WBS	Work Breakdown Structure

Appendix E – References

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Best Practices for Using Systems Engineering Standards (ISO/IEC/IEEE 15288, IEEE 15288.1, and IEEE 15288.2) on Contracts for Department of Defense Acquisition Programs

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